Parvatibai Chowgule College of Arts & Science
(Autonomous)
Margao – Goa

MINUTES OF MEETING OF THE BOARD OF STUDIES IN MATHEMATICS

HELD ON 14th JUNE 2022

A meeting of this BOS was convened on14th June 2022 via online mode through Google Meet. Since the number of members present represented the Quorum, the BOS began its proceedings.

Minutes are presented in the format.

Members present:

1. Anand Masur
2. Danielle Monteiro
3. Chitra Mekoth
4. Darshana Umarye
5. MeetalRaikar
6. Dr. Stefan Dais Barreto
7. Dr. Milind Kulkarni

Members Absent with Intimation

1. Dr. Rajeev Sapre

Proceedings

The Chairperson welcomed the members of the Board of Studies. The Chairperson introduced and explained the agenda for the meeting and Board transacted the following business:

Agenda Items:

1. Approve the modified syllabus of Differential Equations I, Numerical methods and Computers For Mathematics
2. Any other matter with permission of the chair.

PART A:

The following resolutions were passed by the members of the BOS:

1. The syllabus of Computers for Mathematics was approved.
2. The syllabus of Numerical methods with Python was approved.
3. The syllabus of Differential Equations I was approved.

The syllabus and course structure are attached

	Core	**Core**	**Elective-I**	**Elective-II**	**Elective-III**	**Elective-IV**	**Elective V**
Sem-I	Basic Algebra	Basic Real Analysis	---------	---------	---------	---------	
Sem-II	Coordinate Geometry	Mathematical Analysis-I	---------	---------	---------	---------	
Sem-III		Mathematical Analysis-II	Abstract Algebra-I	Number Theory-I	Combinatorics	Numerical Methods	
Sem-IV		Linear Algebra	Advanced Analysis	Number Theory-II	Operations Research I	Probability Theory	
Sem-V		Functions of Several Variables	Metric Spaces	Cryptography	Graph Theory	Logic and Boolean Algebra	Operations Research II
Sem-VI		Vector Analysis	Complex Analysis	Abstract Algebra-II	Computational Linear Algebra	Computers for Mathematics	Pedagogy of Mathematics

Semester	**Skill Enhancement Course**
Sem III	Differential Equations- I
Sem IV	Differential Equations- II

Semester	**Core (Minor)**
I	Basic Algebra
II	Coordinate Geometry
III	Basic Real Analysis/ Numerical Methods
IV	Mathematical Analysis I/ Linear Algebra/Operations Research-I
V	Graph Theory / Numerical Methods/Operations Research-II
VI	Probability Theory/ Vector Analysis

1. Course Title : Differential Equations I

2. Course Code :MAT-III.SEC-I

3. Marks : 100

4. Credits : 4

5. Duration : 60 hours

6. Prerequisite Courses : Mathematical Analysis

7. Course Objectives : To introduce some methods of solving ODE of first and higher order, Applications of the same in different fields.

8. Course Outcomes : Students can solve ODE with constant coefficients, given a simple situation can make an ODE.

Syllabus :

Unit 1:- **(15 lectures)**

Introduction. Some simple situations where we come across ODE, Geometrical Meaning of ODE, Solutions of an ODE. Picard's Existence and Uniqueness theorem.

First order ODE. Variable separable, Homogeneous, Non- Homogeneous, Exact differential equations, integrating factor, linear differential equations, Bernoulli equations.

Unit 2:- **(15 lectures)**

Second order differential equations, Homogeneous and non-homogeneous differential equations, complementary function, particular integral, Wronskian, Solution space, General solution, complex solutions. Some methods of solving second order differential equations (undetermined coefficients, variation of parameters, using one solution to find other).

Unit 3:- **(15 lectures)**

Linear differential equations of higher order, simple examples of non-homogenous differential equations.Some application of differential equations, LR / LCR circuits, SHM (simple-damped- forced), Equation of Catenaries, Planetary Motions – Kepler's Laws.

Unit 4:- **(15 lectures)**

Some numerical methods : Euler method, modified Euler method, Runge- Kutta methods (order two and order four). Picard's method of successive approximation.

References :

Textbook: - Simmons G.F., Differential Equations with historical Notes, Tata McGraw Hill

1. Boyce W.E. &DiPrima R.C., Elementary Differential Equations and Boundary Valued Problems, John Wiley Pvt Ltd.
2. Braun C, Differential Equations and Their Applications: An Introduction to Applied Mathematics (Texts in Applied Mathematics), springer.
3. Coddington E., Theory of Ordinary Differential Equations, Tata McGraw Hill
4. Rainville E.D., Elementary Differential Equations, Pearson

1. Course Title : Numerical Methods with Python

2. Course Code :MAT-III.E-4

3. Marks : 100

4. Credits : 4

5. Duration : 60 hours

6. Prerequisite Courses : Mathematical Analysis

7. Course Objectives : This course covers the basic methods for finding the finite difference, solution of simultaneous equations and the techniques of Numerical Differentiation and Numerical Integration. It also deals with solution of Algebraic and Transcendental equations.

8. Course Outcomes : The student will be able to solve numerically various equations. Also write python programs for some numerical methods.

Syllabus :

Module I: Error Analysis (15 Lectures)

Approximate numbers, significant figures, rounding off numbers, Error- Absolute, relative and percentage

Introduction to Python

Installation, Basics of programming, If, elif, for and while loop, simple programs involving these loops, Lists, list comprehension.

Finite Differences

Operators- Δ, and E (Definitions and some relations among them), finite difference tables, fundamental theorem on differences of a polynomial and examples.

