Tamil Nadu Open University

Regulations and Overview for B.Sc., Mathematics with Computer Applications (Non-Semester) in ODL System

[w.e.f Academic Year 2020-2021]

Department of Mathematics

School of Science

Tamil Nadu Open University

Chennai- 600 015

Bachelor of Science in Mathematics with Computer Applications Regulations

1. Programme's Objectives

Bachelor of Science in Mathematics with Computer Applications Programme has been designed to provide in basic knowledge in Mathematics to those students who are not having opportunity to study in regular mode and for drop-out students from rural and urban areas of Tamil Nadu. The main Objective of this Programme is to enable the students to understand the basic knowledge in mathematics and apply the skills through computer and make them relevant to society.

2. Programme Outcomes

- ✓ Science Knowledge: Apply pure and interdisciplinary science knowledge for the solution of various scientific and engineering problems.
- ✓ Problem analysis: Identify, formulate, review research literature, and analyze scientific problems reaching validated conclusions using basic principles of sciences.
- ✓ Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
- ✓ Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern IT tools including prediction and modeling to complex scientific activities with an understanding of the limitations.
- ✓ The science and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.
- ✓ Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the scientific practice.
- ✓ Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- ✓ Communication: Communicate effectively on various activities with the

Science community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- ✓ Science projects and funding: Demonstrate knowledge for writing and managing scientific projects in various disciplines and apply these to its own work, as a member and leader in a team, manage funds for scientific projects from various funding agencies and NGOs.

- ✓ Lifelong learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. Programme Specific Outcomes – B.Sc., Mathematics with Computer Applications

- Demonstrate proficiency in solving problems using logical thinking
- use software to visualize mathematical concepts
- adopt and utilize principles of mathematics and computer techniques to solve real world problem
- Application of knowledge to real-life problems.
- use software to solve mathematical and Statistical problems
- demonstrate understanding of probability, statistical distributions and its applications to sampling theory and statistical tools in-depth at the Allied level
- acquire wide range of knowledge from General Electives chosen from different disciplines

4. Eligibility for admission:

Candidates should have passed the Higher Secondary Examination (10+2 pattern) conducted by the Board of Higher Secondary Education, Government of Tamilnadu or any other examination (10+3 pattern) accepted by Syndicate, as equivalent thereto.

5. Medium: English

6. Duration of the Course:

The course for the degree of Bachelor of Science in Mathematica with Computer Applications shall consist of three years.

7. Admission:

The candidate's admission for the degree of Bachelor of Science in Mathematica with Computer Applications will be taken in both Academic year and Calendar year.

8. Course of Study

The course of study shall comprise instruction in the following subjects according to the syllabus.

I YEAR	1. Language – I (Tamil etc) 2. English – I 3. Core Theory I 4. Core Theory II 5. Core Theory III 6. Major Practical I
II YEAR	7. Language – II 8. English II 9. Core Theory IV 10. Core Theory V 11. Core Theory VI 12.Core Theory VII 13. Major Practical II 14. Environmental studies
III YEAR	15. Core Theory VI 16. Core Theory VII 17. Core Theory VIII 18. Core Theory IX 19. Core Theory X 20 Major Practical III

9. Examinations:

The examination for the B.Sc. Degree programme shall consist of theory and practical papers.

(i) Theory Examinations: The theory examinations shall be of three hours duration to each paper and conducted at the end of each year. The candidates who failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examinations.

(ii) Practical Examinations: The practical examinations shall be of three hours duration to each practical and conducted at the end of each year. The candidates who failing in any practical(s) will be permitted to appear for each failed practical(s) in the subsequent examinations.

10. Scheme of Examinations:

The scheme of examinations of different year shall be as follows:

S. No	Course Code	Course Title	Credits	Marks Distribution		
				CIA*	TEE**	Total
I Year						
1	BFTM -11	Tamil	6	30	70	100
2	BFEG -11	Foundation in English	6	30	70	100
3	BMCA-11	Elements of Calculus	6	30	70	100
4	BMCA-12	Trigonometry, Analytical Geometry (3D) and Vector Calculus	6	30	70	100
5	BMCA-13	Computer Fundamentals and PC Software	4	30	70	100
6	BMCA-P1	Lab-1: Computer Fundamentals and PC Software	2	30	70	100
Total -A (I Year)			**30**	**180**	**420**	**600**
II Year						
7	BFTM-21	Tamil	6	30	70	100
8	BFEG -21	Foundation in English	6	30	70	100
9	BMCA-21	Groups and Rings	6	30	70	100
10	BMCA-22	Classical Algebra and Numerical methods	6	30	70	100
11	BMCA-23	Differential Equations	6	30	70	100
12	BMCA-24	Programming in C and C++	4	30	70	100
13	BMCA-P2	Lab-2: C and C++	2	30	70	100
14	CCE	Environmental Studies	2	30	70	100
Total- B (II year)			**38**	**240**	**560**	**800**

