**Structure of S. E. (Computer Science & Engineering / Information Technology)**
**w.e.f. July 2013**
**Semester – I**

| Sr. No | Name of the Subject | Teaching Scheme | | | Examination Scheme | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Paper | T/W | OE | POE | |
| 1 | Applied Mathematics-I | 3 | 1 | - | 100 | 25 | - | - | 125 |
| 2 | Discrete Mathematical Structures | 3 | 1 | - | 100 | 25 | - | - | 125 |
| 3 | Advanced C concepts | 3 | - | 4 | 100 | 25 | - | 50 | 175 |
| 4 | Digital Techniques | 4 | - | 2 | 100 | 25 | | 50 | 175 |
| 5 | Computer Graphics | 3 | - | 2 | 100 | 25 | - | - | 125 |
| 6 | Lab - Visual Basic | 2 | | 2 | - | 25 | - | 50 | 75 |
| | **Total** | **18** | **2** | **10** | **500** | **150** | **-** | **150** | **800** |
| 7 | Environmental Studies | 1 | | | | | | | |

**Semester – II**

| Sr. No | Name of the Subject | Teaching Scheme | | | Examination Scheme | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Paper | T/W | OE | POE | |
| 1 | Applied Mathematics – II | 3 | 1 | - | 100 | 25 | - | - | 125 |
| 2 | Theory of Computation | 3 | 1 | - | 100 | 25 | | | 125 |
| 3 | Microprocessors | 4 | - | 2 | 100 | 25 | | 50 | 175 |
| 4 | Data Communication | 3 | - | 2 | 100 | 25 | | | 125 |
| 5 | Data Structures | 3 | - | 4 | 100 | 25 | - | 50 | 175 |
| 6 | Lab - Object Oriented Design & Programming through C++ | 2 | - | 2 | - | 25 | | 50 | 75 |
| | **Total** | **18** | **2** | **10** | **500** | **150** | **-** | **150** | **800** |
| 7 | Environmental Studies | 1 | | | | | | | |



**Note:**

1. The term-work will be assessed based on continuous internal evaluation including class tests, assignments, performance in laboratories, Interaction in class, quizzes, group discussions as applicable.
2. The batch size for practical/tutorials be of 20 students. On forming the batches, if the strength of remaining students exceeds 9 students, then a new batch may be formed.
3. Vocational Training (evaluated at B.E. Part-I) of minimum 15 days shall be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report shall be submitted and evaluated in B.E. Part-I.

# SOLAPUR UNIVERSITY, SOLAPUR.

**S. E. (Computer Science & Engineering / Information Technology)**

**Semester – I**

## 1. APPLIED MATHEMATICS-I

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: - 3** Hrs/Week | **Theory – 100** Marks |
| **Tutorial: - 1** Hr/Week | **Term-Work - 25** Marks |

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**COURSE OBJECTIVES:**

1) To introduce higher order linear differential equations and method of finding the solution.

2) To introduce Fourier series and Laplace transform.

3) To introduce concepts of statistics and Probability.

**COURSE OUTCOMES**

At the end of this course, the student will be able to-

1. Solve the higher order linear differential equation.
2. Find Laplace and inverse Laplace transform some of the standard functions.
3. Express the function in terms of sins and cosines.
4. To develop the statistical and probability concepts in the field of computer science.



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### SECTION – I

**Unit 1 : Linear Differential equations** **(5 hrs.)**

Linear Differential equations with constant coefficients.

**Unit 2: Laplace Transform:** **(6 hrs.)**

Definition, Transform of standard function, Properties, Transform of derivative and integral. Inverse Laplace Transform, Convolution Theorem.

**Unit 3:Z-Transform:** **(5 hrs.)**

Z-Transform of elementary Functions, Properties of Z-Transform and Inverse Z-Transform.

**Unit 4: Fourier series:** (5 **hrs.)**

Definition, Euler's formula, Expansions of function, Change of interval, even and odd functions, half range Fourier series.

## SECTION-II

**Unit 5: Vector Calculus:** (**5 hrs.**)

Differentiation of vectors, Gradient, Divergence and Curl of vector field, Solenoid, irrotational and conservative vector field.

**Unit 6: Statistics:** **(5 hrs.)**

Coefficient of correlation and lines of Regression of bivariate data, fitting of curves-Least square principle.

**Unit 7: Probability:** (**6 hrs.**)

Random variable, Binomial, Poisson, Normal distribution, Stochastic Process, (Randomprocess), Markovprocess, Markovchain.

**Unit 8: Queueing Theory:** **(5 hrs.)**

Introduction, Queueing system, Distributions in Queueing systems, Kendall's notation, classification of queing models, M/M/1: ∞/∞ models, M/M/1: N/∞ models.

