Scheme of
B.Sc. (Mathematics with Data Science)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A1	Calculus	260/MAT/CC101	3	1	-	3	1	-	4	30	70	-	-	100
CC-A2	Discrete Mathematics	260/MAT/CC102	3	1	-	3	1	-	4	30	70	-	-	100
CC-A3	Computer Fundamentals	260/MAT/CC103	2	--	4	2	-	2	4	15	35	15	35	100
Minor/ Vocational Course(s)														
MIC-1	Number Theory and Trigonometry		2	-	-	2	-	-	2	.15	35	-	-	50
Multidisciplinary Course(s)														
MDC-1	One from Pool		2	-	2	2	-	1	3	15	35	5	20	75
Ability Enhancement Course(s)														
AEC-1	One from Pool		2	-	-	2	-		2	15	35	-	-	50
Skill Enhancement Course(s)														
SEC-1	Information and Communication Technology		2	-	2	2	-	1	3	15	35	5	20	75
Value-added Course(s)														
VAC-1	One from Pool		**2**	-	-	**2**	-	-	2	15	35	-	-	50
Total Credits			**18**	**2**	**8**	**18**	**2**	**4**	**24**					**600**

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A4	Algebra	260/MAT/CC201	3	1	-	3	1	-	4	30	70	-	-	100
CC-A5	Descriptive Statistics	260/MAT/CC202	3	--	2	3	-	1	4	25	50	5	20	100
CC-A6	Programming with C	260/MAT/CC203	2	--	4	2	-	2	4	15	35	15	35	100
Minor/ Vocational Course(s)														
MIC-2	Linear Programming		1	-	2	1	-	1	2	5	20	5	20	50
Multidisciplinary Course(s)														
MDC-2	One from Pool		2	-	2	2	-	1	3	15	35	5	20	75
Ability Enhancement Course(s)														
AEC-2	One from Pool		2	-	-	2	-		2	15	35	-	-	50
Skill Enhancement Course(s)														
SEC-2	Operating System		2	-	2	2	-	1	3	15	35	5	20	75
Value-added Course(s)														
VAC-2	One from Pool		**2**	-	-	**2**	-	-	2	15	35	-	-	50
Total Credits			**17**	**1**	**12**	**17**	**1**	**6**	**24**					**600**

Semester-1

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	I
Name of the Course	Computer Fundamentals
Course Code	CC-A3
Course ID	260/MAT/CC103
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand fundamental concepts of computers, working principles, memory organization and applications. 2. Create, edit, format, and present documents using MS Word for academic purposes. 3. Create, format, and present slides effectively using MS PowerPoint. 4. Use MS Excel for data entry, basic data management, calculations, and graphical representation of data.

Credits	**Theory**	**Practical**	**Total**
	2	2	4
Contact Hours	2	4	6
Internal Assessment Marks	15	15	30
End Term Assessment Marks	35	35	70
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Basic model and functioning of a digital computer, Historical evolution of computers, classification of computers, Human being vs computer, Input / Output devices, Storage devices, Memory and mass storage devices, characteristics of memory systems, types of memory, RAM, ROM, concepts of Virtual and Cache memory, Applications of Computer.	30
II	Introduction to MS-Word, Standard Toolbar, Word Wrap, Text formatting, Indents, Tabs, Formatting paragraphs, Applying Effects to text, Applying animation to text.	
III	Introduction to MS Power Point, Power point slide creation, Slide-show, Adding graphics, Formatting Customizing and Printing.	
IV	Introduction to MS Excel, Working with Toolbars, Formatting, Formulas, Data management, Graphs and Charts, Macros and other additional functions.	

