Course Plan for Spring Semester 2018

Tezpur University
Course: MS 103, Mathematics-II
(For the B. Tech. Students of the School of Engineering)
L3-T1-P0-CH4-CR4

Name of the instructors:
1. Mr. Parama Dutta (PD), Dept. of Mathematical Sciences
2. Ms. Nilufar Mana Begum (NMB), Dept. of Mathematical Sciences
3. Dr. Shuvam Sen (SS), Dept. of Mathematical Sciences

Abstract: The course introduces basics of linear algebra, complex analysis, numerical analysis and integral transforms. This course gives a thorough understanding of the theory and its applications. Emphasis is given to developing problem solving capability.

Course Objective:
1. To learn the basics of linear algebra, complex analysis, numerical analysis and integral transforms.
2. To enable the students for developing their computational skills.

Prerequisites of the course: None

Course Outline + Suggested readings:

Linear Algebra: Vector spaces – Linear dependence of vectors, basis, linear transformations, rank and inverse of a matrix, solution of algebraic equations – consistency conditions. Eigenvalues and eigenvectors, system of differential equations, Hermitian and skew Hermitian matrices.

Complex Analysis: Limit, continuity, differentiability and analyticity of functions Cauchy-Riemann equations, elementary complex functions, Line integrals, Cauchy's integral theorem, Cauchy's integral formula, Power series, Taylor's series, Laurent's series, Zeros and singularities, Residue theorem.

Laplace and Fourier Transforms: Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polymomials- Fourier Series, Fourier transforms, Laplace transform, z-transform, Wavelet transforms.

Numerical Analysis: Finite differences, Newton's forward and backward interpolation formulae, Central difference interpolation. Trapezoidal rule and Simpson's 1/3rd rule of integration. Solution of polynomial and transcendental equations – bisection method, Newton Raphson method and Regula falsi method.

Text books:

Linear Algebra

1. K. Hoffman and R. Kunze, *Linear Algebra*, Prentice Hall, 1996.

Complex Analysis:

2. R. V. Churchill and J. W. Brown, *Complex Variables and Applications*, 5th Edition, McGraw-Hill, 1990.

Laplace and Fourier Transforms:

3. K. Sankara Rao, *Introduction to Partial Differential Equations*, Prentice Hall of India, 1995.

Numerical Analysis :

4. Kreyszig E. ,Advance Engineering Mathematics,

Reference books:

Linear Algebra

1. Krishnamurthy V., Mainra V. P., Arora J. L, An Introduction to Linear Algebra,
2. T. M. Apostol, *Calculus*, Volume II, 2nd Edition, Wiley, 1969.

Complex Analysis:

3. J. H. Mathews and R. W. Howell, *Complex Analysis for Mathematics and Engineering*, 3rd Edition, Narosa, 1998.

Laplace and Fourier Transforms:

4. Kreyszig E. ,Advance Engineering Mathematics,
5. Grewal B. S.,Engineering Mathematics,

Numerical Analysis :

6. Grewal B. S.,Engineering Mathematics,

Pedagogy:
Lecture method, Quiz, Home assignment, Discussion etc.

Time Plan for the Course:

