DEPARTMENT OF MATHEMATICS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**B. Tech I year II Semester MME**		
Course Title	**Mathematics - II**		
Course Code	**MAIR21**	**No. of Credits**	**4**
Course Code of Pre-requisite subject(s)	**MAIR11**		
Session	**Jan. 2019**	**Section (if, applicable)**	**-**
Name of Faculty	**Dr. V. Kumaran**	**Department**	**Mathematics**
Email	**kumaran@nitt.edu**	**Telephone No.**	**2503670**
Name of Course Coordinator(s)			
E-mail		**Telephone No.**	
Course Type	X **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Vector space – Subspaces – Linear dependence and independence – Spanning of a subspace – Basis and Dimension. Inner product – Inner product spaces – Orthogonal and orthonormal basis – Gram- Schmidt orthogonalization process.

Basic review of first order differential equation - Higher order linear differential equations with constant coefficients – Particular integrals for $x^n e^{ax}, e^{ax}\cos(bx), e^{ax}\sin(bx)$ – Equation reducible to linear equations with constant coefficients using $x = e^t$ - Simultaneous linear equations with constant coefficients – Method of variation of parameters – Applications – Electric circuit problems.

Gradient, Divergence and Curl – Directional Derivative – Tangent Plane and normal to surfaces – Angle between surfaces –Solenoidal and irrotational fields – Line, surface and volume integrals – Green's Theorem, Stokes' Theorem and Gauss Divergence Theorem (all without proof) – Verification and applications of these theorems.

Analytic functions – Cauchy – Riemann equations (Cartesian and polar) –Properties of analytic functions – Construction of analytic functions given real or imaginary part – Conformal mapping of standard elementary functions $\left(z^2, e^z, \sin z, \cos z, z + \frac{k^2}{z}\right)$ and

bilinear transformation.

Cauchy's integral theorem, Cauchy's integral formula and for derivatives– Taylor's and Laurent's expansions (without proof) – Singularities – Residues – Cauchy's residue theorem – Contour integration involving unit circle.

Reference Books:

1. Kreyszig, E., Advanced Engineering Mathematics, 10th edn, John Wiley Sons, 2010.
2. Grewal, B.S., Higher Engineering Mathematics, 43rd edition, Khanna Publications, Delhi.
3. Gilbert Strang, Linear Algebra and its applications, 4th edn, Cengage Learning, 2006.
4. James Ward Brown and Ruel V. Churchill, Complex variables and Applications, 9th edn, McGraw-Hill, 2013.

COURSE OBJECTIVES

The students would be able to understand the concepts and applications of the following:
1.Vector and innerproduct spaces
2.Linear differential equations reducible to constant type
3.Vector calculus
4.Analytic functions and mappings
5.Contour integration of a complex valued function.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
After the completion of the course, students are able to	
1.Perform standard operation in finite dimensional vector spaces; Compute the dot product of vectors, lengths of vectors, and angles between vectors.	**PO 1 & 2**
2.Solve linear differential equations reducible to constant coefficient type and interpret it geometrically	**PO 1 & 2**
3.Perform gradient, div, curl operator on vector functions and give physical Interpretations; Use Green's, Divergence & Stoke's theorems to solve engineering problems.	**PO 1 & 2**
4. Construct analytic function for given real or imaginary parts; Plot images of the given region by standard complex functions; Compute bilinear map and study its properties.	**PO 1 & 2**
5.Integrate complex functions in some contours, in particular in side a unit circle.	**PO 1 & 2**

COURSE PLAN – PART II

COURSE OVERVIEW

The course develops the basic concepts of vectorpsaces, linear differential equations reducible to constant coefficients type, vector calculus, mapping of analytic functions, integration of complex functions, to apply them in various academic/industrial applications.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st week 2nd week 3rd week Unit-I & II(18-22 hrs) 4th week 5th week 6th week	Vector spaces: basis, dimension and subspaces Inner product spaces and orthogonalization problems on vector spaces and inner product spaces Linear differential equations with constant coefficients Euler's type, simultaneous linear differential equations Variation of parameter method, Electric circuit problems	Chalk & Talk
2	7th week 8th week *Unit-III* *9th week (9-12 hrs)*	Gradient, divergence and curl Solenoidal and irrotational fields, Green's theorem Stokes' theorem, Divergence theorem and applications	Chalk & Talk
3	10th week 11th week 12th week Unit-IV&V(18-24 hrs) 13th week 14th week 15th week	Analytic functions: properties, construction Conformal mapping of elementary functions Bilinear transformation Cauchy's integral theorem, Cauchy's integral formula Taylor's and Laurent's expansions, singularities, residues Residue theorem ,Contour integration involving unit circle	Chalk & Talk

4.	16th week	Revision/Advanced topics	Chalk & Talk

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Test: I	7th week	72 minutes	16%
2	Test: II	10th week	36 minutes	8%
3	Test: III	15th week	72 minutes	16%
4	Assignments	6th , 9th & 15th weeks	Next 1 week	15%
CPA	Compensation Assessment*	16th week	72 minutes	8% or 16%
5	Final Assessment *	17th week	3 hrs	45%

***mandatory; refer to guidelines on page 4**

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

Twice in a semester feedback from students can give oral (in a vedio form) / written feedback about the course delivery, content etc.,

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

MODE OF CORRESPONDENCE (email/ phone etc)

The faculty is available for consultation during working hours at his office in mathematics department. Queries may also be emailed to the faculty directly at kumaran@nitt.edu

.**PASSING MINIMUM**: 35% or class average/2 whichever is greater.

COMPENSATION ASSESSMENT POLICY

1. Absent for tests: If reason is genuine and informed his inability to write the assessment in time with a written request, the student may be permitted for CPA.

2. Poor academic performance: If his/her marks in all 3 tests together are below class average/2 the student may be permitted for CPA.

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

FOR APPROVAL

Course Faculty V.Kumaran (V. KUMARAN) **CC-Chairperson** CB. RAVISANKAR **HOD** 07.02.19