

**Birla Institute of Technology & Science, Pilani**  
**Work-Integrated Learning Programmes Division**

**First Semester 2011-2012**

**Course Handout**

**Course No.** : MATH ZC161  
**Course Title** : Engineering Mathematics – I  
**Instructor** : Deepmala, Bhupendra K Sharma, Pankaj Biswas, Sapna Sharma

**Course Description**

**Calculus:** Differentiation, Integration with applications.

**Differential Equations:** First order and second order ordinary differential equations.

**Linear Algebra:** Algebra of Matrices, Eigen values and Eigen vectors.

**Vector calculus:** Vector Calculus and application of vector Calculus.

**Scope and Objectives**

To enable the students to gain knowledge of the basics of Calculus, Linear Algebra, Vector Calculus and Differential Equations

To enable the students to understand and appreciate the mathematical models based on these concepts.

**Prescribed Text Book**

T1 Zill, Dennis G. & Others, Advanced Engineering Mathematics, Jones & Bartlett, 4<sup>th</sup> Ed., 2010.

**Reference Books**

R1. K.A. Stroud and Deseter j. Booth) Engineering Mathematics Palgrave, Macmillan, 6<sup>th</sup> Ed.

R2. Straus, M.J et. al, Calculus, Pearson Education, 3<sup>rd</sup> Ed., 2007.

R3. M. Ganesh, Review of Elementary Calculus, DLPD- Notes, BITS, Pilani, 2003.**Note: Softcopy of this Supplementary notes will be available for download from BITS DLP website.**

R4. Thomas, G.B. & R.L. Finney, Calculus and Analytical Geometry, Pearson Education, 9<sup>th</sup> Edition, 2001.

## Plan of Self Study

Lect. No.	Learning Objectives	Topic	Reference to Text Book
1	Operation on matrix, Elementary Row operation on matrix	Matrix Algebra, System of Linear Algebraic Equations	T1-Chapter 8: 8.1 to 8.2
2	Methods to find the rank of matrix and inverse of matrix	Rank of a Matrix, Determinants, Properties of Determinants, Inverse of a Matrix	T1-Chapter 8: 8.3 to 8.6
3	To find the solution of system of equations, Meaning of Eigen value and Eigen vectors	Cramer's Rule, The Eigen Value Problem	T1-Chapter 8: 8.7 to 8.8
4	Cayley- Hamilton theorem, real Eigen value and Orthogonal Eigen vectors	Powers of Matrices, Orthogonal matrices	T1-Chapter 8: 8.9 to 8.10
5		<b>Problem discussion on Chapter 8</b>	T1-Chapter 8
6	To introduce the classical methods to solve 1 <sup>st</sup> order Differential equations	First Order Linear Differential Equations: Separable Variables, Linear Equations,	T1-Chapter 2: 2.2 to 2.3
7		Exact Equations, Homogeneous Equations, Solutions by Substitutions	T1-Chapter 2: 2.4 to 2.5
8	To introduce the classical methods to solve 2 <sup>nd</sup> order Differential equations	Higher Order Linear Differential Equations: Linear Equations, Initial- Value Boundary- Value Problems, Homogeneous and Nonhomogeneous Equations, Reduction of order	T1-Chapter 3: Art 3.1 to 3.2
9		Homogeneous Linear Equations with Constant Coefficients, Undetermined Coefficients	T1-Chapter 3: Art 3.3 to 3.4
10		Variation of parameters, Cauchy Euler Equations, Initial Value Problems	T1-Chapter 3: Art 3.5 to 3.6
11		<b>Problem discussion on Chapter 2 &amp; 3</b>	T1-Chapter 2 & 3
12	Vectors in 2-Space, and in 3-Space and products two vectors	Vectors: Vectors in 2-Space, Vectors in 3-Space, Dot Product, Cross Product	T1-Chapter 7: Art 7.1 to 7.4
<b>Syllabus for Mid-Semester Test (Closed Book): Topics covered in Week No. 1 to 8</b>			
13	products three vectors and their application	Triple Scalar Product, Triple vector Product, Lines and Planes in 3-Space.	T1-Chapter 7: Art 7.4 to 7.5
14	Study of vector valued functions of one variable, motion and its path in space.	Vector Functions, Motion on a Curve, Velocity and Acceleration Vectors	T1-Chapter 9: Art 9.1 to 9.2
15	The relation between the dynamics and geometry of motion.	Curvature, Tangent, Normal Components of Acceleration and Binomial Vectors,	T1-Chapter 9: Art 9.3