Practical

The following practicals will be done and their record will be maintained in the practical note book: — **60**

1. Create a document demonstrating different text formatting styles (bold, italic, underline, font size, color).
2. Practice word wrap and alignment (left, right, center, justify).
3. Create a document using bullets and numbering for structured content.
4. Apply paragraph formatting (spacing, indentation, line spacing).
5. Use tabs and indents to format a structured document.
6. Design a formal letter/application using proper formatting tools.
7. Create a table and format it with borders and shading.
8. Apply text effects (shadow, outline, glow, etc.) in a document.
9. Insert and format images and shapes in a document.
10. Create a document using basic animation/text effects (WordArt styles).
11. Create a basic presentation with at least 5 slides.
12. Apply different slide layouts and themes.
13. Insert images, shapes, and SmartArt into slides.
14. Apply slide transitions and animations.
15. Create a slide show with timings and effects.
16. Design a presentation and customize slide master.
17. Add charts/graphs in PowerPoint slides.
18. Practice printing slides and handouts with different settings.
19. Create a worksheet using basic formulas (SUM, AVERAGE, MIN, MAX).
20. Prepare a dataset and apply formatting, sorting, filtering, and charts/graphs.

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:

➢ **Theory 15** • Class Participation /assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum 15** • Seminar/Demonstration/Viva-voce/Lab records etc.: 15	➢ **Theory 35** • Written Examination ➢ **Practicum 35** • Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. D. Sanders, *Computers Today*, McGraw-Hill Publishers..
2. Davis, *Introduction to Computers*, McGraw-Hill Publishers.
3. V. Rajaraman, *Fundamental of Computers*, Prentice-Hall India Ltd., New Delhi..

Semester-2

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	II
Name of the Course	Algebra
Course Code	CC-A4
Course ID	260/MAT/CC104
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Apply matrix concepts including rank, inverse, eigenvalues, and Cayley–Hamilton theorem. 2. Apply matrix methods to solve linear equations and study quadratic forms. 3. Analyze polynomial equations using root-coefficient relations and transformations. 4. Solve cubic equations and apply basic number theory concepts (GCD, LCM, Diophantine equations).

Credits	**Theory**	**Tutorial**	**Total**
	3	1	4
Contact Hours	3	1	4
Internal Assessment Marks	30		
End Term Assessment Marks	70		
Examination Time	3 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Study of special types of matrices including symmetric, skew-symmetric, Hermitian, and skew-Hermitian matrices. Elementary operations on matrices, determination of rank and inverse, and concepts of linear dependence and independence of rows and columns. Row rank and column rank, eigenvalues, eigenvectors, characteristic equation, minimal polynomial, and the Cayley–Hamilton theorem. Reduction of matrices to normal form and consistency of linear systems using rank.	60
II	Application of matrices in solving systems of linear equations (both homogeneous and non-homogeneous), including consistency theorems. Introduction to unitary and orthogonal matrices, along with bilinear and quadratic forms. Reduction of quadratic forms to canonical form and nature of quadratic forms.	
III	Relations between roots and coefficients of polynomial equations in one variable. Solutions of equations under given conditions on roots, common and multiple roots, transformation of equations, nature of roots, and Descartes' rule of signs. Symmetric functions of roots and reciprocal equations.	
IV	Solution of cubic equations using Cardon's method. Basic concepts of number theory including divisibility, greatest common divisor (GCD), least common multiple (LCM), prime numbers, and the fundamental theorem of arithmetic. Euclidean algorithm for GCD and linear Diophantine equations.	

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory 30** • Class Participation: 5 • Seminar/presentation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 20	➢ **Theory 70** • Written Examination

Part C-Learning Resources

Recommended Books:

1. H.S. Hall & S.R. Knight (1994), Higher Algebra. H.M. Publications.
2. S. Narayan & P. K. Mittal (2010), A Text Books of Matrices. S. Chand Publications.
3. K. B. Dutta (2004). Matrix and Linear Algebra. Prentice Hall of India Pvt. Ltd.
4. C. Prasad (1991), Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

