



माँ शाकुम्भरी विश्वविद्यालय, सहारनपुर  
Maa Shakumbhari University, Saharanpur

Syllabus  
B.Sc. Computer Science

For

**Affiliated Colleges**  
Maa Shakumbhari University, Saharanpur

From the Session 2023-24

(Prof. Karamjit Bhatia)

(Prof. Mahesh Kumar)

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(Dr. Jay Prakash)

(Prof. Praveen Kumar)

**Syllabus B.Sc. (Computer Science)**  
**(Effective from 2023 -24)**

<b>Paper Code</b>	<b>Paper Name</b>	<b>Theory/ Practical/ Project</b>	<b>Credit</b>	<b>Int. Exam. Marks</b>	<b>Extern. Exam Marks (Min Marks)</b>	<b>Total Marks</b>	<b>Min Marks (INT+EXT)</b>
<b>SEMESTER- 1</b>							
<b>0127101</b>	Professional English Language & Communication	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0127102</b>	Applied Mathematics	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0127103</b>	Basic Electronics	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0127104</b>	Computer Programming	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0127180</b>	Basic Electronics Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0127181</b>	Computer Programming Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0120008</b>	Environmental Studies	Theory	2(Qualify)	-		<b>100</b>	<b>33</b>
<b>SEMESTER -2</b>							
<b>0227101</b>	Computer Graphics	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0227102</b>	Data Structures Using C	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0227103</b>	Discrete Mathematics	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0227104</b>	Operating System	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0227180</b>	Computer Graphics Using C Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0227181</b>	Data Structure Using C Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>SEMESTER-3</b>							
<b>0327101</b>	Digital System & Architecture	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0327102</b>	Web Designing	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0327103</b>	Object Oriented Programming with C++	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0327104</b>	Cyber Security	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0327180</b>	Digital System & Architecture Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0327181</b>	Web Designing Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0327182</b>	Object Oriented Programming with C++ Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>

<b>SEMESTER-4</b>							
<b>0427101</b>	Computer Network	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0427102</b>	Computer Based Numerical and Statistical Techniques	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0427103</b>	Python Programming	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0427104</b>	Database Management System	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0427180</b>	Python Programming Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0427181</b>	Database Management System Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>SEMESTER-5</b>							
<b>0527101</b>	JAVA Programming	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0527102</b>	Statistics for Data Science	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0527103</b>	Software Engineering	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0527104</b>	Design and Analysis of Algorithms	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0527180</b>	JAVA Programming Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0527181</b>	Algorithms Lab	Practical	2	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>SEMESTER-6</b>							
<b>0627101</b>	Artificial Intelligence	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0627102</b>	Operations Research	Theory	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
	<b>Choose Any one from elective 0627103/04/05</b>						
<b>0627103</b>	VB.NET	Elective	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0627104</b>	Data Mining	Elective	4	<b>25</b>	<b>75 (25)</b>	<b>100</b>	<b>40</b>
<b>0627106</b>	Major Project	Practical	12			<b>100</b>	<b>40</b>

### **Examination Pattern**

#### **Internal Examination:**

1. One written test of 25 Marks. (10 Marks 1st Internal + 10 Marks 2nd Internal) (Very Short + Short + Long Questions).
2. Five Marks for Attendance/ Class Performance.

**External Examination:** Written Exam of 75 marks 3 Hrs Duration.

**External Exam Pattern:**

Unit I: Attempt all five questions. Each question carries 3 marks.

Unit II: Attempt Any Two out of three. Each Question carry 7.5 marks each.

Unit III: Attempt Any Three out of Five. Each Question carry 15 marks each.

*Detailed Syllabus*  
*For*  
*B.Sc. (Computer Science)*

**Program Outcomes: -**

**PO1:** Learn how to organize information efficiently in the forms of outlines, charts, etc. by using appropriate software. Develop the skills to present ideas effectively and efficiently.

**PO2:** Do Academic and Professional Presentations - Designing and delivering an effective presentation and developing the various IT skills to the electronic databases.

**PO3:** Use the Systems Analysis Design paradigm to critically analyze a problem. Solve the problems (programming networking database and Web design) in the Information Technology environment. Function effectively on teams to accomplish a common goal and demonstrate professional behavior.

**PO4:** Develop IT-oriented security issues and protocols. Design and implement a web page. Improve communication and business management skills, especially in providing technical support. Serve as the System Administrators with thorough knowledge of DBMS.

**PROGRAM SPECIFIC OUTCOMES (PSO)**

**PSO1:** Apply standard software engineering process and strategies in software project development using open-source programming environment to deliver a quality product for business success.

**PSO2:** Acquaintance with latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

**PSO3:** Conceptual grounding in computer usage as well as its practical business applications.

**PSO4:** To demonstrate advanced skills in the effective analysis design and realization of business system utilizing contemporary information technology.

# **BSc-I: SEM-1**

## **B.Sc. COURSE IN COMPUTER SCIENCE SYLLABUS**

**SUBCODE: 0127101**

**Core: I -Year & First Semester**

**Credit: 4**

### **Title of the Course/ Paper: Professional English Language and Communication.**

**Course Objectives:** Educate students in both the artistry and utility of the English language through the study of literature and other contemporary forms of culture. Develop their intellectual, personal and professional abilities.

#### **Unit-1 Introduction to Technical Communication**

Nature of Technical Communication Origin and Scope, Feature and General Writing Significance, Style Objective, Style Features as Compared to Literacy Composition, Reports Type, Significance, Structure and Formats of Report, Writing Report, Project, Thesis, Dissertation

#### **Unit-2 Resume and Job Application**

Bio-Data Making, Resumes Making and Job Applications

#### **Unit-3 Business Letters**

Sales and Credit Letters, Letters of Enquiry, Quotation, Order, Claims, Complaint and Adjustment.

#### **Unit -4 Listening**

Listing Process, Hearing and Listening, listening with Purpose, Barriers to listening, listing Comprehension, Effective listening Strategies, Comprehension of Speech, Reproduction of Response, Technical of Taking Notes

#### **Unit-5 Technical Papers and Proposals**

Technical Paper and Scientific Article Writing Elements, Methods and Technical Objectives Technical Proposals Nature, Kinds and writing Tips

#### **Referential Books:**

Malti Agarwal

Professional Communication, Krishana Publication, Meerut

**SUBCODE: 0127102**

**Core: Year-I & Semester-I**

**Credit: 4**

**Title of the Course/ Paper: Applied Mathematics**

**Course Objectives:** Upon completion of degree requirements, graduates from the Applied Mathematics program will be able to demonstrate skills and proficiencies that are highly appealing to employers across industries.

- Problem-Solving and Analytical Thinking.
- Communicating Mathematics.
- Transitioning from Theory to Practice.

**UNIT-I DETERMINANTS:**

Definition, Minors, Cofactors, Properties of Determinants MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof).

**UNIT-II LIMITS & CONTINUITY:** Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

**UNIT-III DIFFERENTIATION:** Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Curve Tracing, Successive Differentiation & Liebnitz Theorem.

**UNIT-IV INTEGRATION:** Integral as Limit of Sum, Fundamental Theorem of Calculus (without proof.), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions(definition). Double Integral in Cartesian and Polar Coordinates to find Area, Change of Order of Integration, Triple Integral to Find Volume of Simple Shapes in Cartesian Coordinates.