**Text books:**


1. J.N. and P.N. Wartikar, A textbook of Applied Mathematics Vol. II and Vol. III – Vidyarthi Grah Prakashan, Pune.
2. B.S.Grewal, Higher Engineering Mathematics – Khanna Publications, Delhi.
3. A textbook of Applied Mathematics by N.P. Bali, Ashok Saxena and N.Ch. S.N. Iyengar – Laxmi Publications , Delhi.
4. Advanced Engineering Mathematics by Kreyzig-John Wiley & SMS, Newyork.




**Reference Books:**


1. Peter O'Neil, Advanced Engineering Mathematics - Cengage Learning.
2. M D Greenberg, Advanced Engineering Mathematics(Second Editions) - Pearson.


**Termwork :**

Student should perform 6 to 8 assignments based on above mentioned syllabus shall be given.

# SOLAPUR UNIVERSITY, SOLAPUR.

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

**Semester – I**

## 2. DISCRETE MATHEMATICAL STRUCTURES

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: - 3** Hrs/Week | **Theory – 100** Marks |
| **Tutorial : -1** Hr/Week | **Term-Work – 25** Marks |

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**Course Objectives**

1) To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
2) To develop fundamental mathematics required for Formal Systems & Automata.

**Course Outcome**

1) Students will be acquainted with the basic mathematical structure required for logical reasoning.
2) This course enables students of computer science to develop applications in areas of data structures, the theory of computer languages, and analysis of algorithms.

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**SECTION-I**

**Unit 1** : **Mathematical logic :** **(6 Hrs)**

Introduction, statements and Notation, Connectives - negation, conjunction, disjunction, conditional, bi conditional, statement formulas and truth tables, well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives

**Unit 2: Representation of expressions:** **(5 Hrs.)**

Normal & Principle normal forms; Completely parenthesized infix & polish notations, Theory of inference for statement calculus.

**Unit 3 : Set theory :** **(4 Hrs.)**

Basic concepts of set theory, types of operations on sets, Ordered pairs, Cartesian product.

**Unit 4 : Relations:** **(6 Hrs)**

Relations, Properties of binary relations, Matrix and graph representation, Partition and covering of set, Equivalence relation, Composition, POSET and Hasse diagram.

## SECTION II

**Unit 5 : Functions :** **(4 Hrs.)**

Function -types, Composition of functions, Inverse functions, Natural numbers.

**Unit 6 : Algebraic systems** **(5Hrs.)**

Algebraic systems, semi groups and monoids, properties and examples

**Unit 7 : Groups:** **(7 Hrs.)**

Polish expressions and their compilation, Groups, group codes.

**Unit 8 : Lattices and Boolean algebra** **(5 Hrs.)**

Lattice as POSETs, definition, examples and Properties, Special lattices,

Boolean algebra definition and examples, Boolean functions .

**Text Books:**

1. Discrete mathematical structures with applications to computer science
   -- J. P. Tremblay & R. Manohar (MGH International)

**Note**: Scope of the articles mentioned in the syllabus is as per the text book.



**Reference Books :**

1. Discrete Mathematics with combinatorics and graph theory- S. SNTHA (CENGAGE Learning)
2. Discrete Mathematical Structures – Bernard Kolman ,Robert C. Busby (Pearson Education)
3. Discrete mathematics -- Liu (MGH)
4. Theory and problems in Abstract algebra -- Schaums outline series (MGH)

**Term work:**

In tutorial session, students of different batches be assigned different exercise problems and be guided for the solution of the problems.

# SOLAPUR UNIVERSITY, SOLAPUR

**S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)**

**Semester – I**

## 3. ADVANCED C Concepts

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: 3** Hrs/Week | **Theory: 100** Marks |
| **Practical: 4** Hrs/Week | **Term-Work: 25**Marks |
| | **Practical Oral Exam: 50** marks |

**Course Objectives**

1) To study and implement advanced features of C programming language.
2) To develop the ability of building logic and analyze time and space complexity of the program.

**Course Outcome**

1) Students will be able to build the logic for different problem statements.
2) Students will get acquainted with advanced features of C languages.
3) Students will be able to implement the concept like searching, sorting etc.

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**SECTION I**

**Unit 1: Storage Classes and standard library functions (4 Hrs)**

Automatic, Register, Static, External storage classes and standard library functions such as arithmetic functions, data conversion functions, character classification functions and time related functions.

**Unit 2: Recursion (4 Hrs)**

Definition and Processes, Recursion in C, How recursion works, Factorial, Fibonacci sequence, Towers of Hanoi, Advantages and Disadvantages of recursive techniques.

**Unit 3: String Processing (5 Hrs.)**

Declaration and initialization of strings, Display of strings with different formats, string library functions, Array of strings.

**Unit 4: Pointers (8 Hrs.)**

Introduction, Pointer to Pointer, Pointers to an Array, Array of Pointers, Pointer and Strings, Pointer and Structures, Pointer to Functions, Pointers and Dynamic memory.

## SECTION II

**Unit 5: Files** **(7 Hrs.)**

Introduction, Streams and file types, File operations, Different File I/O Functions, other file functions, command line arguments.