III Year						
15	BMCA-31	Real and Complex Analysis	6	30	70	100
16	BMCA-32	Linear Algebra and Boolean Algebra	6	30	70	100
17	BMCA-33	Optimization Techniques	6	30	70	100
18	BMCA-34	Graph Theory	6	30	70	100
19	BMCA-35	Introduction to Internet Programming (Java)	4	30	70	100
20	BPHYP-03	Lab-3: Internet Programming (Java)	2	30	70	100
Total- C (II Year)			**30**	**180**	**420**	**600**
Total- (A+B+C)			**98**	**600**	**1400**	**2000**

***** *Continuous Internal Assessment (CIA)*

*Term End Examination (TEE)*

11. Question Pattern for Theory Examinations:

Max. Marks: 70 Time: 3 hours

PART - A (5 × 2 = 10 marks)
Answer all FIVE questions in 50 words
[All questions carry equal marks]

1. From Block - I
2. From Block - II
3. From Block - III
4. From Block - IV
5. From Block- V

PART - B (4 × 5 = 20 marks)
Answer any FOUR questions out of Seven questions in 150 words
All questions carry equal marks

6. From Block - I
7. From Block - II
8. From Block - III
9. From Block - IV
10. From Block- V
11. From any Block
12. From any Block

PART - C (4 × 10 = 40 marks)
Answer any FOUR questions out of Seven questions in 400 words
[All questions carry equal marks]

13. From Block - I
14. From Block - II
15. From Block - III
16. From Block - IV
17. From Block - V
18. From any Block
19. From any Block

12. Passing Minimum

For theory examination: The candidate shall be declared to have passed the examination if the candidate secures not less than 25 marks in the Term End Examinations (TEE) in each theory paper and secures not less than 13 marks in the Continuous Internal Assessment (CIA) and overall aggregated marks is 40 marks in both external and internal taken together.

Continuous Internal Assessment (CIA)		Term End Examination (TEE)		Overall Aggregated Marks	Maximum Marks
Minimum Pass Mark	Maximum Pass Mark	Minimum Pass Mark	Maximum Pass Mark	CIA + TEE	

13	30	25	70	40	100

For practical examination: The candidate shall be declared to have passed the examination if the candidate secures not less than 40 marks in 40 marks out of 100 marks in the University examination and the record notebook taken together is required to Pass the examination. There is no passing minimum for record notebook. However submission of record notebook is a must.

13. Classification of Successful Candidates:

Candidates who pass all the courses prescribed and who secure 60% and above in the aggregate of marks in Core courses will be placed in the First Class. Those securing 50% and above but below 60% in the aggregated will be placed in the Second Class. All other successful candidates will be placed in the Third Class.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications - Syllabus – I year (Distance Mode)

COURSE TITLE : ELEMENTS OF CALCULUS

COURSE CODE : BMCA- 11

COURSE CREDIT : 6

COURSE OBJECTIVES

While studying the **ELEMENTS OF CALCULUS**, the Learner shall be able to:

- To understand the concepts of differential calculus in depth
- To analyze the behavior of various curves

COURSE OUTCOMES

After completion of the **ELEMENTS OF CALCULUS**, the Learner will be able to:

- define the basic concepts and principles of differential calculus
- use derivatives to solve a variety of problems
- develop an appreciation of calculus as a coherent body of knowledge

---

Block – I

Differentiation (Review) – Successive differentiation – Liebnitz theorem – Maxima and minima – Partial differentiation – Homogenous functions – Euler's theorem – maxima and minima of two variables.

Block II

Envelopes, curvature of plane curves – involutes and evolutes – Radius of curvature – Polar equations.

Block III

Definite integrals and their properties – reduction formulae – Bernoulli's formula. – Area, Length of arc, volume and surface area of solid of revolution.

Multiple integrals: Double and Triple integrals – applications – change of variables – Jacobians – Beta and Gamma functions.

Block IV

Sequences – Subsequence – Limit of a sequence – convergent and divergent sequences – bounded and monotone sequences – Upper and Lower bounds – Sandwich limit theorem – Cesaro's theorem – Cauchy's first/second theorem on limits – Cauchy sequence – completeness of R.

Block V

Series – convergence and divergence – alternating series – conditional convergence – Tests for convergence – Comparison test – Harmonic series – D'Alembert's Ratio test – Raabe's test – Bertrand & D'morgan's test – Gauss test – Root test – Series of positive and negative terms – Dirichlet's test – Abel's test.