## Plan of Self Study

Lect. No.	Learning Objectives	Topic	Reference to Text Book
16	Difference between derivative and partial derivative.	Functions of Several Variables, Partial Derivatives, Gradient of a Function	T1-Chapter 9: Art 9.4 to 9.5
17	Generalizations of partial derivatives and their applications.	Directional Derivative, Tangent Planes and Normal Lines,	T1-Chapter 9: Art 9.5 to 9.6
18	Different integrals of vector fields on objects in space; applications to flow, flux, work etc.;	Divergence and Curl of vector fields, Line Integrals	T1-Chapter 9: Art 9.7 to 9.8
19	<b>Problem discussion on Chapter 7 &amp; Chapter 9: 9.1 to 9.8</b>		
20	Evaluation of area of planar regions and volumes using iterated integrals.	Independence of path, Double Integrals in Cartesian Coordinates	T1-Chapter 9: Art 9.9 to 9.10
21		Double Integrals in Polar Coordinates, Green's Theorem,	T1-Chapter 9: Art 9.11 to 9.12
22	Divergence theorem and Stokes' theorem further generalize Green's theorem.	Surface Integrals, Stokes' Theorem	T1-Chapter 9: Art 9.13 to 9.14
23		Triple Integrals, Volume, Divergence Theorem	T1-Chapter 9: Art 9.15 to 9.16
24	<b>Problem discussion on Chapter 9: 9.9 to 9.16</b>		T1-Chapter 9: Art 9.9 to 9.16
<b><i>Syllabus for Comprehensive Exam (Open Book): All topics given in the Plan of Self Study.</i></b>			

## Evaluation Scheme:

EC No.	Evaluation Component & Type of Examination	Duration	Weightage	Day, Date, Session, Time
EC-1	Assignment/ Quiz	TBA	10%	TBA
EC-2	Mid-Semester Test (Closed Book)*	2 Hours	30%	Saturday, 03/09/2011 (AN)* 2 PM – 4 PM
EC-3	Comprehensive Exam (Open Book)*	3 Hours	60%	Saturday, 29/10/2011 (AN)* 2 PM – 5 PM

## \* Legend:

AN: AfterNoon Session; FN: ForeNoon Session; TBA : To be announced

**Closed Book Test:** No reference material of any kind will be permitted inside the exam hall.

**Open Book Exam:** Use of any printed / written reference material (books and notebooks) will be permitted inside the exam hall. Loose sheets of paper will not be permitted. Computers of any kind will not be allowed inside the exam hall. Use of calculators will be allowed in all exams. No exchange of any material will be allowed.

**Note:**

It shall be the responsibility of the individual student to be regular in maintaining the self study schedule as given in the course handout, attend the online/on demand lectures as per details that would be put up in the BITS WILP website [www.bits-pilani.ac.in/dlp-home](http://www.bits-pilani.ac.in/dlp-home) and take all the prescribed components of the evaluation such as Mid Semester Test and Comprehensive Examination according to the Evaluation Scheme given in the respective Course Handout. If the student is unable to appear for the Regular Test/Examination due to genuine exigencies, the student must refer to the procedure for applying for Make-up Test/Examination, which will be available through the **Important Information** link on the BITS WILP website on the date of the Regular Test/Examination. The Make-up Tests/Exams will be conducted only at selected exam centres on the dates to be announced later.

**Instructor-in-charge**