**UNIT-V: VECTOR ALGEBRA & 3D COORDINATE GEOMETRY**

3D Coordinate Geometry: Coordinates in Space, Direction Cosines, Angle Between Two Lines, Projection of Join of Two Points on a Plane, Equations of Plane, Straight Lines, Conditions for a line to lie on a plane, Conditions for Two Lines to be Coplanar, Shortest Distance Between Two Lines, Equations of Sphere, Tangent plane at a point on the sphere. Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and physical interpretation of area and volume.

**Referential Books:**

- S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998.
- Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999
- H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001.
- Shanti Narayan, "Differential Calculus", S.Chand & Company, 1998.
- Kolman, Busby and Ross, "Discrete Mathematical Structure", PHI, 1996.
- S.K.Sarkar, "Discrete Maths"; S. Chand & Co., 2000



**SUBCODE: 0127103**

**Core: Year-I & Semester-I**

**Credit: 4**

**Title of the Course/ Paper: Basic Electronics**

**Course Objectives:** Understand the basic terminology/definitions of electrical and electronics engineering. Apply the knowledge of theorems/laws to analyze the simple circuits. Use the principles of electromagnetic induction in electrical applications.

**UNIT 1: COMPONENTS**

**Introduction to Components**– Passive and active components – Resistors, standardization, color coding techniques, types of resistors –Capacitors, types of capacitors – Inductors, types of inductors, features and specification, transformers, types of transformers.

**Diodes**- Atomic theory – Structure of Silicon and Germanium – Energy band diagram of conductors, semiconductor, insulator – Intrinsic & extrinsic semiconductor – PN junction diode – Characteristics of forward & reverse bias PN junction.

**UNIT 2: SPECIAL DIODES & THEIR APPLICATIONS**

**Special Diodes** – Zener diode – Light Emitting Diode (LED) – Light Dependent Diode (LDR).

**Rectifier** – Half wave and Full wave (Bridge & Centre-Tapped) rectifier – Ripple Factor – Efficiency and filter circuits of rectifiers.

**UNIT 3: TRANSISTORS & BIASING METHODS**

**Bipolar Junction Transistor** – Transistor construction – PNP and NPN transistor – Modes of operation – Common base configuration (CB), Common emitter configuration (CE), Common collector configuration (CC) – Transistor parameters – Relationship between  $\alpha$  and  $\beta$  – Biasing Methods – Fixed Bias – Collector-Base Bias – Emitter Bias

**Field Effect Transistors** – Classification of FET – Comparative study of BJT and JFET – Merits and demerits of FET – Construction of JFET – JFET Characteristics – MOSFET (Enhancement & Depletion)

**UNIT 4: POWER AMPLIFIERS & OP-AMP**

**Amplifiers** – Introduction – Classification of power amplifiers – Class A,B,AB,C – Single stage amplifier – R-C coupled amplifier – Transformer coupled class A amplifier –Pull-pull amplifier. **Feedback Amplifier** – Positive and Negative feedback amplifiers (Qualitative Study only) – Applications of Op-Amp.

**UNIT 5: OSCILLATORS**

Definition – Conditions for oscillation – Classification of oscillators – RC phase shift – Wien bridge – Colpitts oscillators – Hartley – Crystal oscillators – Difference between rectifiers, amplifiers and oscillators.

**RECOMMENDED BOOKS**

**Main Reading:**

1. Basic Electronics, Grobe, McGraw Hill
2. Electronics Devices and Circuits, G.S.N Raju
3. Electronic Devices and Circuits, Jacob Millman & Christos C.Halkias, Tata McGraw–Hill

**Supplementary Books**

1. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, TataMcGraw Hill.
2. Electronics Devices and Components, A. Jamila Rani, N.V. Publication.

**Paper Code : 0127180**

**Paper Name : Electronic Lab I (Basic Electronic Lab)**

1. Finding of Resistors value by color coding technique and using Multi-meter.
2. Study of CRO
3. Ohm's law verification.
4. Series circuit design using resistors
5. Parallel circuit design using resistors
6. V.I characteristics of PN-junction diode.
7. V.I characteristics of Zener diode.
8. V.I characteristics of LED (Light Emitting Diode)
9. Study of half-wave rectifier.
10. Study of full-wave centre-tapped rectifier.
11. Study of bridge rectifier.
12. Characteristics of Common Base (CB) Configuration
13. Characteristics of Common Emitter (CE) Configuration
14. Characteristics of Common Collector (CC) Configuration
15. FET Characteristics
16. RC phase shift oscillator
17. Class A power Amplifier
18. Mono-stable Multivibrator
19. Bi-stable Multivibrator
20. Astable Multivibrator

**SUBCODE: 0127104**

**Core: I Year & First Semester**

**Credit: 4**

**Title of the Course/ Paper: Computer Programming**

**Course Objectives:**

- The primary goal is to develop the programming skills in C.
- To get good knowledge of procedural language approach so that students can make software in the later stage of their course.
- This will help the students to frame the real-world modelling of data and its associated functions
- This course also aims to an understanding of various concepts of C with the help of which one can create its own data types that can be used globally in different program files.

**Unit 1: Fundamentals of Computer System:** Input and Output Devices (keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter). Primary, Secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks. Machine, Assembly and High-Level Language. Compiler, Interpreter and assembler.

**Unit 2: Word Processing and Spreadsheet:** Word Processing Basics, Opening and Closing of documents, Text creation and Manipulation, Formatting of text, Table Handling, Spell check, language setting and thesaurus, Printing of document. Basics of Spreadsheet, Manipulation of cells, Formulas and Functions, Editing of Spreadsheet, printing of Spreadsheet.

**Unit 3: Introduction to C Language:** C character set, Identifier and keywords, data types, constants, Variables, Declarations, Expressions, Statements, Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators, Library functions, Simple C programs, Flow of Control, if, if-else, while, do while, for loop, Nested Control structures, switch, break and continue, go to statements.

**Unit 4: Arrays:** Array handling in C, declaration, single dimensional arrays, two dimensional arrays, sorting, searching on single- and two-dimensional arrays, Array order reversal, string handling function, manipulation on strings.

**Unit 5: Functions and Pointers:** Prototype, declaration, arguments (Formal and Actual), Call by value and Call by reference, return types, types of functions difference between built- in and user- defined functions. Pointers, passing pointers to functions, Operations on Pointers, Pointers and Arrays, Array of Pointers.

**Referential Books:** 1. E Balaguruswamy, 1995, Programming in ANSI C, TMH Publishing Company Ltd.

2. Let Us C (Yashavant Kanetkar) 1991, BPB Publications, NewDelhi.

3.H. Schildt, C, 2004, The Complete Reference, 4<sup>th</sup> Edition, TMH.

4. B.W. Kernighan and D.M. Ritchie, 1988, The C Programming Language, 2<sup>nd</sup> Edition, PHI.

**Paper Code : 0127181**

**Paper Name : Lab II (Computer Programming Lab)**

Lab. Exercise based on the theory course with reference to the text book. (E Balaguruswamy)

**SUBCODE: 0120008 Qualify: Year-I & Semester-I Credit: 2 Contact Hours: 30**

## **Title of the Course/ Paper: Environmental Studies**

**Learning objectives:** This course attempts to create pro-environment attitude and a behavioral pattern in student community and society that attaches importance and priority to create sustainable life style and awareness on various environmental issues.