Section A

Lecture No.	Topics
1 (17.01.18)	(NMB) Functions of complex variables, limit & continuity
2 (18.01.18)	(T) (PD) Vector Spaces and examples
3 (23.01.18)	(SS) Finite difference operators and their relations
4 (24.01.18)	(NMB) Differentiability & analyticity
5 (25.01.18)	(T) (SS) Interpolation, interpolating polynomial, its existence and uniqueness
6 (29.01.18)	(PD) Linear dependence of vectors
7 (30.01.18)	(SS) Error in interpolation, linear interpolation
8 (31.01.18)	(NMB) Cauchy-Riemann equations
9 (01.02.18)	(T) (PD) Linear independence of vectors
10 (05.02.18)	(PD) Basis
11 (06.02.18)	(SS) Error in interpolation, linear interpolation continue
12 (07.02.18)	(NMB) Exponential & logarithmic functions
13 (08.02.18)	(T) (SS) Newton's forward and backward interpolation formulae
14 (12.02.18)	(PD)Linear transformation
15 (13.02.18)	(SS) Newton's forward and backward interpolation formulae continue
16 (14.02.18)	(NMB) Functions continue
17 (15.02.18)	(T) (NMB) Line Integrals
18 (19.02.18)	(PD) Rank of a matrix
19 (20.02.18)	(SS) Central difference interpolation
20 (21.02.18)	(NMB) Cauchy's Integral Theorem & Formula
21 (22.02.18)	(T) (SS) Central difference interpolation continue
22 (26.02.18)	(PD) Inverse of matrix
23 (27.02.18)	(SS) Numerical integration and associated error
24 (28.02.18)	(NMB) Integration continues
25 (01.03.18)	(T) (NMB) Power series
26 (05.03.18)	(SS) Trapezoidal Rule
27 (06.03.18)	(SS) Simpson's 1/3rd rule
28 (07.03.18)	(NMB) Power series continues
29 (08.03.18)	(T) (PD) Solution of algebraic equations
30 (12.03.18)	(PD) Solution of algebraic equations
31 (13.03.18)	(SS) Numerical integration continue
32 (14.03.18)	(NMB) Taylor's series
33 (22.03.18)	(T) (PD) Eigenvalues
34 (26.03.18)	(PD) Eigenvectors
35 (27.03.18)	(PD) System of differential equations
36 (28.03.18)	(SS) Numerical solution of polynomial and transcendental equations, bisection method
37 (02.04.18)	(PD) Systems of differential equations
38 (03.04.18)	(SS) Bisection method continue, error and its order
39 (04.04.18)	(SS) Newton Raphson method and Regula falsi method
40 (05.04.18)	(T) (SS) Newton Raphson method and Regula falsi method continue
41 (09.04.18)	(PD) Hermitian matrices
42 (10.04.18)	(SS) Laplace transform
43 (11.04.18)	(SS) Laplace transform continue
44 (12.04.18)	(SS) z-transform
45 (17.04.18)	(SS) z-transform continue

46 (18.04.18)	**(NMB) Taylor's series continues**
47 (19.04.18)	**(T) (PD) Skew Hermitian matrices**
48 (23.04.18)	**(PD) Polynomials**
49 (24.04.18)	**(SS) Fourier series**
50 (25.04.18)	**(NMB) Laurent's series**
51 (26.04.18)	**(T) (PD) Orthogonal polynomials**
52 (01.05.18)	**(SS) Fourier transforms**
53 (02.05.18)	**(NMB) Laurent's series continues**
54 (03.05.18)	**(T) (PD) Lagrange's Chebysev polynomials**
55 (07.05.18)	**(PD) Trigonometric polynomials**
56 (08.05.18)	**(SS) Fourier transforms continue**
57 (09.05.18)	**(NMB) Zeros and singularities**
58 (10.05.18)	**(T) (NMB) Residue theorem**
59 (14.05.18)	**(PD) Trigonometric polynomials**
60 (15.05.18)	**Revision (SS)**
61 (16.05.18)	**(NMB) Residue theorem continues**
62 (17.05.18)	**Revision (T) (PD)**

Section B

Lecture No.	Topics
1 (19.01.18)	**(PD) Vector Spaces and examples**
2 (23.01.18)	**(T) (SS) Finite difference operators and their relations**
3 (29.01.18)	**(NMB) Functions of complex variables, limit & continuity**
4 (29.01.18)	**(SS) Interpolation, interpolating polynomial, its existence and uniqueness**
5 (30.01.18)	**(T) (NMB) Differentiability & analyticity**
6 (02.02.18)	**(PD) Linear dependence of vectors**
7 (05.02.18)	**(NMB) Cauchy-Riemann equations**
8 (05.02.18)	**(SS) Error in interpolation, linear interpolation**
9 (06.02.18)	**(T) (PD) Linear independence of vectors**
10 (09.02.18)	**(PD) Basis**
11 (12.02.18)	**(NMB) Exponential & logarithmic functions**
12 (12.02.18)	**(SS) Error in interpolation, linear interpolation continue**
13(13.02.18)	**(T) (SS) Newton's forward and backward interpolation formulae**
14 (16.02.18)	**(PD) Linear transformation**
15 (19.02.18)	**(NMB) Functions continue**
16 (19.02.18)	**(SS) Newton's forward and backward interpolation formulae continue**
17 (20.02.18)	**(T) (NMB) Line Integrals**
18 (26.02.18)	**(NMB) Cauchy's Integral Theorem & Formula**
19 (26.02.18)	**(SS) Central difference interpolation**
20 (27.02.18)	**(T) (PD) Rank of a matrix**
21 (05.03.18)	**(NMB) Integration continues**
22 (05.03.18)	**(SS) Central difference interpolation continue**
23 (06.03.18)	**(T) (PD) Inverse of matrix**
24 (09.03.18)	**(PD) Solution of algebraic equations**
25 (10.03.18)	**(SS) Numerical integration and associated error**
26 (10.03.18)	**(SS) Trapezoidal Rule**
27 (12.03.18)	**(NMB) Power series**
28 (12.03.18)	**(SS) Simpson's 1/3rd rule**
29 (13.03.18)	**(T) (PD) Solution of algebraic equations**
30 (23.03.18)	**(PD) Eigenvalues**
31 (26.03.18)	**(SS) Numerical integration continue**