Reference Books

1. S. Narayanan and T.K. Manicavasagam Pillai, Calculus Vol I and II, S. Viswanathan Pvt Ltd, 2004.
2. P. Kandasamy and K. Thilagavathi, Mathematics for B.Sc., Volume II, S. Chand & Co, New Delhi, 2004.
3. S. Arumugam and A.T. Isaac, Sequence and Series, New Gamma Publishing House, 1994.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications - Syllabus – I year (Distance Mode)

COURSE TITLE : **Trigonometry, Analytical Geometry (3D) and Vector Calculus.**

COURSE CODE : **BMCA- 12**

COURSE CREDIT : **6**

COURSE OBJECTIVES

While studying the **Trigonometry, Analytical Geometry (3D) and Vector Calculus.** , the Learner shall be able to:

- To impart knowledge of solving trigonometric equations
- To gain understanding of the different expansions of circular functions and relation between circular and hyperbolic functions and to identify diagonalizable matrices
- To introduce the concept of three dimensional geometry
- To familiarize the concept of magnitude and direction of a quantity
- To introduce the concepts and applications of line, surface and volume integral

---

COURSE OUTCOMES

After completion of the **Trigonometry, Analytical Geometry (3D) and Vector Calculus.** , the Learner will be able to:

- exhibit competence in calculating Eigen values and Eigen vectors, and thereby diagonalizing square matrices

- demonstrate comprehension involving expansions and expressions of circular and hyperbolic functions
- be familiar to planes, straight lines, sphere and cone in three dimensional co-ordinate geometry
- demonstrate knowledge of geometry and its applications in the real world
- understand the concepts of divergence, curl, and the Laplacian along with their physical and geometrical interpretations
- develop the ideas of line, surface and volume integrals and its calculations in rectangular, cylindrical and spherical coordinate systems
- investigate the relation between the line, surface and volume integrals

---

Block I

Expansions of sin θ, cos θ, tan θ in terms of θ - expansions of sin nθ, cos nθ, tan nθ - expansion of $\sin^n \theta$, $\cos^n \theta$; Hyperbolic and inverse hyperbolic functions – logarithm of a complex number – general value and principal value.

Summation of series : sum of sines (cosines) of n angles in A.P.– summations using telescopic method and the C + i S method.

Block II

Plane equations – angle between two planes – Length of the perpendicular – Bisecting plane – Distance between two planes.

The straight line – symmetrical form – Image of a line about a plane.

The plane and the straight line – Angle between a plane and a straight line – coplanar lines – shortest distance between two lines.

Block III

The sphere – equation of the sphere – length of the tangent – plane section of a sphere – Equation of a circle on a sphere-Intersection of two spheres – Equation of the tangent plane.

Volume of a tetrahedron – cylinder – right circular cylinder – cone – Cone with a given vertex point – Right circular cone.

Block IV

Introduction of vectors – dot product and cross product of vectors, product of three and four vectors.

Differentiation and Integration of vector functions.

Differential operators, gradient, divergence and curl Orthogonal Curvilinear coordinates, cylindrical and spherical coordinates.

Block V

Line, Surface and volume integrals. Verification of theorem (without proof): Green's theorem, Gauss divergence theorem and Stoke's theorem.

Reference Books

1. S. Narayanan and T.K. Manickavasagam Pillai, Trignometry, S. Vishvanathan Publishers, 2004.
2. S.L. Loney, Plane Trigonometry, A.I.T.B.S Publishers. Delhi, 2007.
3. T.K. Manickavasagam Pillai and T. Natarajan, Analytical Geometry (3d), S. Viswanathan Publishers, 1998.
4. M.D. Raisinghamia, Vector Calculus, S.Chand Company, 1998.
5. Arumugam and Issac, Analytical Geometry (3d) and Vector Calculus.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications - Syllabus – II year – III Semester (Distance Mode)

COURSE TITLE	**:**	**COMPUTER FUNDAMENTALS AND PC SOFTWARE**
COURSE CODE	**:**	**BMCA- 13**
COURSE CREDIT	**:**	**4**

COURSE OBJECTIVES

While studying the **COMPUTER FUNDAMENTALS AND PC SOFTWARE**, the Learner shall be able to:

- To understand the fundamentals of computer in scientific computing
- To enhance the abilities of students to solve problems with the aid of computer
- To enrich the abilities of students to use PC software.

COURSE OUTCOMES

After completion of the **COMPUTER FUNDAMENTALS AND PC SOFTWARE**, the Learner will be able to:

- understand the basic principles of computers and PC software
- acquire knowledge of developing content using MS word and Power point
- efficiently use the techniques, skills, and computational skills to solve real time numerical problems

---

BLOCK – I

Computer Fundamentals: Hardware & Software: Introduction – Structure of a

Computer – IC Technology – Classifications – Applications. Peripheral devices and Technologies: Memory – Types of memories – Input devices – Output devices – I/O interfaces – Parallel Processing – Pipelining – Vector processing – RISC system. Software Concepts and Terminology: Types of Software – System software and Applications software – Computer languages: Machine – Assembly – High Level – 4GL – Fundamentals of Programming languages. Operating System Concepts: Definition Evolution of Operating System – Types of Operating Systems: Batch – Multiprogramming – Network – Distributed Operating System.