Semester-2

Session: 2026-27

Part A – Introduction

Subject	Mathematics		
Semester	II		
Name of the Course	Descriptive Statistics		
Course Code	CC-A5		
Course ID	260/MAT/CC105		
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC		
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Get introduction to Statistics, data types, collection, classification, and presentation methods. 2. Have knowledge of Measures of Central Tendency and Dispersion: Mean, median, mode, quartiles, standard deviation. 3. Understand Linear Regression and Correlation: Principles of least squares, regression lines, correlation coefficient. 4. Know about Bivariate Random Variables: Joint, marginal, and conditional distributions.		
Credits	**Theory**	**Practical**	**Total**
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	25	5	30
End Term Assessment Marks	50	20	70
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Introduction of Statistics, Basic knowledge of various types of data, Collection, classification and tabulation of data. Presentation of data: histograms, frequency polygon, frequency curve and ogives. Stem- and- Leaf and Box plots.	45
II	Measures of Central Tendency and Location: Mean, median, mode, geometric mean, harmonic mean, partition values. Measures of Dispersion: Absolute and relative measures of range, quartile deviation, mean deviation, standard deviation, coefficient of variation.	
III	Linear Regression: Concept of regression, principle of least squares and fitting of straight line, derivation of two lines of regression, properties of regression coefficients, standard error of estimate obtained from regression line, correlation coefficient between observed and estimated values.	
IV	Angle between two lines of regression, Difference between correlation and regression, Curvilinear Regression: Fitting of second degree parabola, power curve of the type $Y=ax^b$, exponential curves of the types $Y=ab^x$ and $Y = ae^{bx}$. Concepts of bivariate random variables: joint, marginal and conditional distributions.	

Practical

The following practicals will be done and their record will be maintained in the practical note book: 1. Collection of raw data from real-life situations and classification of data into qualitative and quantitative types. 2. Tabulation of data and preparation of frequency distributions using appropriate class intervals. 3. Graphical presentation of data using histograms, frequency polygons, and frequency curves. 4. Construction of ogives (less than and more than) and determination of median, quartiles, and percentiles from ogives. 5. Construction of stem-and-leaf plots and box plots and interpretation of data distribution. 6. Computation of measures of central tendency: mean, median, mode for grouped and ungrouped data. 7. Computation of geometric mean and harmonic mean for suitable data sets. 8. Computation of measures of dispersion: range, quartile deviation, mean deviation, and standard deviation. 9. Calculation of relative measures of dispersion, including coefficient of variation and interpretation. 10. Fitting of a straight line using the method of least squares, estimation of regression coefficients and regression equations. 11. Calculation and interpretation of correlation coefficient, standard error of estimate, angle between regression lines, and distinction between correlation and regression. 12. Fitting of curvilinear regression models (second-degree parabola, exponential or power	30

curves) and problems on joint, marginal, and conditional distributions of bivariate random variables.

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory 25**

- Class Participation: 5
- Presentation/assignment/quiz/class test etc.: 10
- Mid-Term Exam: 10

➢ **Practicum 5**

- Seminar/Demonstration/Viva-voce/Lab records etc.: 5

End Term Examination:

➢ **Theory 50**

- Written Examination

➢ **Practicum 20**

- Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. S.C. Gupta & V. K. Kapoor (2002), Fundamentals of Mathematical Statistics. Sultan Chand & Sons.
2. S. Bernstein & R. Bernstein (2020), Elements of Statistics. Schaum's outline series, McGraw-Hill.
3. I. Miller & M. Miller (2014). John E. Freund's Mathematical Statistics with Applications (8thedition). Pearson. Dorling Kindersley Pvt. Ltd. India.
4. S. M. Ross (2014), Introduction to Probability Models (11th edition). Elsevier.
5. R. V. Hogg, J. W. McKean & A. T. Craig (2013), Introduction to Mathematical Statistics (7th Edition). Pearson Education.
6. S. David (2003), Elementary Probability (2nd Edition). Cambridge University Press.
7. J. Pitman (1993), Probability. Springer-Verlag.