**Learning outcomes:** This course is expected to inculcate a critical thinking on various dimensions of environment through knowledge, skill, critical thinking and problem-solving

### **Unit 1: Understanding the Environment**

- 1.1. Environment: concept, importance and components
- 1.2. Ecosystem: Concept and structure of Ecosystem
- 1.3. Functions of Ecosystem: Food chain, Food Web, Ecological Pyramids and Energy Flow
- 1.4. Ecosystem services: (Provisioning, regulating and cultural)

### **Unit 2: Natural resources and Environmental Pollution**

- 2.1. Natural resources: Renewable and non-renewable (Global status, distribution and production)
- 2.2. Management of natural resources: Individual, community and government managed
- 2.3. Air, water and soil pollution: Causes, consequences and control
- 2.4. Solid waste management: Collection, segregation, transportation and disposal; 3R's

### **UNIT 3: Biodiversity and Issues in Environment**

- 3.1. Concept of Biodiversity - levels, values and hot spots of Biodiversity
- 3.2. Threats to biodiversity and conservation of Biodiversity
- 3.3. Climate change, causes and consequences
- 3.4. Concept and objectives of Environmental Education, Environmental Ethics

### **UNIT-IV Introduction to Environment**

- 4.1. Introduction to Environment, components of Environment and need of Environmental Education
- 4.2. Environmental Pollution-Types and effects on human beings and Environment
- 4.3. Human Population explosion and exploitation of Natural resources

### **UNIT V- Global Environmental issues**

- 5.1. Global Warming and Climate Change, Ozone Depletion and Acid Rain.
- 5.2. Conventional and non-conventional Energy resources
- 5.3. Global Biodiversity loss and Species Extinction

### **Unit VI: Environmental law and policy**

- 6.1 Constitutional provisions for environmental protection (article 21, 48A, 51A), Environment Protection Act, 1986
- 6.2 The National Green Tribunal Act, 2010
- 6.3 National Environment Policy-2006

**Unit VII: Environmental Protocols and Movements**

- 7.1 Earth Summit and role of IPCC in Climate Change Monitoring
- 7.2 Kyoto Protocol and Montreal Protocol
- 7.3 Green Belt Movement and Chipko Movement

**Suggested Reading:**

- 1 Asthana, D. K. Text Book of Environmental Studies. S. Chand Publishing.
- 2 Basu, M., Xavier, S., Fundamentals Of Environmental Studies, Cambridge University Press, Basu, R. N. (Ed.) Environment. University of Calcutta, Kolkata.
- 3 Bharucha, E., Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
- 4 Miller T.O. Jr., Environmental Science, Wadsworth Publishing Co. Wagner K.D. Environmental Management. W.B. Saunders Co. Philadelphia, USA
- 5 Conover, M. 2001 Resolving Human Wildlife Conflict, CRP Press.
- 6 Dickman, A.J.2010.Complexities of Conflict: the importance of considering social factors for effectively resolving human-wildlife conflict, Animal Conservation 13:458-466.
7. Thangavel, P. & Sridevi, G.2015.Environmental Sustainability: Role of Geen Technologies. Springer Publications.
8. Shastri, S.C. 2015, Environmental Law, Eastern Book Company.
9. Rao, M.N. &Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt.Ltd.
10. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
11. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi1992.
12. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
13. Latifi, N.R., Akhter, S. 2022. Environmental Sciences, Wisdom Press.
14. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
15. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

**SCHEME OF EXAMINATION**

The paper shall consist of 100 objective questions of 100 marks. There are VII units in the syllabus paper setter have to take at least 10 questions from each unit.

## **BSc (CS): SEM-2**

**SUBCODE: 0227101**

**Core: I Year & Second Semester**

**Credit: 4**

**Title of the Course/ Paper:** Computer Graphics.

**Course Objectives:** The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.

**Unit 1: Introduction to Computer Graphics:** Brief Survey of Computer Graphics, Graphics System: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input Devices, Hard Copy Devices, Graphics Software.

**Unit 2: Output Primitives and Their Attributes:** Line Drawing Algorithms (Direct, DDA and Bresenham's), Circle Generating Algorithm (Bresenham's, Midpoint), Ellipse Generating Algorithm (Midpoint), Area Filling (Boundary – Fill and Flood- Fill) Algorithms, Line attributes and color.

**Unit 3: 2-D Geometrical Transforms & Viewing:** Homogeneous Coordinate System, Basic Transformations: Translation, Rotation, Scaling, Reflection, Shear, composite transformations like- Rotation about an Arbitrary Point, Reflection through an Arbitrary line, transformations of points.

**Clipping: Point clipping and Line clipping algorithms:** Cohen- Sutherland and Liang- Barsky, Polygon Clipping, Window to viewport coordinate transformations.

**Unit 4: Three Dimensional Concepts:** Three-Dimensional Display Methods: Parallel and Perspective Projections, Translation, Rotation, Scaling, Composite Transformations, Hidden line and surface elimination- Z-buffer, back face, scan line, depth buffer.

**Unit 5: Shading:** Modelling light intensities- flat shading, gouraud shading, phong shading, Representation of Space curves, Beizer curves, B-Spline Curves, B-Spline Curve Fit.

**Referential Books:** 1. D. Hearn and M.P Baker, 2005, Computer Graphics, 2<sup>nd</sup> Edition, Pearson Education, Prentice Hall, 19<sup>th</sup> Reprint.

2. S. Harrington, 1987, Computer Graphics, 2<sup>nd</sup> Edition, McGraw Hill Book Co.

3. N. Krishnamurthy, 2002, Introduction to Computer Graphics, 1<sup>st</sup> Edition, Tata McGraw- Hill Publishing Co. Ltd.

4. D.F. Rogers, 2001, Procedural Elements for Computer Graphics, 2<sup>nd</sup> Edition, Tata McGraw-Hill Publishing Co. Ltd.

**Paper Code : 0227180**

**Paper Name : Lab III (Computer Graphics using C Lab)**

Lab. Exercise based on the theory course with reference to the text book. (N. Krishnamurthy)

**SUBCODE: 0227102**

**Core: I Year & Second Semester**

**Credit: 4**

**Title of the Course/ Paper: Data Structure Using C**

**Course Objectives:** To provide the knowledge of basic data structures and their implementation. To understand the importance of data structures in context of writing efficient programs. To develop skills to apply appropriate data structures in problem solving.

**Unit 1: Introduction to Data Structures:** Time and Space Complexities, Asymptotic Notation, Recurrence Relations, Abstract data types, Sparse Matrices, Recursion definition and processes, Tower of Hanoi, Stacks –Operations: Push & Pop, Array Representation of Stack, Linked Representation of stack, Stack applications, Queues- Array and Linked representation and Implementation of queues, Operations on Queues.

**Unit 2: Linked List:** Representation and Implementation of Singly Linked Lists, Insertion, Deletion and Searching operation, Two-way Traversing and Searching of Linked Lists.

**Unit 3: Trees and Binary Search Trees:** Basic Terminology, Binary trees, Traversing of Binary trees, Binary Search Trees, Definition, Implementation, Insertion and Deletion in BST Operation-Searching, B-Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Trees,

**Unit 4: Sorting and Searching:** Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Sequential Search, binary search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

**Unit 5: Graphs:** Terminology & Representation, Graphs & Multi-graphs, Directed Graphs, Sequential Representation of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

**Referential Books:**1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R.F.Gilberg and B.A.Forouzan Cengage Learning.