32 (26.03.18)	(SS) Numerical solution of polynomial and transcendental equations, bisection method
33 (27.03.18)	(T) (SS) Bisection method continue, error and its order
34 (28.03.18)	(PD) Eigenvectors
35 (02.04.18)	(SS) Newton Raphson method and Regula falsi method
36 (02.04.18)	(SS) Newton Raphson method and Regula falsi method continue
37 (03.04.18)	(T) (PD) System of differential equations
38 (06.04.18)	(PD) Systems of differential equations
39 (09.04.18)	(SS) Laplace transform
40 (09.04.18)	(SS) Laplace transform continue
41 (10.04.18)	(T) (SS) z-transform
42 (17.04.18)	(T) (NMB) Power series continues
43 (20.04.18)	(PD) Hermitian matrices
44 (23.04.18)	(NMB) Taylor's series
45 (23.04.18)	(SS) z-transform continue
46 (24.04.18)	(T) (NMB) Taylor's series continues
47 (27.04.18)	(PD) Skew Hermitian matrices
48 (01.05.18)	(T) (NMB) Laurent's series
49 (04.05.18)	(PD) Polynomials
50 (07.05.18)	(NMB) Laurent's series continues
51 (07.05.18)	(SS) Fourier series
52 (08.05.18)	(T) (PD) Orthogonal polynomials
53 (11.05.18)	(PD) Lagrange's Chebysev polynomials
54 (14.05.18)	(NMB) Zeros and singularities
55 (14.05.18)	(SS) Fourier transforms
56 (15.05.18)	(T) (NMB) Residue theorem
57 (18.05.18)	(PD) Trigonometric polynomials
58 Extra Class	(SS) Fourier transforms continue
59 Extra Class	(NMB) Residue theorem continues
60 Extra Class	(PD) Trigonometric polynomials

Section C

Lecture No.	Topics
1 (17.01.18)	(T) (PD) Vector Spaces and examples
2 (18.01.18)	(NMB) Functions of complex variables, limit & continuity
3 (19.01.18)	(SS) Finite difference operators and their relations
4 (23.01.18)	(PD) Linear dependence of vectors
5 (24.01.18)	(T) (SS) Interpolation, interpolating polynomial, its existence and uniqueness
6 (25.01.18)	(NMB) Differentiability & analyticity
7 (30.01.18)	(PD) Linear independence of vectors
8 (31.01.18)	(T) (SS) Error in interpolation, linear interpolation
9 (01.02.18)	(NMB) Cauchy-Riemann equations
10 (02.02.18)	(SS) Error in interpolation, linear interpolation continue
11 (06.02.18)	(PD) Basis
12 (07.02.18)	(T) (NMB) Exponential & logarithmic functions
13 (08.02.18)	(NMB) Functions continue
14 (09.02.18)	(SS) Newton's forward and backward interpolation formulae
15 (13.02.18)	(PD) Linear transformation
16 (14.02.18)	(T) (PD) Rank of a matrix
17 (15.02.18)	(NMB) Line Integrals
18 (16.02.18)	(SS) Newton's forward and backward interpolation formulae continue
19 (20.02.18)	(PD) Inverse of matrix
(21.02.18)	(T) MISSED