Semester-2

Session: 2026-27

Part A – Introduction

Subject	Mathematics		
Semester	II		
Name of the Course	Programming with C		
Course Code	CC-A6		
Course ID	260/MAT/CC106		
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC		
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)		
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Solve basic problems using programming constructs, algorithms, and flowcharts. 2. Execute basic C programs using data types, operators, control structures, and library functions for problem solving. 3. Implement arrays, strings, and functions, including recursion and storage classes, to solve programming problems. 4. Use structures, unions, pointers, and file handling to manage complex data and perform input/output operations.		
Credits	**Theory**	**Practical**	**Total**
	2	2	4
Contact Hours	2	4	6
Internal Assessment Marks	15	15	30
End Term Assessment Marks	35	35	70
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Basic programming structures: sequence, selection, iteration, and modular programming. Problem-solving concepts using algorithms, flowcharts, and pseudo code - definitions, characteristics, and simple examples. Writing basic algorithms and drawing flowcharts.	30
II	C language fundamentals: tokens, identifiers, keywords, variables, and data types. Operators and expressions (arithmetic, relational, logical, conditional). Control structures: if, if–else, switch, for, while, do-while, break and continue. Basic library functions (math and string). Simple C programs with emphasis on problem solving.	
III	Arrays (one-dimensional and two-dimensional) and strings. Functions: definition, calling, parameter passing, return values, recursion. Use of arrays with functions. Basics of storage classes.	
IV	Structures and unions: declaration, access, and differences. Pointers: basics, pointer arithmetic, and pointers to pointers. File handling: opening and closing files, file modes, sequential and random access, and command-line arguments.	

Practical

The following practicals will be done and their record will be maintained in the practical note book: 1. Write an algorithm and flowchart to find the sum and average of given numbers. 2. Write an algorithm and flowchart to check whether a number is even or odd. 3. Write an algorithm and flowchart to find the largest of three numbers. 4. Write an algorithm and flowchart to calculate factorial of a number. 5. Write a C program to perform basic arithmetic operations using operators. 6. Write a C program to check whether a number is positive, negative, or zero. 7. Write a C program to find the largest of three numbers using if–else. 8. Write a C program to display grade of a student using switch statement. 9. Write a C program to print first n natural numbers using for loop. 10. Write a C program to find factorial of a number using while loop. 11. Write a C program to read and display elements of a one-dimensional array. 12. Write a C program to find sum and average of array elements. 13. Write a C program to perform matrix addition using two-dimensional arrays. 14. Write a C program to find length of a string without using library functions. 15. Write a C program to reverse a string using functions. 16. Write a C program to find factorial of a number using recursion. 17. Write a C program to store and display student details using structures. 18. Write a C program to swap two numbers using pointers. 19. Write a C program to read and write data to a file (text file). 20. Write a C program to copy contents of one file to another.	**60**

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory 15** • Class Participation /assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum 15** • Seminar/Demonstration/Viva-voce/Lab records etc.: 15	➢ **Theory 35** • Written Examination ➢ **Practicum 35** • Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. A. B. Chaudhari, *The Art of programming through flowcharts & algorithm*, Firewall Media, Laxmi publication, New Publication.
2. E. Balagurusamy, *Programming in C*, TMH Publications.
3. K. Ritche, *C Programming*
4. Y. Kanetkar, *Programming with C*
5. Holzner, *C Programming*, PHI Publication.
6. Ravichandran, *Programming in C.*

Semester-1

Session: 2026-27

Part A – Introduction

ubject	Mathematics
mester	I
me of the Course	Number Theory and Trigonometry
urse Code	MIC-1
ourse ID	260/MAT/MIC101
ourse Type: (CC/MIC/ IDC/ /VOC/AEC/VA C/SEC)	MIC
re-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Evaluate problems in divisibility, and primes. 2. Explore congruences and Diophantine equations. 3. Apply Euler's theorem, the Chinese Remainder Theorem, and divisor functions to solve modular and arithmetic problems. 4. Expand and analyze trigonometric functions by De Moivre's Theorem.

Credits	**Theory**	**Tutorial**	**Total**
	2	-	2
Contact Hours	2	-	2
Internal Assessment Marks	15		
End Term Assessment Marks	35		
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple) Primes, Fundamental Theorem of Arithmetic. Linear Congruences.	30
II	Fermat's theorem. Wilson's theorem and its converse. Linear Diophanatine equations in two variables	
III	Euler's $\emptyset$ function, Euler's generalization of Fermat's theorem. Chinese Remainder Theorem, The number of divisors and the sum of divisors of a natural number n (The functions $d(n)$ and $\sigma(n)$).	
IV	De Moivre's Theorem and its Applications. Expansion of trigonometrical functions.	