2. Data Structure and Program Design in C, Pearson, New Delhi,R.Kruseetal.

3. Data Structure Using C, Balagurswamy

**Paper Code : 0227181**

**Paper Name : Lab IV (Data Structures Lab)**

Lab. Exercise based on the theory course with reference to the text book. (Baluja)

**SUBCODE: 0227103 Core: I Year & Second Semester**

**Credit: 4**

**Title of the Course/ Paper: Discrete Mathematics**

**Course Objectives:** The main objectives of the course are to:

- Introduce concepts of mathematical logic for analysing propositions and proving theorems.
- Use sets for solving applied problems, and use the properties of set operations algebraically.
- Work with relations and investigate their properties.
- Investigate functions as relations and their properties.
- Introduce basic concepts of graphs, digraphs and trees.

**Unit 1: Mathematical Logic:** Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference.

**Unit 2: Set and Relations:** Set Operations, Representations and Properties of Relations, Equivalence Relations, Partially Ordering.

**Unit 3: Group Theory:** Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory

**Unit 4: Graph Theory:** Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Path in Weighted Graphs, Eulerian Path and Circuits, Hamiltonian Path and Circuits, Planner Graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut-Sets.

**Unit 5: Boolean Algebra:** Boolean Functions and its Representations, Simplification of Boolean Functions.

**Reference Books:**

Lipchitz

Discrete Mathematics, McGraw Hill



**SUBCODE: 0227104**

**Core: I Year & Second Semester**

**Credit: 4**

**Title of the Course/ Paper: Operating System**

**Course Objectives:** The purpose of this course is to understand the mechanisms of the Operating Systems like Process Management, Process Synchronization, Memory Management, File System Implementation, Storage Structures used in OS and Protection Principles.

**Unit 1: Operating System:** Operating System Structure, Simple Batch, Multi-programmed, Time shared, Personal Computer, Parallel, Distributed Systems, Real- Time Systems, System components, Operating system services, System calls.

**Process Management:** Process Scheduling, Pre-emptive and non-pre-emptive Algorithms (FCFS, SJFS, RRS, Priority), Interprocess Communication, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization.

**Unit 2: Process Synchronization:** Concurrent Processes, Race condition, Shared data, Critical section problem, Mutual exclusion, Progress, Bounded Waiting, software solution, Busy form of waiting, lock and unlock primitives, Peterson's solution, Synchronization: Semaphores, Monitors, Reader Writer Problem, Producer Consumer Problem, Dining Philosopher Problem.

**Unit 3: Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention (Mutual Exclusion, Hold and Wait, No pre-emption, Circular Wait), Deadlock Avoidance (Safe state, unsafe state, Resource allocation graph Algorithm, Banker's Algorithm) and Detection, Recovery from Deadlock (Wait- for- graph).

**Unit 4: Memory management and Allocation:** Hierarchy of memory types, Cache memory Types: Associative, direct mapped, set associative memory. Contiguous and Non- Contiguous allocation, Swapping, Fragmentation, Virtual Memory: Demand Paging, Page Replacement Algorithms: FIFO, Optimal, LRU, LFU, MFU, Thrashing.

**Unit 5: File System Interface and Operations:** File(s) Attributes, Operations, Types, Structure, Access Methods: Sequential, Direct access, Index, File System Structure, Allocation methods: Contiguous Allocation, Linked Allocation, Indexed Allocation, Disk scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK.

**Reference Books:**

1. Galvin P.B., Silberschatz A., Gange G.: Operating Sysytem Concepts, Wiley Publications.
2. Deitel, H.M.: An Introduction to Operating System, Addison- Wesley Publication Company.
3. Hansen P. Brineh: Operating system Principles, Prentice- Hall India.
4. Madnick and Donovan: Operating System, McGraw- Hill Publishing Company.

## **BSc-II: SEM-3**

**SUBCODE: 0327101**

**Core: II Year & Third Semester**

**Credit: 4**

### **Title of the Course/ Paper: Digital System and Architecture**

**Objective of Course:** Design the digital systems as an activity in a larger systems design context. Study the design and operation of semiconductor memories frequently used in application specific digital system.

**Unit 1: Fundamental of Digital Logic:** Boolean algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps, Combinational Circuits: Adders,

Mux, De-Mux, Sequential Circuits: Flip-Flops (SR, JK & D), Counters: Synchronous and Asynchronous Counters.

**Unit 2: Computer System:** Comparison of Computer Organization & Architecture, Computer Components and Functions, Interconnection Structures, Bus Interconnections, Input/Output: I/O Module, Programmed I/O, Interrupt Driven I/O, Direct Memory Access.

**Unit 3: Memory System Organization:** Classification and design parameters, Memory Hierarchy, Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory, Cache Memory: Design Principles, Memory mappings, Cache performance, Cache Coherence, Virtual Memory, External Memory: Magnetic Discs, Optical Memory, Flash Memories, RAID Levels.

**Unit 4: Processor Organization:** Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples, Processor Organization, Introduction to RISC and CISC.

**Unit 5: Control Unit:** Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control.

**Reference Books:** 1. M. Mano, Computer System Architecture 3<sup>rd</sup> edition, Pearson  
2. A. Anand Kumar, Switching Theory and Logic Design PHI  
3. William, metalling's (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersey.

**Paper Code : 0327180**

**Paper Name : Lab V ( Digital System and Architecture Lab)**

Lab. Exercise based on the theory course with reference to the text book. (M.Mano)

**SUBCODE: 0327102 Core: II Year & Third Semester**

**Credit: 4**

**Title of the Course/ Paper: Web Designing**

**Course Objectives:** Students learn how to critically evaluate website quality, learn how to create and maintain quality web pages, learn about web design standards and why they're important, and learn to create and manipulate images.

**Unit 1: Web Design Principles:** Basic principles involved in developing a web site, Five golden rules of web designing, Page design, Home Page Layout, brief history of Internet, World Wide Web, Web Standards.

**Unit 2: Introduction to HTML:** What is HTML, HTML documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading- Paragraphs, Line breaks, HTML Tags.

**Unit 3: Elements of HTML:** Introduction to elements of HTML, working with Text, working with Lists, Tables and Frames, working with Hyperlinks, Images and Multimedia, Working with Forms and Controls.

**Unit 4: Introduction to Cascading Style Sheets:** Concept of CSS, creating style sheet, CSS properties, CSS styling (Background, Text format, controlling fonts), Working with block elements and objects, working with Lists and Tables.

**Unit 5: Introduction to JavaScript:** Benefits of JavaScript, Variable declaration, Operators, Control statements, Error Handling, understanding arrays, Function declaration, Built In functions, Standard Date and Time functions.

**Reference Books:** 1. The Complete Reference, HTML & CSS, fifth edition, published by Thomas A. Powell.

2. HTML, CSS, JavaScript, All in One, third edition by Jennifer Kyrnin, Julie C. Meloni, Pearson publications.

3. HTML, CSS and JavaScript, MadeEasy by Dr. T Vasudev, Dr. Chandrajit M, Arvind G, Vasanthi published by DreamBook.

**Paper Code : 0327181**

**Paper Name : Lab VII ( Web Designing Lab)**

Lab. Exercise based on the theory course with reference to the text book. (HTML & CSS, JavaScript).

