



# BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani

## Pilani Campus

### INSTRUCTION DIVISION SECOND SEMESTER 2015-2016 Course Handout (Part-II)

Date: 04/01/2016

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 No.** : MATH F112  
**Course Title** : MATHEMATICS-II  
**Instructor-incharge** : TRILOK MATHUR  
**Instructors** : Balram Dubey, B. K. Sharma, Devendra Kumar, Jitender Kumar, Preeti Dubey, Priyanka Kumari, Rakhee, Shivi Agarwal, Sumanta Pasari, Suresh Kumar.

**1. Scope and Objective of the Course:** The course is meant as an introduction to Linear Algebra and Theory of Functions of Complex Variable and their applications. Students are encouraged to study MATLAB for solving linear algebra problems given in the Text Book.

**2. Course Description:** System of linear equations, Eigenvalues and eigenvectors, Vector spaces, Basis and dimension of vector spaces, Linear transformations, Range and kernel, Orthogonality. Function of complex variables and their analyticity, Elementary functions, Integration, Taylor and Laurent series expansions, Calculus of residues and its applications.

### 3. Text Books:

- (1) Elementary Linear Algebra by S. Andrilli and D. Hecker, 4<sup>th</sup> Edition, 2012, Elsevier.
- (2) Complex Variables and Applications by R.V. Churchill and J.W. Brown, 8<sup>th</sup> Edition, 2009, McGraw-Hill.

### 4. Reference Books:

- (1) Linear Algebra: A First Course with Applications by Larry E. Knop, 1<sup>st</sup> Edition, 2008, Chapman & Hall.
- (2) A Modern Introduction to Linear Algebra by Henry Ricardo, 1<sup>st</sup> Edition, 2009, Chapman & Hall.
- (3) A First Course in Complex Analysis with Applications by Dennis G. Zill & Patrick Shanahan, 2<sup>nd</sup> Edition, 2009, Jones & Bartlett.
- (4) Complex Variables with Applications by A.D. Wunsch, 3<sup>rd</sup> Edition, Pearson Education.

### 5. Course Plan:

Lec. No.	Learning Objectives	Topics to be covered	Sec. No.
<b>A. LINEAR ALGEBRA (Text Book (1))</b>			
1-3	Solving system of linear equations.	Solutions of linear systems of equations by Gauss Elimination, Gauss-Jordan, RREF, Rank,	2.1- 2.4



Please Consider Your Environmental Responsibilities  
Do Not Print Unless Necessary



# BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani

## Pilani Campus

		Inverse of matrices.	
4-11	Introduction to abstract vector spaces, finite and infinite dimensional vector spaces and related concepts.	Vector spaces, subspaces, linear independence, basis and dimension.	4.1-4.6
12-13	Computing eigenvalues and eigenvectors.	Eigenvalues and eigenvectors.	3.4
14-18	Introduction to linear transformations, examples of linear transformations, understanding the link between linear transformations and matrices.	Coordinates and change of basis. Linear transformations, kernel and range of linear transformation. The matrix of a linear transformation, Composite and invertible linear transformations.	4.7 5.1-5.5
19	Introduction to MATLAB	Use of MATLAB in solving the problems of linear algebra.	Lecture Notes
<b>B. COMPLEX VARIABLES (Text Book (2))</b>			
20,21	Revising the knowledge of complex numbers.	Review	1-11
22	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
23-25	Introduction to analytic functions. Finding out singular point of a function.	Derivative, CR-equations, analytic functions.	19-26
26-29	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.	29-36
30,31	Integrating along a curve in complex plane.	Contour integrals, anti-derivatives.	37-44
32-33	Learning techniques to find integrals over particular contours of different functions.	Cauchy--Goursat Theorem, Cauchy Integral Formula, Morera's Theorem.	46,48-52
34	To study applications of complex variable theory to Algebra.	Liouville's Theorem, Fundamental Theorem of Algebra.	53
35	Series expansion of a function analytic in an annular domain. To study different types of singular points.	Laurent series.	60,62
36-37	Calculating residues at isolated singular points.	Residues, Residue Theorem.	68-76
38-39	To study application of complex integration to improper real integral.	Improper real integrals.	78-81,85



**Please Consider Your Environmental Responsibilities**  
**Do Not Print Unless Necessary**



**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani**  
**Pilani Campus**

**6. Evaluation Scheme:**

EC No.	Evaluation Component	Duration	Weightage (%)	Date	Nature of Component
1.	Mid Semester Exam	90 min.	35	14/3 11:00 - 12:30 PM	Closed Book
2.	Class Performance Tests (Quizzes/Assignments)	15 min. each	20	Unannounced	Closed Book
3.	Comprehensive Exam	180 min.	45	3/5 AN	Closed Book/ Open Book

**7. Assignments:** Two assignments will be given to the students, one each from Linear Algebra and Complex Analysis. At least one question from each assignment will be asked in Mid Semester and Comprehensive Exams.

**8. Notices:** All notices about the course will be put on Department of Mathematics Notice Board and on Online Notice Board (NALANDA).

**9. Chamber Consultation Hour:** To be announced in the class by the respective Instructors.

**10. Make UP Policy:** (i) **NO MAKE UP** will be given in Class Performance Tests under any circumstances. (ii) Make up of other evaluation components (Mid Sem. and Comprehensive Exam) will be granted only in genuine cases. Permission must be taken in advance except in extreme cases. (iii) **No MAKE-MAKE-UP will be entertained.** (iv) Students must write their quizzes/ assignments in their own tutorial sections ONLY. If a student is writing any quiz in any other section (NOT in his/her section), it may not be evaluated.

*Instructor-In-Charge*  
**MATH F112**



**Please Consider Your Environmental Responsibilities**  
**Do Not Print Unless Necessary**