

Syllabus

Mathematics (Regular)

submitted to



Gauhati University

under the

Choice Based Credit System

By

Department of Mathematics

Gauhati University

Credits allocation for the Regular courses:

Course	*Credits	*Credits
Theory + Practical	Theory + Tutorial	Theory + Practical
I. Core Course (6 Credits)		
(12 Papers)	12×4= 48	12×5=60
04 Courses from each of the 03 disciplines of choice		
Core Course Practical / Tutorial*		
(12 Practical/Tutorials*)	12×2=24	12×1=12
04 Courses from each of the 03 disciplines of choice		
II. Elective Course (6 Credits)		
(6 Papers)	6×4=24	6×5=30
Two papers from each discipline of choice including paper of interdisciplinary nature		
Elective Course Practical / Tutorial*	6 × 2=12	6×1=6
Two papers from each discipline of choice including paper of interdisciplinary nature		
Optional Dissertation or project work in place of one Discipline Specific Elective paper (6 credits) in 6th Semester		
III. Ability Enhancement Courses		
1. Ability Enhancement Compulsory Courses (AECC) (2 Papers of 4 credit each)	2 × 4=8	2 × 4=8
Environmental Science		
English Communication		
2. Skill Enhancement Courses (SEC) (4 Papers of 4 credit each)	4 × 4=16	4× 4=16
Total credit	132	132

* wherever there is a practical there will be no tutorial and vice-versa

Core papers (Mathematics):

1. MAT-RC-1016: Calculus
2. MAT-RC-2016: Algebra
3. MAT-RC-3016: Differential Equations
4. MAT-RC-4016: Real Analysis

Skill Enhancement Course (SEC) papers

SEC-1

MAT-SE-3014: Computer Algebra Systems and Related Software

SEC-2

MAT-SE-4014: R Programming

SEC-3

MAT-SE-5014: Combinatorics and Graph Theory

SEC-4

MAT-SE-6014: LaTeX and HTML

Discipline Specific Elective (DSE) papers

DSE-1 (Choose one)

MAT-RE-5116: Number Theory

MAT-RE-5126: Discrete Mathematics

DSE-2 (Choose one)

MAT-RE-6116: Numerical Analysis

MAT-RE-6126: Programming in C

SEMESTER-IV
MAT-RC-4016: Real Analysis

Total Marks: 100 (Theory 80, Internal Assessment 20)

Per week 5 Lectures, 1 Tutorial, Credits 6

Each unit carry equal credit

Unit 1: Order completeness of Real numbers, Open and closed sets, Limit of functions, Sequential criterion for limits, Algebra of limits, Properties of continuous functions, Uniform continuity.

[1] Chapter 2 (Sections 2.1, and 2.2, Sections 2.3, and 2.4) Chapter 11 (Section 11.1, Definition and Examples only)

Unit 2: Sequences, Convergent and Cauchy sequences, Subsequences, Limit superior and limit inferior of a bounded sequence, Monotonically increasing and decreasing sequences, Infinite series and their convergences, Positive term series, Comparison tests, Cauchy's nth root test, D'Alembert's ratio test, Raabe's test, Alternating series, Leibnitz test, Absolute and conditional convergence.

[1] Chapter 3, (Sections 3.1, and 3.2,3.3,3.4,3.5,3.7), Chapter 9 [Section 9.1(excluding grouping of series) Sections 9.2 (Statements of tests only), 9.3 (9.3.1, and 9.3.2) Chapter 4 (Sections 4.1 to 4.3).Chapter 5 (Sections 5.1, 5.3 and 5.4 excluding continuous extension and approximation)

Text Book:

1. Bartle, Robert G., & Sherbert, Donald R. (2015). *Introduction to Real Analysis* (4th ed.) Wiley India Edition.

Reference Books:

1. Ross, Kenneth A. (2013). *Elementary Analysis: The Theory of Calculus* (2nd ed.). Undergraduate Texts in Mathematics, Springer. Indian Reprint
2. Bilodeau, Gerald G., Thie, Paul R., & Keough, G. E. (2010). *An Introduction to Analysis* (2nd ed.). Jones & Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.

SEMESTER-IV
SEC-2
MAT-SE-4214: R Programming

Total marks: 100 (Project 30, Internal assessment 20, Practical 50)

Per week: 2 Lectures, 2 Practical, Credits 4(2+2)

Each unit carry equal credit.

Unit 1: Getting Started with R - The Statistical Programming Language

Introducing **R**, using **R** as a calculator; Explore data and relationships in **R**; Reading and getting data into **R**; combine and scan commands, viewing named objects and removing objects from **R**, Types and structures of data items with their properties, Working with history commands, Saving work in **R**; Manipulating vectors, Data frames, Matrices and lists; Viewing objects within objects, Constructing data objects and their conversions.

[1] Chapter 14 (Sections 14.1 to 14.4)

[2] Chapter 2, Chapter 3

Unit 2: Descriptive Statistics and Tabulation

Summary commands: Summary statistics for vectors, Data frames, Matrices and lists; Summary tables.

[2] Chapter 4

Unit 3: Distribution of Data

Stem and leaf plot, Histograms, Density function and its plotting, The Shapiro-Wilk test for normality, The Kolmogorov-Smirnov test.

[2] Chapter 5

Unit 4: Graphical Analysis with R

Plotting in **R**: Box-whisker plots, Scatter plots, Pairs plots, Line charts, Pie charts, Cleveland dot charts, Bar charts; Copy and save graphics to other applications.

[1] Chapter 14 (Section 14.7)

[2] Chapter 7

Practical to be done in the Computer Lab using Statistical Software R:

[1] Chapter 14 (Exercises 1 to 3)

[2] Relevant exercises of Chapters 2 to 5, and 7

Note: The practical may be done on the database to be downloaded from <https://data.gov.in/>

Text books:

1. Bindner, Donald & Erickson, Martin. (2011). *A Student's Guide to the Study, Practice, and Tools of Modern Mathematics*. CRC Press, Taylor & Francis Group, LLC.
2. Gardener, M. (2012). *Beginning R: The Statistical Programming Language*, Wiley Publications.