BLOCK II

Data communication: Fundamentals – Data Communication codes – Speed of communication – Channels – Types of Transmission: Analog – Digital – Parallel and Serial Transmission – Data Communication Modes: Synchronous and Asynchronous – Modes of communications: Simplex-Half-Duplex-Full Duplex – Elements of Communication Hardware: Sender / Receiver Hardware – Devices – Channels. Computer Networks and Recent Trends: Network concepts – Types of networks – LAN – WAN – Applications of Networks: E-mail – EDI – Trends: Internet – BITNET – ISDN – NICNET – CompuServe. Computer Security: Definition – Breaches of Security – Measures: Physical – Software – Network – Password – Role of Cryptography – Crypt analysis – Computer Virus: Definition – Classification – Protection and Cure.

BLOCK III

Graphical User Interface – Concepts – MS-Windows – Elements of Windows-Working with windows – Working with dialog Box – Managing System in Windows: System settings – Backup – Disk Drive Utilities – Add/Remove applications – Windows for Multi User – Windows Explorer: Working with Files - Working with Folders – Recycle Bin – Program and Accessories – Running User programs – Use – Writing and Drawing. Communication through network: E-mal – Internet – Multimedia: Types of media – Tools.

BLOCK IV

PC Software: MS-Word – Getting Started – Working with Text – Common Features – Find and Replace – Editing – Proofing tools. Text Formatting: Character – paragraph – templates. Page Formatting: Page Setup – Margins – Header – Footer – Numbering. Working with Tables – Mail Merge – Macros – Printing a document – protecting a document.

BLOCK V

PowerPoint: Basic concepts – Presentation – Working with tools.

Reference Books

1. Mano M.Morris, Computer System Architecture and Organisation, McGraw Hill, 1983.
2. William Stalling, Data and Computer Communication, Seventh edition, Prentice Hall of India, 2003.
3. Levin and Young, The complete reference windows 98.
4. Laura Acklain et.al., Microsoft Office 97 professional essentials.

BMCA-P1 Lab-1: Computer Fundamentals and PC Software.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications- Syllabus – II year(Distance Mode)

COURSE TITLE : GROUPS AND RINGS

COURSE CODE : BMCA- 21

COURSE CREDIT : 6

COURSE OBJECTIVES

While studying the **GROUPS AND RINGS**, the Learner shall be able to:

- To understand the concept of Relation and functions, Law of Trichotomy, groupoid and Lagrange's Theorem.
- To understand the Ring theory and domain.

COURSE OUTCOMES

After completion of the **GROUPS AND RINGS**, the Learner will be able to:

- have in-depth knowledge on relation and function
- understand the concept of groupoid
- understand the concepts of Ring theory

BLOCK- I

Relations – Types of relations – Functions – Types of Functions, Binary Operations – Peano's Postulates – Principles of Induction – Law of Trichotomy.

BLOCK - III

Groupoid – Semi group – Monoid – Group Theory – Definition – examples – elementary results –equivalent definitions of group – symmetric group – sub group – examples – center – Normalizer - cyclic group.

BLOCK - III

Cosets – Lagrange's Theorem – normal sub groups – quotient groups – finite groups and Cayley Tables – homomorphism and isomorphism of groups – Cayley's Theorem – automorphisms – Fundamental theorem of homomorphism.

BLOCK – IV

Ring Theory: Definition – examples – elementary results – field – integral domain – characteristics – subring – ideals – quotient rings – maximal and prime ideals – homomorphism and isomorphism of rings.

BLOCK - V

Field of quotients of an integral domain, ordered integral domain, Unique factorization domain – Euclidean domain – Principal Ideal Domain and Unique Factorization Domain – Notherian and Artinian Rings.

Reference Books :

1. M. Murugan, A First course in Groups and Rings, Muthali Publishing House, Chennai, 2017.
2. S.Arumugam and A.Issac, Modern algebra, SCITECH Publications (India) Pvt. Ltd., Chennai, 2005.
3. Surjeet Singh and Quazi Zameeruddin, Modern algebra, Vikas Publishing House Pvt Ltd, 1998.