## BSc-II: SEM-3

**SUBCODE: 0327103**

**Core: II Year & Third Semester**

**Credit: 4**

**Title of the Course/ Paper:** Object Oriented Programming with C++

### **Course Objectives:**

- Describe OOPs concepts.
- Use functions and pointers in your C++ program.
- Understand tokens, expressions, and control structures.
- Explain arrays and strings and create programs using them.
- Describe and use constructors and destructors.
- Understand and employ file management.

**Unit 1: Principles of Object-Oriented Programming:** Procedure –Oriented programming, Object Oriented programming, Basic Concepts and Benefits.

**Beginning with C++:** What is C++, Simple C++ Programs, Input Operator, Cascading of I/O Operates, Classes and Structure of a C++ program, creating a source file, Compiling and Linking, difference between ANSI-C and C++.

**Unit 2: Tokens, Expressions and Control Structures:** Introductions, tokens, Keywords, identifiers, Basic Data Types, User-Defined Data Types, Derived data Types, Symbolic Constants, Type Compatibility, Declaration of variables, Dynamic Initialization of variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member de-referencing Operators, Memory Management Operators, Manipulators Type case Operator, Expressions and Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.

**Functions in C++:** Introduction: The main Function, Function Prototyping, Call by Reference, Inline Function, Default Arguments, const Argument, Function Overloading, Friend and Virtual Functions.

**Unit 3: Classes and Objects:** Introduction C Structures Revisited: Specifying a Class, Defining Member Functions, A C++ Program with Class, Making an Outside Function Inline, Nesting of Member Function, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friendly Functions, Returning Objects, const Member Functions, Pointers in Members.

**Constructors and Destructors:** Introduction Constructors, Parameterized Constructors, Multiple Constructors in a Class Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Dynamic Constructor, Constructing Two Dimensional Arrays, Destructors.

**Operator Overloading and Type Conversions:** Introduction: Definition Operator Overloading, Overloading Unary Operator, Overloading Binary Operators, Overloading Binary Operators Using friends, Manipulation of Strings Using Operator, Rules for Overloading Operators, Type Conversions.

**Unit 4: Inheritance Extending Classes:** Introduction, Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructors in derived Classes.

**Member Classes:** Nesting of Classes, Pointers.

**Virtual Functions and Polymorphism:** Introduction Pointers to Object, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

**Unit 5: File Handling:** Stream classes, Stream Errors, Disk file I/O with streams, File pointers, Error handling in file I/O with member function, Overloading the extraction and insertion operators, Memory as a stream object, Command line arguments, and printer output.

**Reference Books:** 1. Object Oriented Programming with C++ by Balagurusamy.

2. C++, the Complete Reference, 4<sup>th</sup> Edition, Herbert Schildt, TMH.

3. C++ programming Language, 3<sup>rd</sup> Edition, S. B. Lippman and J.Lajoie, Pearson Education.

4. The C++ Programming Language, 3<sup>rd</sup> Edition, B. Stroutstrup, Pearson Educ.

**Paper Code : 0327182**

**Paper Name : Lab VIII ( Object Oriented Programming with C++ Lab)**

Lab. Exercise based on the theory course with reference to the text book. (Balagurusamy)

**SUBCODE: 0327104**

**Core: II Year & Third Semester**

**Credit: 4**

**Title of the Course/ Paper: Cyber Security**

**Course Objectives:** Analyze and evaluate the cyber security needs of an organization. Conduct a cyber security risk assessment. Measure the performance and troubleshoot cyber security systems. Implement cyber security solutions.

**Unit 1: Introduction to Cyber Security:** Defining Cyberspace and Overview of Computer and Web- technology, Architecture of cyberspace, Communication and web technology, Internet, World Wide Web, Internet society, Concept of Cyber Security, Issues and challenges of Cyber Security.

**Unit 2: Cyber-crime and Cyber law:** Classification of cyber-crimes, Common cyber-crimes: cybercrime targeting computers and mobiles, cybercrime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cybercrime and offences.

**Unit 3: Social Media Overview and Security:** Introduction to Social networks. Types of social media, social media platforms, social media monitoring. Social media marketing, social media privacy. Challenges, opportunities and pitfalls in online and social media. Laws regarding posting inappropriate content. Best practices for the use of social media.

**Unit 4: E- Commerce and Digital Payments:** Definition of E- Commerce, Main components of E- Commerce, Elements of E-Commerce security, E-Commerce threats, E- Commerce security best practices, Introduction to digital payments, Components of digital payment. Modes of digital payments- Banking Cards, Unified Payment Interface (UPI), e-Wallets, Aadhar enabled payments, Digital payments related common frauds and preventive measures.

**Reference Books:**

1. Cyber Crime Impact in the New Millenium, by R.C. Mishra, Author Press, Edition 2010.
2. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13<sup>th</sup> November 2001)
3. Electronic Commerce by Elias M. Awad, Prentice Hall India Pvt. Ltd.

# **BSc-II: SEM IV**

**SUBCODE: 0427101**

**Core: II Year & IV Semester**

**Credit: 4**

## **Title of the Course/ Paper: Computer Network**

**Course Objectives:** The main goal of computer networking is to link devices and enable smooth communication and data exchange between them. Resource sharing: By allowing linked devices to share hardware, software, and data resources, networking maximizes resource usage and fosters cooperation.

**Unit 1: Data Communication:** Components of Data Communication System, Simplex, Half-Duplex and Duplex modes of communication, Analog and Digital Signals, Bandwidth, Throughput and Latency, Digital and Analog Transmission, Transmission media, Multiplexing, Network Topologies, LAN, MAN, WAN, Wireless Networks, Internet.

**Unit 2: Network Models:** Layered Architecture, OSI Model and its protocols, TCP/IP Model, Switching techniques, Error Detection and Correction Methods, Network Devices.

**Unit 3: Functions of Models:** Classful and Classless Addressing, Datagram, IPv4 & IPv6 Packet format, Routing algorithms, Flow control, error control and congestion control in TCP.

**Unit 4: World Wide Web (WWW):** Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution- Mapping Name to Addresses and Addresses to Names, Electronic Mail Architecture, SMTP, POP, IMAP, TELNET, FTP.

**Unit 5: Network Security:** Malwares, Cryptography, Secret- Key Algorithms, Public Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls.

### **Reference Books:**

A.S Tanebaum

Madhulika Jain, Vineeta Jain & Satish Jain

D.E.Comer

Computer Network (PHI)

Computer Network(BPB Publication)

Internet working with TCP/IP

**SUBCODE: 0427102**

**Core: II Year & IV Semester**

**Credit: 4**

**Title of the Course/ Paper: Computer Based Numerical and Statistical Techniques**

**Course Objectives:**

- Obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis.
- Gain experience in the implementation of numerical methods using a computer.
- Trace error in these methods and need to analyze and predict it.
- Provide knowledge of various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Statistical Methods.
- Demonstrate the concepts of numerical methods used for different applications.

**Unit-I**

**Introduction:** Numbers and their accuracy, Computer Arithmetic, Errors and their Computation, General error formula, Error in a Series Approximation.

