BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI

WORK-INTEGRATED LEARNING PROGRAMMES DIVISION
B Tech(Information Systems) in collaboration with WIPRO
Second Semester 2022-2023(July 2023)

COURSE HANDOUT

Part A: Content Design

Academic Term	II Semester 2022 – 2023(July 2023)
Course Title	CALCULUS
Course ID No.	SEWI ZC131

Course Objectives

No	Course Objective
CO1	Basic mathematics required for a professional to apply these concepts in the related field of engineering
CO2	Introduces the important problem solving techniques required in solving various engineering problems

Course Modules (add more rows as per needs)

Module No	Module Title	Objectives
1	Functions, LImit, Continuity	Calculus of single variable. Basics of calculus.

2	Differentiation	Rate of change – average & instantaneous, Derivate of a function Rules of derivatives, Implicit differentiation, Related rates, Maxima & minima
3	Integration	Indefinite integrals, Techniques of integration, Definite integrals, Mean value theorem, Fundamental Theorem
4	Fourier Series	Fourier series are needed in the treatment of many physical problems, i.e. in the theory of sound, heat condition and mechanical vibrations.
5	Laplace Transformation	Definition of Laplace Transforms and Laplace Transforms of some standard functions, Translation Theorems, Additional Operational properties etc.
6	Differential Equations (ODI)	Definitions, classification, Solution of few special classes.
7	Partial Differentiation	Calculus of muti-variables, Chain rule, Partial Diff. Eq. (PDE), Boundary Value Problem (BVP)
8	Numerical Techniques	Euler method, Picard's iteration, Higher order methods – Runge Kutta Methods

Text Book(s)

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

Reference Book(s) & other resources

R1	Pratap Singh, Review of Elementary Calculus, WILPD- Notes, BITS, Pilani.
R2	Thomas, G. B. & R. L. Finney, Calculus and Analytical Geometry, Pearson Education, 9th Edition, 2001.
R3	E. Kreyzig: Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition, 2006

Learning Outcomes:

No	Learning Outcomes
LO1	Student should be able to have fundamental knowledge of important concepts like differentiation and integration with applications
LO2	Student should be able to solve various types of ordinary and partial differential equations for analytical / numerical solutions

Self-Study & Contact Session Plan

Module Title: Functions & Limit

Session 1

Topic No.	Topic Title	Reference
1.1	Functions	R1-Chapter 1, Chapter 3
1.2	Limits	

Module Title: Functions & Limit

Session 2

Topic No.	Topic Title	Reference
2.1	Graphs of Functions	R1-Chapter 1, Chapter 3
2.2	Limits : Introducing the Concept	

Module Title: Limit & Continuity

Session 3

Topic No.	Topic Title	Reference
3.1	Limits	R1-Chapter 1, Chapter 3
3.2	Continuity	

Module Title: Differentiation

Session 4

Topic No.	Topic Title	Reference

| 4.1 | Introducing the Concept | R2-Chapter 2, chapter 3 |
| 4.2 | Rules of Derivatives | R2-Chapter 2, chapter 3 |

Module Title: Differentiation

Session 5

Topic No.	Topic Title	Reference
5.1	Rules of Derivatives and Their Proofs	R2-Chapter 2, chapter 3
5.2	Applications of Derivatives	

Module Title: Differentiation

Session 6

Topic No.	Topic Title	Reference
6.1	Mechanical Problems	R2-Chapter 2, chapter 3
6.2	Concavity	
6.3	Point of Inflections	

Module Title: Integration

Session 7

Topic No.	Topic Title	Reference
7.1	Anti-derivatives	R1-Chapter 4
7.2	Indefinte Integration	

7.3	Definite Integral	

Module Title: Integration

Session 8

Topic No.	Topic Title	Reference
8.1	Area under a curve	R1-Chapter 4
8.2	Orthogonal/orthonormal Properties of Functions	

Md-Semester Test (Closed Book) : Topics in Session 1 to 8

Module Title: Fourier Series

Session 9

Topic No.	Topic Title	Reference
9.1	Fouries Series Expansion	T1 – Chapter 12 - 12.1 to 12.3
9.2	Expansion of odd/even functions	
9.3	Half-Range Expansion	

Module Title: Differential Equations

Session 10

Topic No.	Topic Title	Reference
10.1	Ordinary Differential Equations	T1 – Chapter 3- 3.1
10.2	Classification	

10.3	Solution of Diff. Eq.	

Module Title: Laplace Transformation

Session 11

Topic No.	Topic Title	Reference
11.1	Definition & Examples	T1 - Chapter 4 - 4.1 to 4.6
11.2	Inverse Laplace Transformation	

Module Title: Laplace Transformation

Session 12

Topic No.	Topic Title	Reference
12.1	Laplace Transformation of Derivatives	T1 - Chapter 4 - 4.1 to 4.6
12.2	Solution of IVP	
12.3	Volterra inegral Eq.	

Module Title: Partial Differentiation

Session 13

Topic No.	Topic Title	Reference
13.1	Introductions	T1-Chapter 9 – 9.4, Chapter 13-13.1 to 13.5
13.2	Chain Rule	
13.3	Partial Differental Equations	

Module Title: Partial Differentiation

Session 14

Topic No.	Topic Title	Reference
14.1	Partial Derivatives and Its Solution	T1-Chapter 9 – 9.4, Chapter 13-13.1 to 13.5
14.2	Boundary Value Problems	

Module Title: Partial Differentiations

Session 15

Topic No.	Topic Title	Reference
15.1	Heat Equation	T1-Chapter 9 – 9.4, Chapter 13-13.1 to 13.5
15.2	Wave Equation	
15.3	Laplace Equation	

Module Title: Numerical Techniques

Session 16

Topic No.	Topic Title	Reference
16.1	Euler's Method	T1 – Chapter 6- 6.1,6.2, R3- Chapter 1- 1.9
16.2	Runge-Kutta Method	
16.3	PIcard's Method	