Module II: Interpolation and Extrapolation (15 lectures)

Newton Gregory Forward and backward interpolation formulae (with deduction of formulae) and examples (for equal intervals)

For unequal intervals- Lagrange's Formula and Newton's divided difference formula (No proof) and examples

Python program for Newton Gregory Forward and Backward interpolation formula, Lagrange interpolation formula, Newton's Divided difference formula.

Module III: Numerical Integration and differentiation (15 lectures)

Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules (with proof) and problems. Weddle's rule (no proof, only problems)

Numerical differentiation and examples

Python program for Trapezoidal rule, Simpson's $1/3^{rd}$ rule, $3/8^{th}$ rule, Weddle's rule and numerical differentiation formula (derivative at the initial point only).

Module IV: Numerical Solutions of Equations (15 Lectures)

To find a real root of an algebraic or transcendental equation using Bisection method, regular falsi method, Newton Raphson method with geometrical significance and problems and method of iteration. Gauss- Seidel method to solve simultaneous equations.

Python program for Bisection method, Regula falsi method, Newton Raphson method Gauss- Seidel method.

Curve fitting : Method of least squares- fitting a line, second degree polynomial, exponential curve and examples. Python programs for fitting a line, second degree polynomial, exponential curve.

References :

1. Atkinson K., An Introduction to Numerical Analysis, John Wiley & Sons
2. Chatterji P.N, Numerical Analysis
3. Comte S.D and Carl de Boor, Elementary Numerical analysis - An Algorithmic approach, McGraw Hill
4. Hildebrand F.B, Introduction to Numerical Analysis, McGraw Hill
5. Sastry S.S, Introductory Methods of Numerical Analysis, Prentice Hall India
6. Scarborough J.B, Numerical Mathematical Analysis, Oxford and IBH Publishing Company, New Delhi.

SYLLABUS FOR PROGRAMME BACHELOR OF ARTS/SCIENCE IN MATHEMATICS
T.Y.B.A./T.Y.B.Sc. (SEMESTER-VI)

1. Course Title : Computers for Mathematics

2. Course Code :MAT-III.E-16

3. Marks : 100

4. Credits : 4

5. Duration : 60 hours

6. Prerequisite Courses : Basic knowledge of computers, a basic course in ODE, Numerical analysis. Familiarity with computer programming will be helpful but not compulsory.

7. Course Objectives :To train students to use computers for mathematical typing, computing and plotting. Helping them understand theory using computational methods

8. Course Outcomes :Students will be able to use these free packages for writing and drawing mathematical papers. Also can understand some basic aspects of programming and perform basic data analysis in R.

Syllabus :

Unit 1.Introduction to LaTeX (15 Lectures)

Mathematical typing in MS Word 07/13
Short comings of Word, need of some other package of writing.
Document Editing using LaTeX: - Text formatting, Paragraph formatting
Fonts and colours, special char acters, Tables, Page layout, importing graphics, footnotes, referencing, Beamer Presentations

Unit 2.Mathematical typesetting in LaTeX (10 Lectures)

Mathematical environments and packages Symbols, Greek letters and operators, Powers and indices, fractions, Roots, Sums, integrals and derivatives, Brackets, Matrices

Unit 3. Introduction R Programming. (12 Lectures)

Fundamentals of R programming:-Introduction to interface (R studio), evolution, features, All Data types in R, Variable (assignment, its data type), All operators in R, Loops and R functions (user defined and built in functions), Entering data

from keyboard, Importing data from various data Sources.

Unit 4. R Statistics , data visualization and management (12 Lectures)

R charts and graphs, Data frame, Data reshaping, Mean, Median , Mode.

Unit 5. Scilab/ Matlab/Geogebra (11 Lectures)

Introduction to Scilab, familiarizing with the Scilab, Scilab syntax, Variables, functions, Loops, plotting graphs.

References :

1. M.Alley, the Craft of Scientific Presentations, Springer (2003).
2. W.C. Booth, G.G. Colomb, and J.M. Williams, The Craft of Research (Chicago Guides to Writing, Editing, and Publishing) Univ. of Chicago Press, 2008.
3. George Graetzer, Math into LaTex, An introduction to LaTex and AMS-LaTex, Birkhauser, 1996.
4. Donald E. Knuth; Tracy E Larrabee, Paul M. Roberts: Mathematical writing, Mathematical Association of America, 1989.
5. S. Krantz: A Primer of Mathematical Writing: Being a Disquisition on Having Your Ideas Recorded, Typeset, Published, Read & Appreciated, American Mathematical Society, 1996.
6. S. Krantz: How to Teach Mathematics, American Mathematical Society, 1999.
7. Leslie Lamport: LaTex, a document preparing system, Addison-Wesley, 1994.
8. Jr. Strunk, William; E. B. White, The Elements of Style, Fourth Edition, Longman; 4th edition (1999).
9. Robert I. Kabacoff(2011): R in Action – Data Analysis and graphics in R, Manning.
10. Hadley Wickham(2009):ggplot: Elegant graphics for Data Analysis, Springer.

The foregoing minutes of the meeting were read out by the Chairman at the meeting itself and they were unanimously approved by all themembers present

Ms. Danielle Monteiro	Mr. Anand Masur
Member Secretary, BOS	Chairman, BOS

Date:

PART C: The remarks of the Dean of the Faculty:-

a. The minutes are in order.
b. The minutes may be placed before the Academic Council with remark, if any.
c. Important points of the minutes which need clear policy decision of the Academic council to be recorded.

Date:

Signature of the Dean: _____
(Faculty of Sciences)