**Solution of Algebraic and Transcendental Equation:**

Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding complex roots, Graffe's method, Rate of convergence of Iterative methods, Polynomial Equations.

**Unit-II**

**Interpolation:** Finite Differences, Difference tables, Newton's forward and backward formula

Central Difference Formulae: Gauss forward and backward formula, Stirling's formula, Bessel's formula. Laplace Everett's formula.

Interpolation with unequal intervals: Lagrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation,

**Unit-III**

**Numerical Integration and Differentiation:** Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Weddle's rule.

**Unit-IV**

**Solution of ordinary differential Equations:** Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Predictor Corrector Methods, and Stability of solution, some application-based questions on Numerical differentiation and Numerical Integration



## **Unit-V**

**Statistical Computation:** Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines, Regression Analysis, Linear and nonlinear Regression.

### **References:**

1. Rajaraman V, "Computer Oriented Numerical Methods", Pearson Education
2. Gerald & Whealey, "Applied Numerical Analyses", AW
3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
4. Grewal B S, "Numerical methods in Engineering and Science", Khanna Publishers, Delhi
5. T Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods, TMH
6. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
7. Francis Scheld," Numerical Analysis", TMH
8. Sastry S. S, "Introductory Methods of Numerical Analysis", Pearson Education.
9. Gupta C.B., Vijay Gupta, "Introduction to Statistical Methods", Vikas Publishing.
10. Goyal, M, "Computer Based Numerical and Statistical Techniques", Firewall Media, New Delhi.
11. Gupta S.C, Kapoor V.K, "Fundamental of Mathematical Statistics", S. Chand Publication New Delhi

**SUBCODE: 0427103**

**Core: II Year & Fourth Semester**

**Credit: 4**

## **Title of the Course/ Paper: Python Programming.**

**Course Objectives:** To learn how to design and program Python applications. To learn how to use lists, tuples, and dictionaries in Python programs. To learn how to identify Python object types. To learn how to use indexing and slicing to access data in Python programs.

**Unit-1 Overview of Python:** History & Versions, Features of Python, Execution of a Python Program, Flavours of Python, Innards of Python, Python Interpreter, Memory Management in Python, Garbage Collection in Python, Comparison of Python with C and Java, Installing Python, Writing and Executing First Python Program, Getting Help, IDLE.

**Unit- 2: Data Types, Variables and Other Basic Elements:** Comments Docstrings, Data types, Basic Elements of Python, Variables, Input Function, Output Statements, the print () function, control statements, Operators.

**Unit-3 Functions:** Function definition and call, Returning Results, Returning Multiple Values from a Function, Built-in Functions, Pass Value by Object Reference, Parameters and Arguments, Formal and Actual Arguments, Positional Arguments Keyword Arguments, Default Arguments, Arbitrary Arguments, Recursive, Modules in Python.

**Unit-4 Strings:** Creating Strings, Functions of Strings, working with Strings, Length of a String, Indexing and Slicing, Repeating and Concatenating Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting Substrings, Immutability, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting Strings, searching in the Strings, Finding the Number of Characters and Words, Inserting Substrings into a String.

**Unit 5: List and Tuples:** Lists, List Functions and Methods, List Operations, List Slices, Nested Lists, Tuples, Functions in Tuple.

**Dictionaries:** Creating a Dictionary, Operators in Dictionary, Dictionary Methods, Using for Loop with Dictionaries, Operations on Dictionaries, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions, Sorting the Elements of a Dictionary, Ordered Dictionaries.

### **Reference Books:**

1. Practical Programming: An Introduction to Computer Science Using Python 3, Paul Gries , Jennifer Campbell, Jason Montojo, Pragmatic Bookshelf, 2nd Edition, 2014.
2. Programming through Python, M. T Savaliya, R. K. Maurya& G M Magar, Sybgen Learning India. 2020.

**Paper Code : 0427180**

**Paper Name : Lab X ( Python Programming Lab)**

Lab. Exercise based on the theory course with reference to the text book. (M. T Savaliya)

**SUBCODE: 0427104 Core: II Year & Fourth Semester**

**Credit: 4**

**Title of the Course/ Paper: Database Management System**

**Course Objectives:** Master the basics of SQL and construct queries using SQL. Understand the relational database design principles. Familiar with the basic issues of transaction processing and concurrency control. Familiar with database storage structures and access techniques.

**Unit 1: Database System Concepts and Architecture:** An overview of database management system, database system Vs file system, Three- Schema Architecture, Data Independence, Database languages, Client/ Server Architecture.

**Unit 2: Data Modelling:** ER Models, Relational Model- Constraints, languages, Design, Relational Database Schemas, Update Operations, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, Code rules.

**Unit 3: SQL:** Data Definition and Data Types, Constraints, Keys, Queries, Insert, Delete and Update statements, Views, Aggregate, Date and Time, String, logical Functions, Joins, Unions, Intersection, Minus.

**Unit 4: Normalization:** Functional Dependencies, normal forms, first, second, third normal forms, BCNF, lossless join decompositions, normalization using FD, MVD and JD.

**Unit 5: Transaction Processing Concepts:** Transaction system, Serializability, conflict and view serializable, recovery from transaction failures, checkpoints, deadlock handling, Concurrency control and locking techniques, Time stamping protocols, multiple granularity.

**Reference Books:**

1. Henry F. Korth, Database Concepts, Mc Graw Hill.
2. Elmasri & Navathe, Fundamentals of Database systems, Pearson Education.
3. Bipin C. Desai, Introduction to Database Systems, Galgotia.

**Paper Code : 0427181**

**Paper Name : Lab XI ( DBMS Lab)**

Lab. Exercise based on the theory course with reference to the text book. (Bipin C. Desai)

# **BSc-III: SEM-V**

**SUBCODE: 0527101    Core: III Year & Fifth Semester**

**Credit: 4**

## **Title of the Course/ Paper: JAVA Programming**

**Course Objectives:** 1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. 2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

**Unit 1: Introduction to JAVA:** Features of Java- basic concepts of Object-Oriented Programming- java Tokens- java Statements- Constants- Variables- Data Types- Type Casting- Operators- Expressions- Control Statements: Branching and Looping Statements.

**Unit 2: Classes, Objects and Methods:** Constructors- Methods, Overloading- Inheritance- Overriding Methods- Finalizer and Abstract Methods- Visibility Control- arrays, String and Vectors- string Buffer Class- Wrapper Classes

**Unit 3: Interfaces- Packages:** Creating Packages- Accessing a Package- Multithreaded Programming – Creating Threads- Stopping and Blocking a Thread- Life Cycle of a Thread- using Thread Methods- Thread Priority- Synchronization- Implementing the Runnable Interface.

**Unit 4: Managing Errors and Exceptions:** Syntax of Exception Handling Code- Using Finally Statement- Throwing Our Own Exceptions. Input/Output Files: Concept of Streams- Stream Classes- Byte stream Classes- Character Stream Classes- Using Streams – Using the File Class- creation of files- Random Access Files- Other Stream Classes.

**Unit 5: AWT:** Working with Windows, Graphics and Text- AWT Classes-Working with Frames- Working with Graphics- Working with Color- Working with Fonts- Using AWT Controls, Layout Managers and Menus.

**Reference Books:** 1. E. Balaguruswamy, 2004, Programming with JAVA, 2<sup>nd</sup> Edition, Tata McGraw- Hill Publishing Co.Ltd.