****

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications - Syllabus – II year – III Semester (Distance Mode)

COURSE TITLE	**:**	**Classical Algebra and Numerical methods**
COURSE CODE	**:**	**BMCA- 21**
COURSE CREDIT	**:**	**6**

COURSE OBJECTIVES

While studying the **Classical Algebra and Numerical methods**, the Learner shall be able to:

- To understand the fundamentals of classical Algebra and Numerical Methods.
- To enhance the abilities of students to solve Numerical problems with the aid of computer

---

COURSE OUTCOMES

After completion of the **Classical Algebra and Numerical methods**, the Learner will be able to:

- have a basic knowledge about the Classical algebra
- face competitive examinations
- understand major subjects.
- study bionomial and logarithmic series and its applications
- understand the relation between roots and coefficients
- find the roots of algebraic and transcendental equations using various methods

- solve simultaneous equations
- interpolate the function using difference tables
- evaluate derivatives and integration using numerical methods
- find solutions for differential equations

Block I

Binomial Exponential and logarithmic series – Application to summation of series and approximations.

Inequalities – AM ≥ GM ≥ HM and applications – Cauchy Schwartz in equality.

Block II

Theory of equations – imaginary roots rational roots – Relation between the roots and coefficients of equations – symmetric function of the roots – sum of the power of the roots of an equation – Newton's Theorem.

Transformation of equations – Roots multiplied by a given number – reciprocal roots – reciprocal equations – standard forms to increase and decrease the roots of a given equation by a given quantity – Removal of terms.

Descarte's rule of signs – Roll's theorem – Multiple roots – Strun's Theorem –General Solutions of the cubic equation – Cardon's method.

Block III

Solutions of algebraic equations – bisection, Iteration method – Newton – Raphson method – Method of False Position.

Solutions of simultaneous linear equations – Gauss's method – Gauss Jordan method – Iteration method – Gauss's Seidal method.

Block IV

Interpolation – Newton's forward and backward formula – divided differences and their properties – Newton's divided difference formula – Gauss formula – Stirling's formula – Bessels's formula – Laplace – Everett formula – Lagrange's formula – simple problems – inverse interpolation using Lagrange's formula – successive approximations – simple problems.

Finite Differences Forward, Backward differences – Operators – Relations – Properties – finding missing Terms – Inverse Operators – Factorial Notation.

Block V

Differentiation - First order and second order derivatives.

Integration – Trapezoidal – Simpson's 1/3 and 3/8 rules –Solution of ordinary differential equations – Taylor method – Euler method- Runge Kutta method.

Reference Books

1. S.S. Sastry, Introduction to methods of Numerical analysis, Prentice Hall of India, 1994.
2. T.K. Manicavasagam Pillai, T. Natarajan and K.S. Ganapathy, Algebra, S. Viswanathan Pvt Ltd, 2004.
3. P. Kandasamy, K. Thilagavathy and K. Gunavathy, Numerical Methods, S. Chand & Co, New Delhi, 2006.
4. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computations, New Age International Publishers, New Delhi, 2010.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications- Syllabus– II year (Distance Mode)

COURSE TITLE : DIFFERENTIAL EQUATIONS

COURSE CODE : BMCA- 23

COURSE CREDIT : 6

COURSE OBJECTIVES

While studying the **DIFFERENTIAL EQUATIONS**, the Learner shall be able to:

- To evaluate integration of irrational functions and improper integrals
- To understand the concepts of double and triple integration

---

COURSE OUTCOMES

After completion of the **DIFFERENTIAL EQUATIONS**, the Learner will be able to:

- understand the concepts of double and triple integration
- use Beta-Gamma functions as a tool to evaluate integrals
- use numerical integration for approximating the integrals that are difficult or impossible to integrate analytically

---

Block I

Differential equation of first order – formation – variable separable – Homogeneous – Linear – Bernouille – Equations solvable for x,y,p – Clairaut's form – Exact equation of first order.

Block II

Differential equation of second order – Differential equation with constant coefficients – various types of particular integral – Linear Differential equation with variable coefficients – equations reducible to linear homogeneous equations – variation of parameters.

Block III

Simultaneous differential equation of the form $dx/P = dy/Q = dz/R$ – Exactness, n^{th} order exact differential equation – Condition of exactness for a n^{th} order linear equation.

Block IV

Partial differential equations of the first order – classification of integrals – derivations of Partial differential equation – Lagrange's method of solving – Charpit's method - the linear equations – standard forms – Equations reducible to the standard forms.

Block V

Laplace Transform – Laplace Transforms of Periodic functions – Evaluation of integrals. Inverse Laplace transforms – Solving ordinary differential equation with constant coefficients and variable coefficient and simultaneous linear equations using Laplace Transform.

Reference Books

1. S. Narayanan and T.K. Manickavasagam Pillai, Differential Equations & its Applications, S. Viswanathan Publishers Pvt Ltd, 2003.
2. P. Kandasamy and K. Thilagavathi, Mathematics for B.Sc., Volume III, S. Chand & Co, New Delhi, 2004.
3. S.Arumugam and A.Issac, Differential Equations with Applications, New Gamma Publishing House, 2002.
4. S.Narayanan & T.K.Manicavasagam pillai, Calculus Vol- III, S.Viswanathan

Pvt Ltd, 1991.

