BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus

INSTRUCTION DIVISION
SECOND SEMESTER 2017-2018
Course Handout (Part-II)

Date: 06/01/2018

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 No.	**: MATH F112**
Course Title	**: MATHEMATICS-II**
Instructor-incharge	**: TRILOK MATHUR**
Instructors	**:** Amit Kumar, Amol Holkundkar, Ashish Tiwari, Balram Dubey, Bhavya Tripathi, Bhupendra Kumar Sharma, Biswanath Layek, Devendra Kumar, Jitender Kumar, K. Satya Pritam, Krishnendra Shekhawat, Parvin Kumari, Rajesh Kumar, Sanjay Lamba, Sangita Yadav, Shivi Agarwal, Srijata Dey, Srikanth.

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.

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:

(i) Elementary Linear Algebra by S. Andrilli and D. Hecker, 4th Edition, 2012, Elsevier.
(ii) Complex Variables and Applications by R.V. Churchill and J.W. Brown, 8th Edition, 2014, McGraw-Hill.

4. Reference Books:

(i) Linear Algebra: A First Course with Applications by Larry E. Knop, 1st Edition, 2008, Chapman & Hall.
(ii) A Modern Introduction to Linear Algebra by Henry Ricardo, 1st Edition, 2009, Chapman & Hall.
(iii) Introductory Linear Algebra: An Applied First Course by Bernard Kolman and David R. Hill, 9th Edition, 2014, Prentice Hall.
(iv) A First Course in Complex Analysis with Applications by Dennis G. Zill & Patrick Shanahan, 2nd Edition, 2009, Jones & Bartlett.
(v) Complex Variables with Applications by A. D. Wunsch, 3rd Edition, 2004, Pearson Education.
(vi) Complex Analysis by Lars Ahlfors, 3rd Edition, 1979, McGraw-Hill.

5. Course Plan:

Lec. No.	Learning Objectives	Topics to be covered	Sec. No.
A. LINEAR ALGEBRA (Text Book (i))			
1-3	Solving system of linear equations.	Solutions of linear systems of equations by Gauss Elimination, Gauss-Jordan method. RREF, Rank, Inverse of matrices.	2.1- 2.4
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
12-18	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
19-20	Computing eigenvalues and eigenvectors.	Eigenvalues and eigenvectors.	3.4
B. COMPLEX VARIABLES (Text Book (ii))			
21-22	Quick revision of complex numbers and their properties.	Review	1-11
23	Evaluation of limits in complex plane. Testing continuity of complex valued functions.	Functions of a complex variable. Limit and continuity	12,15-18
24-26	Introduction to analytic functions. Singular points of a complex valued function.	Derivative, CR-equations, analytic functions.	19-26
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.	29-36
31-32	Integrating along a curve in complex plane.	Contour integrals, anti-derivatives.	37-44
33-34	Techniques to find integrals of different functions over particular contours.	Cauchy--Goursat Theorem, Cauchy Integral Formula, Morera's Theorem.	46,48-52
35	Application of complex variable theory in Abstract Algebra.	Liouville's Theorem, Fundamental Theorem of Algebra.	53
36	Series expansion of a function analytic in an annular domain. To	Laurent series.	60,62

	study different types of singular points.		
37-38	Calculating residues at isolated singular points.	Residues, Residue Theorem.	68-76
39-40	Application of complex integration to evaluate improper real integral.	Improper real integrals.	78-81,85

6. Evaluation Scheme:

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

7. Assignments: Two assignments will be given to the students, first one from Linear Algebra and second one from Complex Variables. One question from each assignment may be asked in Mid Semester and/or 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 class performance tests / assignments in their own tutorial sections **ONLY**. If a student would write any of class performance tests / assignments in a section, different from his own tutorial section, then it would **not** be evaluated.

Instructor-In-Charge
MATH F112