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory 15** • Class Participation/assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10	➢ **Theory 35** • Written Examination

Part C-Learning Resources

Recommended Books:

1. S.L. Loney, *Plane Trigonometry Part – II*, Macmillan and Company, London..
2. R.S. Verma and K.S. Sukla, *Text Book on Trigonometry*, Pothishala Pvt. Ltd.Allahabad.
3. I.Ninen and H.S. Zuckerman, *An Introduction to the Theory of Numbers*.

Semester-2

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	II
Name of the Course	Linear Programming
Course Code	MIC-II
Course ID	260/MAT/MIC102
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	MIC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Formulate linear programming problems and identify their components. 2. Solve LPPs graphically and understand primal–dual relationships. 3. Apply the simplex method and analyze feasibility and optimality cases. 4. Solve LPPs using artificial variable methods and compare their approaches.

Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
Internal Assessment Marks	5	5	10
End Term Assessment Marks	20	20	40
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Introduction to Operations Research, its scope and methodology. Optimization problems, Linear Programming Problem (LPP): Definition, Requirements for a Linear Programming Problem, Advantages and limitations of Linear Programming, Formulation of Linear Programming Problems, Objective function, constraints and decision variables	15
II	Graphical solution: Multiple, unbounded and infeasible solutions. Duality in LPP, primal-dual relationship.	
III	Principle of simplex method: standard form, basic solution, basic feasible solution. Computational Aspect of Simplex Method: Cases of unique feasible solution, no feasible solution, multiple solution and unbounded solution and degeneracy	
IV	Need for artificial variables, Two Phase method, Big-M method, Comparison of Two Phase and Big-M methods	

Practical

The following practicals will be done and their record will be maintained in the practical note book: 1. Identification of optimization problems from real-life situations and classification into maximization and minimization problems. 2. Formulation of Linear Programming Problems by defining objective function, decision variables, and constraints from given statements. 3. Conversion of formulated LPPs into standard form suitable for graphical or simplex methods. 4. Graphical solution of two-variable LPPs and identification of feasible region and optimal solution. 5. Graphical analysis of multiple, unbounded, and infeasible solutions of LPPs. 6. Formulation of the dual problem for a given primal LPP and verification of primal–dual relationships. 7. Identification of basic solutions and basic feasible solutions for LPPs in standard form. 8. Solution of LPPs using the simplex method resulting in a unique optimal solution. 9. Solution of LPPs using the simplex method involving degeneracy and multiple optimal solutions. 10. Detection and illustration of unbounded and infeasible solutions using the simplex method. 11. Solution of LPPs requiring artificial variables using the Two Phase method. 12. Solution of LPPs using the Big-M method and comparison of results obtained using Two Phase and Big-M methods.	30

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory 5** • Class Participation /assignment/quiz/class test etc.: 5 ➢ **Practicum 5** • Seminar/Demonstration/Viva-voce/Lab records etc.: 15	➢ **Theory 20** • Written Examination ➢ **Practicum 20** • Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. J.K. Sharma, Mathematical Model in Operations Research, Tata McGraw Hill.
2. H.A. Taha, Operations Research – An Introduction.
3. Kanti Swarup, P.K. Gupta, and Manmohan, Operations Research.
4. P.K. Gupta and D.S. Hira, Operations Research, S. Chand & Co.
5. S.I. Gass, Linear Programming (3rd Edition), McGraw Hill, New York, 1985.
6. S.D. Sharma, Operations Research.
7. N.S. Kambo, Mathematical Programming.
8. G. Hadley, Linear Programming, Narosa Publishing House, 1987.

Semester-1

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	I
Name of the Course	Information and Communication Technology
Course Code	SEC-I
Course ID	260/MAT/SEC101
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	SEC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand data, information and fundamentals of computer networks and communication devices. 2. Explore the World Wide Web, its history, differences from the Internet, search engines, and the roles and types of web servers. 3. Explore web services and email protocol. 4. Examine applications, benefits, and limitations of video conferencing.