****

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications-Syllabus – II year (Distance Mode)

COURSE TITLE : PROGRAMMING IN C

COURSE CODE : BMCA- 24

COURSE CREDIT : 4

COURSE OBJECTIVES

While studying the **PROGRAMMING IN C**, the Learner shall be able to:

- To expose the standard numerical techniques as a powerful tool in scientific computing
- To enhance the abilities of students to solve problems with the aid of computer

---

COURSE OUTCOMES

After completion of the **PROGRAMMING IN C**, the Learner will be able to:

- understand the basic principles of scientific and engineering programming
- acquire knowledge of developing algorithms for matrix algebra, numerical solution of ordinary differential equations and for finding roots of non-linear equations
- efficiently use the techniques, skills, and computational skills to solve real time numerical problems

---

BLOCK – I

Constants – Variables – Data types – Operators – Expressions – Library functions – Standard Input/output functions.

BLOCK - II

While, do-while, for, if-else, switch and go to statements – break and continue statements.

BLOCK- III

Defining a function – accessing a function – passing arguments to a function – Recursion - Automatic, External and Static variables.

BLOCK – IV

Defining and processing an array – passing arrays to a function – multi dimensional arrays. Pointer declarations – passing pointers to a function – pointers and arrays – operations on pointers – arrays of pointers – passing functions to other functions.

BLOCK - V

Defining a structure – Processing a structure – user–defined data type – Structure and pointers – passing structures to a function – self-referential structures – Unions – Data Files.

REFERENCE BOOKS :

1. Gottfried, B.S., Schaum's Outline of Theory and Problems of Programming in C,

Second Edition, Tata Mc-Graw Hill Pub. Co., New Delhi (2000).

2. Kernighan, B.W. and Ritchie, D.M., The C Programming Language, Prentice-Hall of

India Private Ltd., New Delhi, (1998).

3. Johnsonbaugh, R. and Kalin, M. Applications Programming in ANSI C, Third Edition, Pearson Education Asia, Delhi (2002).

4.Balagurusamy, E. Programming in ANSI C, Third Edition, Tata Mc-Graw Hill Pub. Co., New Delhi (2004).

BMCA-P2: Lab-2: C and C++

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc.,Mathematics with ComputerApplications-Syllabus – III year (Distance Mode)

COURSE TITLE	**:**	**Real and Complex Analysis**
COURSE CODE	**:**	**BMCA- 31**
COURSE CREDIT	**:**	**6**

COURSE OBJECTIVES

While studying the **Real and Complex Analysis** , the Learner shall be able to:

- To understand the concept of sets and elements, Definition of a sequence and subsequence.
- To understand the Convergence and divergence.
- To provide an adequate foundation for further self-study To introduce the analysis of complex numbers
- To expose a fertile area of pure mathematics as a source of powerful technique that are widely applied in sciences and advanced Engineering mathematics

COURSE OUTCOMES

After completion of the **Real and Complex Analysis**, the Learner will be able to:

- have in-depth knowledge on real number system
- understand the concept of continuity
- understand the concepts of differentiability
- demonstrate understanding of the basic concepts in complex analysis
- understand the importance of analytic functions in applications to the field of sciences and advanced Engineering
- apply conformal mapping in solving boundary value problems
- apply the methods of complex analysis to evaluate definite integrals and infinite series

---

Real Analysis

Block I

Countable sets – Uncountable sets – Inequalities of Holder and Minkowski.

Metric Spaces: Definitions and examples – Bounded sets in a metric space – Open ball in a metric space – Open sets – Subspaces – Interior of a set – Closed sets – Closure – Limit point – Dense sets.

Complete Metric Spaces: Completeness – Baire's Category theorem.

Block II

Continuity: Continuity – Homeomorphism – Uniform continuity –Discontinuous functions on R.

Connectedness: Definition and examples – Connected subsets of R – Connectedness and continuity.

Compactness: Compact space – Compact subsets of R – Equivalent characterization for compactness – Compactness and continuity.

Block III

Differentiability of a function – Differentiability and continuity, Chain rule, Rolle's theorem and Mean value theorems.

Definition, existence and properties of Riemann integral – First and second fundamental theorem of Calculus – Mean value theorem of Integral calculus, Taylor's series – Taylor's theorem.

Complex Analysis

Block IV

Analytic function – Cauchy Riemann equations.

Conformal mapping – bilinear transformations.

Block V

Complex integration – Cauchy's integral theorems – Cauchy's integral formula – Cauchy's inequalities – Morera's theorem – Liouville's theorem – maximum modulus theorem. Taylor's and Laurent's Theorem – Singularities – Rouche's theorem. Cauchy's residue theorem – Contour integration.