2. Herbert Schildt, 2005, The Complete Reference Java 2,5<sup>th</sup> Edition ,Tata McGraw-Hill Publishing Co.Ltd.

3. Y.Daniel Liang, 2003, An Introduction to JAVA Programming, Prentice-Hall of India Pvt.Ltd.

**Paper Code        : 0527180**

**Paper Name        : Lab XII ( JAVA Programming Lab)**

Lab. Exercise based on the theory course with reference to the text book. (E. Balagurusamy)

**SUBCODE: 0527102      Core: III Year & Fifth Semester      Credit: 4**

**Title of the Course/ Paper: Statistics for Data Science**

**Course Objectives:** To introduce the student to the concept of Probability and Statistics that plays a vital role in computing and computational intelligence. Knowledge of these topics is critical to decision making and to the analysis of data. Using concepts of probability and statistics, individuals are able to predict the likelihood of an event occurring, organize and evaluate data. Statistics plays an important role in data analytics. The main aim of this course is to help the students to read, classify and then interpret the data given to them and draw conclusions.

**Unit I: Data and Representation**

Introduction to Statistics, Collection of data, classification and tabulation of data, Types of data: Primary data, Secondary data, Presentation of data Diagrammatic and Graphical Representation: Histogram, frequency curve, frequency polygon, Ogive curves, stem and leaf chart.

**Module II: Measures of Central Tendency and Dispersion**

Arithmetic Mean (A.M.) Definition, Mode, Median, Partition Values: Quartiles, Deciles and Percentiles, Box Plot, Percentile ranks. Means of transformed data, Geometric Mean (G.M.) Definition, Harmonic Mean (H.M.), Weighted Mean: Weighted A.M., G.M. and H.M. Range, Mean deviation Mean square deviation, Variance and Standard Deviation, Combined variance (derivation for 2 groups), Combined standard deviation.

**Module III: Correlation and Regression**

Bivariate normal distribution, types, importance, methods of measuring correlation-scatter diagram, Karl Pearson's Coefficient of Correlation and Spearman's rank Correlation. Regression lines, Difference between regression and correlation, uses of Regression.

**Module IV: Sampling theory and tests of significance**

Methods of sampling (Description only): Simple random sampling with and without replacement (SRSWR and SRWOR) stratified random sampling, systematic sampling. Tests of significance – z, t, chi-square and F.

**References:**

1. Mood, A. M., Graybill, F. A. And Boes, D.C. : Introduction to the Theory of Statistics, McGraw Hill.
2. Biswas and Srivastava – A textbook, mathematical Statistics, Ist Edition, Narosa Publishing House, New Delhi.
3. Gupta, S.C. and V. K. Kapoor – Mathematical Statistics, Sultan Chand and sons.
4. Hogg,R.V. and Craig, A.T: Introduction to Mathematical Statistics, McMillan.
5. S. C. Gupta – Fundamentals of Statistics, Himalaya Publishing House

**Title of the Course/ Paper: Software Engineering**

**Course Objectives:** 1. To provide the idea of decomposing the given problem into Analysis, Design, Implementation, Testing and Maintenance phases. 2. To provide an idea of using various process models in the software industry according to given circumstances.

**Unit 1: Software Process Models:** Software Process, Generic Process Model- Framework Activity, Process Lifecycle, Prescriptive Process Models, Project Management, SDLC Models, Waterfall Model, Prototyping Model, RAD Model, Incremental Model, Spiral Model, Component Based Model.

**System Analysis:** Principles of Structure Analysis, DFD's, E- R Diagram, Data Dictionary.

**Unit 2: Software Requirements:** Functional and Non- Functional Requirements, eliciting requirements, developing use cases, requirement analysis and modelling, requirement reviews, Software Requirement Specification (SRS) Document, Characteristics of SRS, Components of SRS, Designing of SRS.

**Unit 3: Software Design:** Design Objectives, Design Principles, Concepts, Design Process, Design Methodologies, Structured Design, Modular Design, Object Oriented Design, User Interface Design and its elements and its characteristics.

**Unit 4: Software Quality:** Quality Control, Quality Assurance, Software Reliability.

**Estimation and Scheduling of Software Projects:** Software Sizing, LOC and FP based Estimations, Estimating Cost and Effort, Estimation Models, Constructive Cost Model (COCOMO).

**Unit 5: Software Testing:** Verification and Validation, Error, Fault, Bug and Failure, Unit and Integration Testing, White- box Testing and Black- box Testing, Basis Path Testing, Control structure Testing, Deriving Test cases, Alpha and Beta Testing, Regression Testing, Performance Testing, Stress Testing.

**Software Configuration Management:** Change Control and Version Control, Software Reuse, Software Re- engineering, Reverse Engineering.

**Reference Books:**

1. Pressman: Software Engineering, Tata- McGraw Hill Publishing House.
2. Sommerville, I: software Engineering, Pearson Education.
3. Jalota, Pankaj: An integrated approach to Software Engineering, Narosa Publishing Company.
4. William E. Perry, WILEY: Effective methods for Software Testing.
5. Rajib Mall: Fundamentals of Software Engineering, PHI Learning Pvt. Ltd.

## BSc-III: SEM V

**SUBCODE: 0527104**

**Core: III Year & Fifth Semester**

**Credit: 4**

### **Title of the Course/ Paper: Design and Analysis of Algorithms**

**Course Objectives:** Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

**Unit 1: Introduction to Data Structures:** Definition, Analysis algorithms, space and time complexity, Asymptotic Notation ( $O$ ,  $\Omega$ ,  $\Theta$ ) complexities, Best, average and worst-case performance of algorithms, examples, Recursive algorithms, Introduction to recurrence relations.

**Unit 2: Divide and Conquer:** General method, Binary search, Merge sort, Quick sort, Selection problem, Strassen's matrix multiplication and analysis of these problems.

Greedy Method: General Method, Knapsack problem, Job sequencing with deadlines, Minimum spanning Trees (Prim's Algorithm, Kruskal's Algorithm), Single source shortest path and analysis of these problems.

**Unit 3: Dynamic programming:** General Method, Optimal binary search trees, 0/1 Knapsack, the travelling, salesperson problem, Single Source Shortest Path Problem (Bellman Ford Algorithm), All pair shortest path problem (Floyd's Algorithm).

**Unit 4: Back Tracking and Branch and Bound:** General Method, N queen's problem, Graph Coloring, Hamiltonian cycles, Analysis of these problems.

Branch –And-Bound: General Method, 0/1 Knapsack, Travelling salesperson problems.

**Unit 5: NP-hard and NP-Complete problems:** Basic concepts, Statement of Cook's Theorem, NP-hard graph [Clique Decision Problem, Chromatic Number Decision problem] and NP-scheduling problems [Scheduling Identical Processors, Job Shop Scheduling].

**Reference Books:** 1. Ellis Horowitz, Satraj Sahni, Rajasekharam(2007), Fundamentals of Computer Algorithms, 2<sup>nd</sup> edition, University Press, New Delhi.