Credits	**Theory**	**Practical**	**Total**
	2	1	3
Contact Hours	2	2	4
Internal Assessment Marks	15	5	20
End Term Assessment Marks	35	20	55
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Data, Information and knowledge, ICT – definition, Scope, Importance & Nature of Information & Communication Technology, Applications. Computer networks, Networking Instruments, Communication devices	30
II	World Wide Web – History, Difference between Internet and www. Search engines. Web Servers: What is a server; Server software, Services provided by servers and their types.	
III	Concept of web services, Email: Definition, Protocols used in email services. Mail account and address, Sending and receiving an email, Features like cc, Bcc, Spam and junk, Email etiquettes, proper structure and layout.	
IV	Video conferencing: definition, Areas of application, Advantages and disadvantages of Video conferencing.	

Practical

The following practicals will be done and their record will be maintained in the practical note book: 1. Explore and differentiate data, information, and knowledge, and analyze the role of ICT in various applications. 2. Identify and use networking instruments and communication devices (router, switch, modem, cables), and demonstrate their functions. 3. Access and navigate the World Wide Web, perform searches using different search engines, and distinguish between Internet and WWW. 4. Explore web servers, understand server software, and document the types of services provided by servers. 5. Study the concept of web services and analyze their applications in real-world scenarios. 6. Create, send, and receive emails using proper etiquette, and demonstrate features like cc, bcc, attachments, and spam/junk handling. 7. Explore email systems, understand email structure, and demonstrate proper formatting and layout of professional emails. 8. Conduct a video conferencing session using platforms like Zoom or Google Meet, and analyze its applications, advantages, and limitations. 9. Study different communication technologies used in ICT and evaluate their importance in modern communication systems. 10. Analyze the scope, importance, and nature of ICT, and prepare a report on its impact in education, business, and society.	30

Suggested Evaluation Methods

Internal Assessment: **Theory 15** • Class Participation /assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10	**End Term Examination:** ➢ **Theory 35** • Written Examination ➢ **Practicum 20**

Practicum 5 • Seminar/Demonstration/Viva-voce/Lab records etc.: 5	• Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. C. Abbott, *ICT: Changing Education*, RoutledgeFalmer
2. Wong, M.L. Emily, S.C. Sandy, Tat-heung Choi, and Tsz-ngong Lee. *Insights intoInnovative Classroom Practices with ICT: Identifying the Impetus for Change,Education Technology & Society*.
3. Ann Hatherly, *ICT and the greatest Technology: A Teacher Mind, Early ChildhoodFolio*
4. Mary Hayes, David Whitebread, *ICT in the Early Years*, Open University Press.

Semester-2

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	II
Name of the Course	Operating System
Course Code	SEC-2
Course ID	260/MAT/SEC102
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	SEC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand operating system concepts, processes, and multithreading. 2. Analyze CPU scheduling and manage process synchronization. 3. Explain memory management and apply page replacement techniques. 4. Describe file systems, disk management, and operating system basics.

Credits	**Theory**	**Practical**	**Total**
	2	1	3
Contact Hours	2	2	4
Internal Assessment Marks	15	5	20
End Term Assessment Marks	35	20	55
Examination Time	2 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Operating System Concept, Functions of Operating System, Types of Operating Systems, Process, Process States, Process Control Block, Context Switching, Thread, Multithreading	30
II	CPU Scheduling, Scheduling Criteria, First Come First Served Scheduling, Shortest Job First Scheduling, Round Robin Scheduling, Critical Section, Mutual Exclusion, Semaphore, Producer–Consumer Problem	
III	Memory Management, Logical and Physical Memory, Contiguous Memory Allocation, Fragmentation, Virtual Memory, Demand Paging, Page Fault, FIFO Page Replacement, Least Recently Used Page Replacement	
IV	File System, File Operations, Directory Structure, File Allocation Methods, Disk Scheduling, Overview of UNIX/Linux and Windows	