Reference Books

1. S. Arumugam and A. Thangapandi Isaac, Morden Analysis, New Gamma Publishing House, Palayamkottai, 2002.
2. R.Golberg, Methods of Real Analysis, Oxford and IBH Publishing Co, New Delhi, 2000.
3. E. T. Copson, An Introduction to the Theory of functions of a Complex Variable, Oxford University Press, 1994.
4. S. Narayanan and T. K. Manickavasagam Pillai, Complex Analysis, S. Viswanathan Pvt Ltd, 1996.
5. S. Arumugam and A. Thangapandi Isaac, Complex Analysis, New Gamma Publishing House, 1996.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications- Syllabus–III year(Distance Mode)

COURSE TITLE : LINEAR ALGEBRA AND BOOLEAN ALGEBRA

COURSE CODE : BMCA- 32

COURSE CREDIT : 6

COURSE OBJECTIVES

While studying the **LINEAR ALGEBRA AND BOOLEAN ALGEBRA**, the Learner shall be able to:

- To understand the fundamentals of Vector space and basis and dimension of vector base.
- To determine the eigen values and eigen vectors
- To understand the concept of Algebra of linear transformations and matrics.

COURSE OUTCOMES

After completion of the **LINEAR ALGEBRA AND BOOLEAN ALGEBRA**, the Learner will be able to:

- know the fundamentals of vector space
- understand basis and dimension of a vector space
- determine eigen values and eigen vectors
- learn posets, lattices and Boolean algebra
- get interest in pure mathematics

Linear Algebra

Block I

Vector Spaces: Definition and examples – Elementary results – Subspaces – Linear transformation – fundamental theorem of homomorphism.

Block II

Span of a set – Linear independence – Basis and dimension – maximal linear independent set – minimal generating set – equivalent conditions for a basis – Rank and nullity – Matrix of a linear transformation.

Block III

Inner product spaces: Definition and examples – Orthogonality – Gram –Schmidt orthogonalisation process – Orthogonal complement – Dimention of a inner product spaces in terms of subspaces.

Block IV

Bilinear forms: Definition and examples – Quadratic forms – Reduction of a quadratic form to the diagonal form by Lagrange.

Boolean Algebra

Block V

Partial order relation – Posets – Lattices – Equivalent Definition of a Lattice – Distributive and Modular lattices – Boolean Algebra and Boolean Rings – Boolean functions – Switching.

Reference Books

1. S. Arumugam and A.T. Isaac, Modern Algebra, SCITECH, 2005.
2. J.N. Sharma and A.R. Vashishtha, Linear Algebra, Krishna Prakasha Mandir, 1981.
3. Boolean Algebra & Lattices, Schaum's Series, Lipschiutz, 1996.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications- Syllabus–III year(Distance Mode)

COURSE TITLE : OPTIMIZATION TECHNIQUES

COURSE CODE : BMCA- 33

COURSE CREDIT : 6

COURSE OBJECTIVES

While studying the **OPTIMIZATION TECHNIQUES**, the Learner shall be able to:

- To formulate linear programming problem for simple mathematical models
- To develop mathematical skills to analyse and solve linear programming and network models arising from a wide range of applications

---

COURSE OUTCOMES

After completion of the **OPTIMIZATION TECHNIQUES**, the Learner will be able to:

- develop a general understanding of the Operations Research methodology to decision making
- identify best techniques to solve a specific problem in linear model of OR
- gain knowledge to apply CPM and PERT techniques, to plan, schedule, and control project activities.

Block I

Introduction to Linear Programming and Operations Research – Simplex method – Standard Maximization case – Minimization problem – Artificial variables – Big – M method – Two phase method – Degeneracy – cycling in LPP – Application of simplex method.

Concept of duality – Duality theorems – Duality and simplex methods – Dual simplex method – Integer programming – Culty plane method – (Gomarian

constraint).

Block II

Assignment model – Formulation of assignment problem – Hungarian method – Knoig's theorem – Minimization type – Unbalanced type – Routing problem – Traveling salesman problem.

Transportation Problem – Introduction and mathematical formulation of TP – Initial basic feasible solution – Row minima method – Column minima method – Northwest corner method – Least cost method – Vogal's approximation method – Unbalanced transportation table.

Block III

Game theory: Two person zero sum games – The maximum and minimum values – saddle point – Games with out saddle point – Mixed strategies – Solutions of 2X2games – Graphical method – Method of dominance principles – LP method.

Block IV

Inventory control – various costs – EOQ – with or without shortages – multi item Inventory model with constraints – price break in inventory.

Block V

Queuing theory – elements of queue – Poisson arrival and exponential service – Multiple servers – finite population and finite capacity.

