Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2021-2022
Course Handout Part-II

30-09-2021

In addition to part-I (General Handout for all courses appended to the timetable), this portion gives further specific details regarding the course.

Course No. : MATH F111
Course Title: MATHEMATICS I
Instructor-in-charge: A MICHAEL ALPHONSE
Name of Instructors: DK Satpathi, Pratyusha Chattopadhyay, K Venkata Ratnam, Nijjwal Karak, A Michael Alphonse, Farida Parvez Barbhuiya, Sumit Kumar V, Rohit Gupta, Sharan Gopal, Sajith P, Jhuma Sen Gupta, Nabin Kumar Meher, Debopam Chakraborthy, Sayan Ghosh, Sri Sakti Swarup Anupindi, Agrawal A. S., Aleena Philip, Nakidi Shravani, Anjali P V, Vipin, Simran Arora, Hirendra Kumar Garai, Ruddarraju Amrutha, Debarati Mondal , Amritanshu Rai, Sunil Rampuria, Md Imdadul Islam, Gaurav Narayanrao Gadbail, Pankaj Patel, Sunita Kumawat

Scope and Objective of the Course:
Calculus is needed in every branch of science and engineering, as all dynamics is modeled through differential and integral equations. Functions of several variables appear more frequently in science than functions of a single variable. Their derivatives are more interesting because of the different approaches in which the variables can interact. Their integrals occur in several areas. All these lead in a natural way to functions of several variables.

Text Book:
1. George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas' Calculus*, Pearson, 14th Edition, 2018.

Reference Books:
1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India, 2015.
2. James Stewart, *Calculus*, 7th Edition, Cengage Learning, 2017.
3. Monty J. Strauss, Gerald L. Bradley and Karl J. Smith, *Calculus*, 3rd Edition, Pearson, 2007.

Course Plan:

Lect. No.	Learning Objectives	Topics to be Covered	Chapter in the Text Book
1	Overview of the course	-	-
2-3	To explain how calculus of one variable real-valued functions are related to vector valued functions.	Limit, continuity and differentiability of vector functions, arc length, velocity and unit tangent vector	13.1, 13.2 (only Integrals of Vector Functions is included, Projectile Motion is excluded), 13.3
4-6	To explain the concepts of curvature and torsion.	Curvature, normal vector, torsion and binormal vector, tangential and normal components of velocity and acceleration	13.4, 13.5
Self-Study	To learn to prove continuity, discontinuity and existence of limits for the functions of several variables.	Functions of several variables, level curves, limits, continuity	14.1, 14.2
7-9	To define partial derivatives and explain the chain rules for functions of several	Partial derivatives, chain rule	14.3, 14.4

	variables		
10-12	To explain how to find the derivative along a particular direction	Directional derivative, gradient vectors, tangent planes and normal line, Estimating the change in a specific direction, Linearization of functions of two and three variables, The error in the standard linear approximation	14.5, 14.6
13-15	To explain the concepts of local maximum and minimum for functions of several variables	Maximum, minimum and saddle points of functions of two or three variables, constrained maxima and minima – method of Lagrange multipliers.	14.7, 14.8
16-19	How to obtain length of a polar curve and area of a surface of revolution of a polar curve?	Polar Coordinates, Graphing in Polar Coordinates, Length of a polar curve, area of a surface of revolution, Conics in polar coordinates.	11.3-11.5 and 11.7
20-21	How formula for area in polar coordinates can be found through polar double integral?	Double integrals, area, change of integrals to polar coordinates. Double integrals in polar form	15.1 - 15.4
22-24	To identify which type of integral evaluates volume of a solid in a simpler way	Triple integral, integral in Cylindrical and Spherical coordinates, Substitutions in multiple integrals	15.5, 15.7, 15.8
25-29	To explain the equivalent definitions of conservative field and understand how Green's theorem can simplify evaluation of line integrals.	Line integral, work, circulation, flux, path independence, potential function, conservative fields, Green's theorem in the plane	16.1 – 16.4
30-33	To explain the concept of surface measure and learn to apply Stokes theorem	Surface area and surface integral, Stokes' theorem, Gauss divergence theorem	16.5 - 16.8
34-38	To explain the convergence of infinite series with examples and counter examples	Sequence of real numbers, frequently occurring limits, infinite series, different tests of convergence, series of nonnegative terms, absolute and conditional convergence, alternating series	10.1 – 10.6
39-40	To explain the power series and their properties	Power series, Taylor and Maclaurin series	10.7 – 10.8

Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage*	Date, Time	Nature of Component
1.	Midsemester Test	90 mins	30%	06/12 - 9.00 - 10.30AM	Open Book
2.	Assignment I	------	15%	To be announced later	Open book
5.	Assignment II	----	15%	To be announced later	Open book
6.	Comprehensive Examination	120 mins	40%	19/01 FN	Open Book

*** The total marks of all the components, taken together will be 300**.
Chamber consultation hour: To be announced in the class.
Make-up Policy:
Make-up will be given only for very genuine cases and prior permission has to be obtained from the I/C.
Notices: The notices concerning this course will be displayed on the CMS Notice Board only.
Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR IN -CHARGE
MATH F111