Practical

The following practicals will be done and their record will be maintained in the practical note book: 1. Study and demonstration of basic operating system concepts, functions, and types with examples. 2. Creation and management of processes, including observation of process states and simulation of context switching. 3. Implementation of threads and multithreading in a sample program and observation of concurrent execution. 4. Simulation and analysis of CPU scheduling algorithms: First Come First Served (FCFS) and Shortest Job First (SJF). 5. Simulation of Round Robin (RR) CPU scheduling with given time quantum. 6. Demonstration of critical section problem and implementation of mutual exclusion using semaphores. 7. Implementation of the Producer–Consumer problem using semaphores. 8. Study of memory management concepts, including logical and physical memory, and contiguous memory allocation. 9. Simulation of fragmentation (internal and external) and calculation of memory utilization. 10. Implementation of page replacement algorithms: FIFO and Least Recently Used (LRU), including page fault calculations. 11. Study and demonstration of file operations: creation, reading, writing, deletion, and exploration of directory structures. 12. Overview and hands-on exercises with disk scheduling algorithms, and practical exploration of UNIX/Linux and Windows OS features.	30

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory 15** • Class Participation /assignment/quiz/class test etc.: 5 • Mid-Term Exam: 10 ➢ **Practicum 5** • Seminar/Demonstration/Viva-voce/Lab records etc.: 5	➢ **Theory 35** • Written Examination ➢ **Practicum 20** • Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. A. Silberschatz, P. Galvin, G. Gagne, *Operating System Concepts Essentials*, 9th Edition, Wiley Asia Student Edition.
2. W. Stallings, *Operating Systems: Internals and Design Principles*, 5th Edition, Prentice Hall of India.
3. C. Crowley, *Operating System: A Design-oriented Approach*, 1st Edition, Irwin Publishing
4. G. J. Nutt, *Operating Systems: A Modern Perspective*, 2nd Edition, Addison-Wesley
5. M. Bach, *Design of the Unix Operating Systems*, 8th Edition, Prentice-Hall of India
6. D. P. Bovet, M. Cesati, *Understanding the Linux Kernel*, 3rd Edition, O'Reilly and Associates

Semester-1

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	I
Name of the Course	Calculus
Course Code	CC-A1
Course ID	260/MAT/CC101
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand and use the fundamental ideas of limits, continuity, differentiability, and higher order derivatives in the analysis of real-valued functions. 2. Examine the behavior of curves through asymptotes, curvature, and radius of curvature in different forms of representation. 3. Identify singularities and geometric features of curves, and apply reduction formulae in the evaluation of standard expressions. 4. Solve problems related to arc length, area, quadrature, and solids of revolution arising in elementary differential calculus.

Credits	**Theory**	**Tutorial**	**Total**
	3	1	4
Contact Hours	3	1	4
Internal Assessment Marks	30		
End Term Assessment Marks	70		
Examination Time	3 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Fundamental concepts of limits and continuity of real-valued functions, standard limit theorems, and classification of discontinuities. Differentiability and its geometric meaning, higher order derivatives, indeterminate forms, and successive differentiation. Leibnitz theorem for nth derivative of a product. Expansion of functions by Taylor's and Maclaurin's theorems with suitable remainder forms and applications to approximation of functions.	60
II	Analytical treatment of asymptotes of algebraic and polar curves, including horizontal, vertical, and oblique asymptotes. Determination of the points where a curve meets its asymptotes. Curvature and radius of curvature, their interpretation and evaluation for curves expressed in Cartesian, parametric, polar, and intrinsic forms. Simple applications connected with bending of curves and geometrical behavior.	
III	Singular points and special features of curves, including multiple points, nodes, cusps, and conjugate points. Criteria for concavity, convexity, and points of inflexion. Tracing of standard curves using symmetry, intercepts, tangents, asymptotic behavior, and region-wise analysis. Reduction formulae for trigonometric, logarithmic, and exponential forms, with applications in simplification and evaluation.	
IV	Rectification of curves and determination of arc length. Intrinsic equation of a curve and its interpretation. Quadrature and computation of area enclosed by curves in Cartesian and polar forms. Volume and surface area of solids generated by the revolution of plane curves about coordinate axes. Applications to standard geometrical figures and related problem solving.	

