BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI – K.K. BIRLA GOA CAMPUS
INSTRUCTION DIVISION
SECOND SEMESTER 2017-2018
<u>**Course Handout (Part II)**</u>

Dated: January 8, 2018

In addition to Part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course Number	: **MATH F112**
Course Title	: **MATHEMATICS-II**
Instructor-in-charge	: **Himadri Mukherjee**
Instructors	: **Anil Kumar, Manoj Kumar Pandey, Danumjaya Palla, Jajati Keshari Sahoo, Amit Setia, Tarkeshwar Singh, Akshay Sakharam Rane, Himadri Mukherjee**

1. Scope and Objective of the Course:

The course is meant as an introduction to Linear Algebra, and theory of Complex Variable functions. Study of linear algebra helps us in solving the system of linear equations and various properties of linear transformations. Systems of linear equations are needed to be solved in several branches of sciences and engineering. Complex analysis deals with the method of solving contour integrals, which cannot be evaluated through our conventional techniques. Students are encouraged to study MATLAB's capabilities for solving linear algebra problems given in the Text Book.

2. Text Books:

  a. S. Andrilli and D. Hecker, *Elementary Linear Algebra*, Elsevier, 4th edition, 2015.
  b. R.V. Churchill and J.W. Brown*, Complex Variables and applications*, McGraw-Hill, 8th edition, 2008.

3. Reference Books:

  a. H. Anton and Chris Rorres, *Elementary Linear Algebra: Application Version*, John Wiley & Sons, 9th Ed, 2008.
  b. B. Kolman and D.R. Hill, *Introductory Linear Algebra with Applications*, Pearson Education, 8th edition, 2005.
  c. A.D. Wunsch*, Complex Variables with Applications*, Pearson Education, 3rd edition, 2005.
  d. V. Krishnamurthy, V.P. Mainra and J.L. Arora*, An Introduction to Linear Algebra*, East-West Press, 1976.

4. Course Plan:

Lec. No.	Learning Objectives	Topics to be covered	Sec. No.

Linear Algebra

Lec. No.	Learning Objectives	Topics to be covered	Sec. No.
1	Review of vectors & matrices	Self-study	Chapter-1
2-5	Solving system of linear equations	Solutions of linear systems of equations by Gauss Elimination, Gauss-Jordan, RREF, Equivalent systems, Rank, Row space, Inverse of Matrices	2.1- 2.4.
6-7	Eigenvalues and diagonalization	Eigenvalues & Diagonalization	3.4
8-14	Introduction to abstract vector spaces, finite and infinite dimensional vector spaces and related concepts	Vector spaces, subspaces, Span, linear independence, basis and dimension, Coordinatization	4.1-4.7
15-19	Introduction to linear transformations, examples of linear transformations	Linear transformation, Matrix of a Linear transformation, Dimension theorem,	5.1-5.3, 5.5, 7.5

		Diagonalization of Linear Operators, Introduction to inner-product spaces.	
20	Orthogonality	Orthogonal bases & Gram-Schmidt process	6.1.

FUNCTIONS OF A COMPLEX VARIABLE

21-22	Revising the knowledge of complex numbers	Review	1-11
23	Evaluation of limit of functions of complex variables at a point. Testing continuity of such functions	Functions of a complex variable. Limit and continuity	12,15-18
24-26	Introduction to analytic functions. Finding out singular point of a function	Derivative, CR-equations, analytic functions	19-24,26
27-30	Study of elementary functions. These functions occur frequently all through the complex variable theory, understanding multiple valued function, branch cut and branch point	Exponential, trigonometric and hyperbolic functions, logarithmic functions, complex exponents, inverse functions	29-35
31-32	Integrating along a curve in complex plane	Contour integrals, anti-derivatives	37-43
33-35	Learning techniques to find integrals over particular contours of different functions	Cauchy-Goursat Theorem, Cauchy Integral formula, Morera's theorem (No proof)	44-46, 48-52
36	To study application of complex variable theory to algebra	Liouville's theorem, fundamental theorem of algebra	53-54
37	Series expansion of a function analytic in an annular domain. To study different types of singular points	Taylor and Laurent series (No proof)	60-62
38-39	Calculating residues at isolated singular points	Residues, residue theorem	68-73
40-41	To study application of complex integration to improper real integrals	Improper real integrals	78-81

5. **Evaluation Scheme:**

EC No.	Evaluation Components	Duration	Weightage (%)	Date, Time	Remarks
2	Midterm	90 Min.	35	09/03/2018, 11:00 A.M -12.30 P.M	
3	Announced quizzes, surprise class assignments	**	**	**	**
4	Comp. Exam	3 Hours	45	09/05/2018 (AN)	

** To be announced later.

6. **Problems:** Students are strongly advised to work out all the problems in the text-book and do similar problems from other reference books.
7. **Make-up:** Make-up will be given only in genuine medical cases/ emergency, in all cases prior permission must be obtained from the IC.
8. **Chamber consultation hour:** To be announced in the class.
9. **Self Study Components (SSC):** Matrices and its applications, inversion of matrices, Complex numbers and its applications**.**
10. **Notices:** All notices regarding MATH F112 will be displayed on the Moodle course page.

Instructor-in-Charge
MATH F112