2. Lipschutz, Seymour, 1986: Theory & Problems of Data Structures, Schaum Series.

3. Goodman, S.E. & Hedetniemi: Introduction to the Design and Analysis of Algorithms, McGraw-Hill Book Comp.

**Paper Code : 0527181**

**Paper Name : Lab XII (Design and Algorithms Lab)**

Lab. Exercise based on the theory course with reference to the text book. (McGraw-Hill Book)

# BSc-III: SEM-6

**SUBCODE: 0627101**    **Core:** III Year & Sixth Semester

**Credit: 4**

## **Title of the Course/ Paper:** Artificial Intelligence

**Course Objectives:** The main learning objectives of the course are to: Identify problems where artificial intelligence techniques are applicable. Apply selected basic AI techniques; judge applicability of more advanced techniques.

**Unit 1: Approaches to AI:** Introduction and Applications, History of AI from Alan Turing and developments in AI, application areas, Criteria for success, Problem Characteristics, Problem representation- State space representation, problem reduction representation, production system, Introduction to agents, intelligent software systems.

**Unit 2: Search and Control Strategies:** Data driven and goal driven search, Uninformed search- Breadth- first search and Depth- first Search methods, Heuristic Search Techniques- Hill Climbing, best first Search, A\*, AO\*, Constraint satisfaction and means- end analysis techniques.

**Unit 3: Knowledge Representation:** Information and Knowledge, Knowledge Acquisition and Manipulation, Issues in Knowledge Representation, Knowledge Representation methods, Propositional logic and First Order predicate Logic, Horn's Clauses, Semantic Networks, Frames, scripts and Conceptual Dependencies.

**Unit 4: Game Playing:** Min-max Search Procedure, Adding Alpha -Beta Cut-offs.

**Unit 5: Expert Systems:** Definition and Applications, Characteristics of Expert Systems, Architecture of a typical Expert System, Expert System shells, Building an Expert System, Expert Systems like MYCIN, Specific Application of AI, Definition of Neurons, Communication and Learning in Neural Networks.

### **Reference Books:**

1. Rich Elaine and Knight Kevin: Artificial Intelligence; Tata- McGraw Hill Company, New Delhi.
2. George F Luger; William A. Stubblefield: Artificial Intelligence; Structures and Strategies for Complex Problem solving, Pearson Education.
3. Patterson, Dan W.: Introduction to Artificial Intelligence and Expert Systems, Prentice- Hall of India Pvt. Ltd., New Delhi.



**Title of the Course/ Paper: Operations Research.**

**Course Objectives:** The objective of this course is to enable the student to understand and analyse managerial and engineering problems to equip him to use the resources such as capitals, materials, productions, controlling, directing, staffing, and machines more effectively.

**Unit 1: Concepts of Computer Based System:** Data, information, Information Systems, Model of Computer Based information system, Introduction to Management Information System, decision Support System and Knowledge Based Systems.

**Unit 2: Manufacturing Information System:** Model and subsystems including accounting information, Industrial engineering, Inventory, Quality and Cost Subsystems, PERT/CPM.

**Unit 3: Basics of Operation Research (OR):** Origin and Development of OR, Characteristics of OR, Models in OR, OR and Decision Making, Role of Computers in OR, Limitations of OR.

**Unit 4: Introduction to Operations Research:** Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

**Unit 5: Transportation Problem:** Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method.

**Assignment model:** Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem.

**Reference Books:**

1. Basandra, Suresh K.: Computer Systems Today, Wheeler Publishing.
2. Gupta, Prem Kumar & Hira, D.S.: Operation Research.
3. S.D. Sharma: Operation Research, Sultan Chand & Sons.
4. Rao, S.S.: Introduction to Optimization: Theory & Applications, Wiley Eastern.

**SUBCODE: 0627103**

**Core: III Year & Fifth Semester**

**Credit: 4**

## **Title of the Course/ Paper: Programming with VB.NET(Elective)**

**Course Objectives:** The course is designed to enable the students to develop applications using event driven programming with VB.net.

### **UNIT - I**

**Overview of the Visual Studio .NET IDE:** Introduction to .NET Framework and the Common Language Runtime, Introduction to Visual Studio.NET IDE: Menu Bar and Tool Bar, Design Window, Code Editor, Server Explorer, Solution Explorer, Toolbox, Properties Window, Object Browser, Class view Window, Working with windows forms and events, Adding different controls of Toolbox (Text Box, Label, Check Box, Radio Button, Button, Frame, List Box, Combo Box, Picture Box, Progress Bar, Timer) to Forms , Setting their Tab orders, enabling and disabling controls

### **UNIT - II**

**Basics of VB.Net:** Constants, Variables, data types, Operators: Arithmetic, Concatenation, Comparison, logical operators, and assignment operators, Control structures: If, if/then/else selection structures, select case Multiple-selection structure, While, do while, do until, For/Next, For each repetition structure.

### **UNIT - III**

**Procedures:** Introduction, sub-Procedures, function procedures, event procedures, commonly used Form events, creating message boxes, input boxes and dialog boxes

Arrays and Strings: declaring and allocating Arrays, Using Strings and String functions: len, right, left, ucase, lcase, ltrim, trim

Designing Menus: The Menu Strip control and Tool Strip Menu Item objects, working with Multiple Forms, Setting the Startup Form.

### **UNIT - IV**

**Working with Data and ADO.NET:** Understanding ADO.net Object model, components, Basic operations in ADO.net, Data Reader, Data Adapter and Data sets, connecting to and querying a data source, Using Data Grid view for viewing the records from tables.

### **References:**

1. Visual Basic.NET How to Program Deitel, Pearson Education, Low Price Edition3
2. Visual Basic 2008 in simple steps KoGent Solutions Inc., dreamTech Press
3. Sams Teach Yourself More Visual Basic.net in 21 days Lowell Mauer

**SUBCODE: 0627104**

**Core: III Year & Fifth Semester**

**Credit: 4**

**Title of the Course/ Paper: DATA MINING (Elective)**

**Course Objectives:** Identify what kinds of technologies are used for different application. Manipulate data preprocessing, data Warehouse and OLAP technology, data cube technology; mining frequent patterns and association, classification, clustering, and outlier detection.

**Unit 1: DATA WAREHOUSING**

Data warehousing Components, building a Data warehouse, Mapping the Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support, Data Extraction, Cleanup, and Transformation Tools, Metadata.

**Unit 2: BUSINESS ANALYSIS**

Reporting and Query tools and Applications, Tool Categories, The Need for Applications, Cognos Impromptu, Online Analytical Processing (OLAP), Need, Multidimensional Data Model, OLAP Guidelines, Multidimensional versus Multi-relational OLAP, Categories of Tools, OLAP Tools and the Internet.

**Unit 3: DATA MINING, CLUSTERING AND APPLICATIONS AND TRENDS IN DATA MINING**

Introduction, Types of Data, Data Mining Functionalities, Interestingness of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Data Warehouse, Issues, Data Preprocessing, Cluster Analysis, Types of Data, Categorization of Major Clustering Methods, K-means, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint, Based Cluster Analysis, Outlier Analysis, Data Mining Applications.

**Unit 4: ASSOCIATION RULE MINING AND CLASSIFICATION**

Mining Frequent Patterns, Associations and Correlations, Mining Methods, Mining Various Kinds of Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification and Prediction, Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Backpropagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods , Prediction

**TEXT BOOKS:**

1. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

**Paper Code : 0627165 Credit: 12**  
**Paper Name : Major Project**

Under the supervision and guidance of the Faculty Members.