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory 30**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 20

End Term Examination:

➢ **Theory 70**

- Written Examination

Part C-Learning Resources

Recommended Books:

1. H. Anton, I. Bivens& S. Davis (2021), *Calculus (12th edition)*, J. Wiley & Sons.
2. G. Klambauer (1986), *Aspects of Calculus* (4th edition). Springer.
3. W. Krawcewicz& B. Rai (2003), *Calculus with Maple Labs*. Alpha Science Int'l Ltd.
4. G. Prasad (2016), *Differential Calculus* (19th edition). Pothishala Pvt. Ltd.
5. G. B. Thomas Jr., J. Hass, C. Heil& M. D. Weir (2018), *Thomas' Calculus* (14th edition). Pearson

Education.
6. S. Narayan(2003), *A Textbook of Vector Calculus*. S. Chand Publishing, 2003.
7. M. R. Spiegel & R. Wrede (2002), *Theory and Problems of Advanced Calculus*. Schaum Publishing Co., New York.

Semester-1

Session: 2026-27

Part A – Introduction

Subject	Mathematics
Semester	I
Name of the Course	Discrete Mathematics
Course Code	CC-A2
Course ID	260/MAT/CC102
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC
Pre-requisite for the course (if any)	Mathematics as a subject at 4.0 Level (Class-XII)
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Understand sets, relations, functions, counting, and discrete structures fundamentals. 2. Apply induction, pigeonhole principle, and propositional logic effectively. 3. Solve recurrence relations using characteristic equations and generating functions. 4. Analyze graph properties, paths, connectivity, coloring, and algorithms.

Credits	**Theory**	**Tutorial**	**Total**
	3	1	4
Contact Hours	3	1	4
Internal Assessment Marks	30		
End Term Assessment Marks	70		
Examination Time	3 Hours		

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Introduction to set theory, Venn diagrams, Set operations, Power sets, Algebra of sets, Duality, Counting principles, Finite and infinite sets, Countable and uncountable sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem. Cartesian product, Representation of relations, Types of relation, Binary relation, Equivalence relations, Partitions, Partial ordering relations, POSET, Hasse diagram, Lattices and its types. Functions, Types of functions, Bijective functions, Composition of functions, Inverse functions, recursively defined functions,	60
II	Mathematical Induction, Pigeon Hole Principle and its applications. Introduction to Propositions and compound propositions, Logical operations, Propositions and truth tables, Tautologies, Contradictions, Logical equivalence, Algebra of propositions, Conditional and Bi-conditional statements, The use of Quantifiers.	
III	Recurrence Relation, Linear Recurrence Relations with constant Coefficients, Linear Homogeneous Recurrence Relations with Constant Coefficients, Particular Solution, Homogeneous Linear Difference Equations, Non-Homogeneous Linear Difference Equations, Total Solution, solving recurrence relation using generating functions.	
IV	Introduction to graphs and their properties, Degree, Connectivity, Path, Cycle, Directed and undirected graphs, Subgraph, Bipartite Graphs, Regular Graphs, Connected Graphs, Multigraph and Weighted graph, Homomorphic and Isomorphic graphs, cut points and bridges, Paths and circuits, shortest path algorithm for weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring.	

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory 30**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 5
- Mid-Term Exam: 20

End Term Examination:

➢ **Theory 70**

- Written Examination

Part C-Learning Resources

Recommended Books:

1. K. H. Rosen (2011), *Discrete Mathematics and its Applications*, 6th Edition, Tata McGraw Hill.
2. S. B. Gupta, *A Text Book of Discrete Mathematics and Structures*, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra (2008), *Elements of Discrete Mathematics A Computer Oriented*

Approach, Tata McGraw Hill, 3rd Edition.
4. J.P. Trembley and R. Manohar (2012), *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill – 13th reprint.
5. R. Johnsonbaugh (2011), *Discrete Mathematics*, 6th Edition, Pearson Education Asia.
6. S. Lipschutz and M. Lipson (2010), *Discrete Mathematics*, Tata McGraw Hill, 3rd Edition.
7. B. Kolman, R. C. Busby and S. C. Ross, (2010), *Discrete Mathematical structures*, 6th Edition, PHI