20 (22.02.18)	**(NMB) Cauchy's Integral Theorem & Formula**
21 (27.02.18)	**(PD) Solution of algebraic equations**
22 (28.02.18)	**(T) (SS) Central difference interpolation continue**
23 (01.03.18)	**(NMB) Integration continues**
24 (06.03.18)	**(PD) Solution of algebraic equations**
25 (07.03.18)	**(T) (SS) Central difference interpolation**
26 (08.03.18)	**(NMB) Power series**
27 (09.03.18)	**(SS) Numerical integration and associated error**
28 (13.03.18)	**(PD) Eigen values**
29 (14.03.18)	**(T) (SS) Trapezoidal Rule**
30 (22.03.18)	**(NMB) Power series continues**
31 (23.03.18)	**(SS) Simpson's 1/3rd rule**
32 (27.03.18)	**(PD) Eigenvectors**
33 (28.03.18)	**(SS) Numerical integration continue**
34 (03.04.18)	**(PD) Systems of differential equations**
35 (04.04.18)	**(T) (SS) Numerical solution of polynomial and transcendental equations, bisection method**
36 (05.04.18)	**(SS) Bisection method continue, error and its order**
37 (06.04.18)	**(SS) Newton Raphson method and Regula falsi method**
38 (10.04.18)	**(PD) System of differential equations**
39 (11.04.18)	**(T) (SS) Newton Raphson method and Regula falsi method continue**
40 (12.04.18)	**(SS) Laplace transform**
41 (17.04.18)	**(PD) Hermitian matrices**
42 (18.04.18)	**(T) (PD) Skew Hermitian matrices**
43 (19.04.18)	**(NMB) Taylor's series**
44 (20.04.18)	**(SS) Laplace transform continue**
45 (24.04.18)	**(PD) Polynomials**
46 (25.04.18)	**(T) (NMB) Taylor's series continues**
47 (26.04.18)	**(NMB) Laurent's series**
48 (27.04.18)	**(SS) z-transform**
49 (01.05.18)	**(PD) Orthogonal polynomials**
50 (02.05.18)	**(T)(PD) Lagrange's Chebysev polynomials**
51 (03.05.18)	**(NMB) Laurent's series continues**
52 (04.05.18)	**(SS) z-transform continue**
53 (08.05.18)	**(PD) Trigonometric polynomials**
54 (09.05.18)	**(T) (NMB) Zeros and singularities**
55 (10.05.18)	**(NMB) Residue theorem**
56 (11.05.18)	**(SS) Fourier series**
57 (15.05.18)	**(PD) Trigonometric polynomials**
58 (16.05.18)	**(T) (SS) Fourier transforms**
59 (17.05.18)	**(NMB) Residue theorem continues**
60 (18.05.18)	**(SS) Fourier transforms continue**

Evaluation plan:

TEST I	: 25 Marks
TEST II	: 40 Marks
TESTIII	: 25 Marks
TEST IV	: 60 Marks
TOTAL	: 150 Marks

Expected outcome of the course: Towards the end of the course the student would be able to apply the concepts taught in various problems in Engineering.

NOTICE

This is to inform the students whose name appears at the bottom of this notice, that their TESTS for the course MS103: Mathematics II will be held as per the following schedule:

TEST	Marks	Date & Time	Venue
TEST I	**25 Marks**	**13.02.18, Tuesday 5:00PM – 5:45PM**	**Department of Mathematical Sciences, Academic Building-II** CSE: Room No. 35, ELB: Room Nos. 33, CIB: Room No. 22, MEB: Room Nos. 21, FPB: Room No. 37, EEB: Room No. 32, **Backlog students: Shall wait in Room No. 24.**
TEST II	**40 Marks**	(15.03.18-21.03.18) To be decided by Dean SoE	To be decided by Dean SoE
TEST III	**25 Marks**	**20.04.18, Friday 5:00PM – 5:45PM**	**Department of Mathematical Sciences, Academic Building-II** CSE: Room No. 35, ELB: Room Nos. 33, CIB: Room No. 22, MEB: Room Nos. 21, FPB: Room No. 37, EEB: Room No. 32, CSE Backlog students: Room Nos. 35 ELB Backlog students: Room Nos. 33 **CIB Backlog students: Room Nos. 21** MEB Backlog students: Room Nos. 21 FPB Backlog students: Room Nos. 37 **EEB Backlog students: Room Nos. 37**
TEST IV	**60 Marks**	(22.05.18-31.05.18) To be decided by Dean SoE	To be decided by Dean SoE

Please note:

1. **All students shall sit in their designated rooms serially enrollment number wise starting with extreme left row, first bench. Only one student shall be seated in one bench. Students not following sitting arrangements shall be debarred from taking the test.**
2. No change of time, date and venue will be entertained. Please do not come and request for the same. The syllabus for each test will be the topics taught till the last class.
3. If any student does not turn up for any examination as per the above time and place he/she will be marked absent and will be awarded '0' (ZERO) mark in that examination.
4. **Students with special permission to write the examinations with computer** will sit for **TEST I** and **TEST III** in the Computer Lab. of the Dept. of Mathematical Sciences. For **TEST II** and **TEST IV** such students will sit as per arrangement made by Dean, SoE.