Reference Books

1. Kanti swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand and Sons, 2016.
2. Ravindran A, Philips D.T. and Solberg J.J, Operation Research, John Wiley and Sons.
3. P.K. Gupta and D.S. Hira, Operations Research, S. Chand and company.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications- Syllabus–III year(Distance Mode)

COURSE TITLE : Graph Theory

COURSE CODE : BMCA- 34

COURSE CREDIT : 6

COURSE OBJECTIVES

While studying the **Graph Theory**, the Learner shall be able to:

- To introduce basic concepts of graph theory
- To develop theoretical aspects of graph theory
- To apply graph theory based tools in solving practical problems

---

COURSE OUTCOMES

After completion of the **Graph Theory**, the Learner will be able to:

- understand fundamental definitions of graph theory
- have learnt a clear perspective of solving real life problems using graph theory
- analyze one way communication problems in networking
- use a combination of theoretical knowledge and independent mathematical thinking for creative research in graph theory

---

Block I

Basic Concepts: Introduction – Graph models – Vertex degrees – Isomorphism – Subgraphs – The pigeonhole principle and Turan's theorem.

Connectedness: Connected and disconnected graphs – Center – Adjacency Matrix and Incidence Matrix – Operations on graphs.

Block II

Bipartite Graphs: Definitions and examples – Characterisation of Bipartite graphs – Trees.

Connectivity: Cut edges and Cut vertices.

Graphic Sequences: Degree sequences – Graphic sequences – Algorithm.

Block III

Eulerian and Hamiltonian Graphs: Eulerian graphs – Hamiltonian graphs – Closure and Hamiltonian.

Independent sets and Covering: Independence and covering – Edge independence and Edge covering.

Block IV

Colorings: Edge Colourings – Vertex Colourings – Chromatic polynomials.

Planar Graphs: Definitions and Basic Concepts – Euler's formula – Maximal planar graphs – Colourings in Planar Graphs – Face colouring.

Block V

Directed Graphs: Definitions and Basic Concepts – Connectedness in Directed Graphs – Tournaments.

Reference Books

1. M. Murugan, Introduction to Graph Theory, Muthali Publishing House, 2005. S.A. Choudum, A first Course in Graph Theory, McMillan India Ltd, 1987.
2. S. Arumugam and S. Ramachandran, Invitation to Graph Theory, Scitech, Chennai, 2001.

Tamil Nadu Open University
Department of Mathematics
School of Science,
Chennai – 15

B.Sc., Mathematics with Computer Applications- Syllabus–III year(Distance Mode)

COURSE TITLE	**:**	**Introduction to Internet Programming (Java)**
COURSE CODE	**:**	**BMCA- 34**
COURSE CREDIT	**:**	**4**

COURSE OBJECTIVES

While studying the **Introduction to Internet Programming (Java)**, the Learner shall be able to:

- To learn the basic concepts of object oriented programming and classes with constructors
- To understand and demonstrate the concepts of inheritance and interfaces
- To provide an understanding of concepts such as packages, exception handling
- To introduce the concepts of multithreading and generics
- To give insight about java library

COURSE OUTCOMES

After completion of the **Introduction to Internet Programming (Java)**, the Learner will be able to:

- Understand the concepts of object-oriented programming
- Use Java programming language at a basic level and construct simple software applications

- Understand classes, objects and implementing inheritance
- Analyze and understand the functionality of Inheritance, Interface and develop simple applications
- To develop software applications and services using Java code

---

Block I

Fundamentals of Java Programming: Internet Programming: Introduction – Fundamentals of Java – Applets and Applications – Features of JAVA – JVM – Java API – Java libraries – Structure of a Java program – Java variables – Constants – Java data types – Operators – Keywords – Type Casting.

Block II

Java Programming Constructs: Statements: if – if else if – for – while – do while – switch case – break – continue – go to – Simple Java programs. Arrays: one dimensional – multidimensional – Initialisation of arrays – Simple programs. Classes – Objects – Constructor: default – parameterized – copy

Block III

Subclassing and Exception Handling: Subclassing – abstract class – extends keyword – instanceof operator – final keyword –static variables and methods – Access specifier – Wrapper classes – Inner classes – Simple programs – Exception Handling: Exception classes – try and catch – multiple exceptions – built-in exceptions – using finally – throw – catching exceptions – user defined exceptions.

Block IV

Packages and Interfaces: Packages – creation – Adding classes to existing package – Interfaces – creation and implementation – features – Object Oriented Programming in Java.

Block V

Applet Programming: Applet creation – execution – GUI creation – Designing

layouts – Multithreading – Simple Programs.

Reference Books

1. Herbert Schildt, Java 2, Fifth Edition, Tata McGraw Hill, 2004.
2. Y.Daniel Lang, An Introduction to Java Programming, Prentice Hall of India, 2003.
3. E.Balagurusamy, Java Programming, Second edition, Tata McGraw Hill, 1998.

BMCA-P3 Lab-3: Internet Programming (Java).