**Unit 6: Algorithm Analysis** **(3 Hrs.)**

Introduction to Asymptotics, Big–O notation, Omega Notation, Time complexity space complexity.

**Unit 7: Searching and Sorting** (6 **Hrs.)**

**Searching**: equential search, Binary search, Analysis and comparison of these methods. **Sorting:** Insertion sort, Selection sort, Shell sort, Bubble sort, Merge sort, Quick sort, Heap sort analysis of all these sorting techniques

**Unit 8: Hashing** **(5 Hrs.)**

Different Hash Functions, choosing a hash function
Collision Resolution by Open Addressing: Linear probing, quadratic probing, double hashing
Collision Resolution by Chaining, Comparison of the methods.

**Text Books:**

1) Let Us C by Yashvant Kanetkar
2) Pointers in C by Yashvant Kanetkar
3) Data Structure using C and C++ second edition by Yedidyah Langram , Moshe J, Augensteen, Aason M. Tanenbaum



**Reference Books :**

1) Data Structures Using C & C++ by Rajesh Shukla.
2) Data Structures A Pseudocode Approach with C by Richard F. Gilberg & Behrouz A. Forouzan

**Termwork :**

Student should perform 12 to 14 experiments based on the following guidelines and preferably conducted on unix / linux platform

1. Programs to demonstrate storage classes and functions like atoi(), itoa(), clock() etc.
2. Represent Sparse Matrix using arrays and perform Matrix Operations such as Addition and Multiplication.
3. Program to implement Magic Square by taking the size from user.
4. Program to find Factorial of a number, $N^{th}$ number in Fibonnoci sequence, Towers of Hanoi using recursion.
5. Program to perform different string operations using string library functions.
6. Program to sort the strings alphabetically.

7. Programs to demonstrate: Array of Pointers, Pointer and Structures, Dynamic memory allocation.
8. Programs to simulate string library functions using pointers.
9. Menu driven program for performing the following operations on Files: Insert, Delete , Modify and Display records.
10. Program to demonstrate file copy operation using Command Line Arguments.
11. Program to implement Linear and Binary Search.
12. Program to implement Merge Sort and/or Quick Sort.
13. Program to implement Insertion sort and/or Selection sort and/or Shell sort.
14. Program to implement Hashing and resolving collision using Open Addressing – Linear probing
15. Program to implement Hashing and resolving collision using Chaining.

# SOLAPUR UNIVERSITY, SOLAPUR.

**S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)**

**Semester – I**

## 4. DIGITAL TECHNIQUES

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: 4** Hrs/Week | **Theory: 100** Marks |
| **Practical: 2** Hr/Week | **Term-Work: 25**Marks |
| | **Practical Oral Exam: 50** marks |

**Course Objectives:**

1. To study combinational logic circuits and sequential circuits.
2. To develop design and implementation skills of combinational logic circuits.
3. To develop implementation skills of sequential circuits.

**Course Outcomes:**

1. At the end of the course the student will be able to design and analyze digital circuits.
2. Student will be able to strengthen the principles of combinational logic design and use of simple memory devices, flip-flops, and sequential circuits.

### SECTION I

**Unit 1 : Combinational Logic Circuit (8 Hrs)**

Introduction to Standard representation of Logical function, K-map representation, Simplification using k-map up to 4 variables, Minimization of logical function specified in minterm / maxterms, Don't care condition, AND / OR/ XOR function using NOR / NAND gates, Implementation of SOP & POS expression using NAND & NOR gate respectively.

**Unit 2: Arithmetic Circuits (9 Hrs)**

Binary addition, subtraction, One's & Two's complement arithmetic, Half adder, Full adder, Half subtractor, Full subtractor, n – bit binary adder, Carry look ahead (CLA) adder, One bit Comparator, Parity Checker, Arithmetic Logic Unit- Basic concepts.

**Unit 3: Sequential Logic Circuit (9 Hrs)**

Introduction to flip-flops, S-R, J-K, D-Flip-flop & T-flip-flop, Excitation Tables for Flip flops, Basic register, Shift register, Asynchronous counters, Up-down counter, MOD counter, Introduction to synchronous counter

## SECTION - II

**Unit 4: Digital Design with MSI** **(8 Hrs)**

Data selector / multiplexer, MUX as logic function, Decoder / Demultiplexes, application of MUX/ DEMUX using IC – 74151, 74154, 74148, problems based on MSI circuits, decoder / driver for 7 segment display using 7447.

**Unit 5: Introduction to Memory** (9 **Hrs)**

Memory operation & organization, TTL RAM Cell, ROM, EPROM, MOS Static RAM Cell, Dynamic RAM Cell and Refreshing, , Expanding memory size (Word Capacity & Word Size)

**Unit 6: Introduction to VHDL** **(9 Hrs)**

Entity, Architecture, Data Objects and examples of VHDL codes for simple digital circuits like adder, subtractor, multiplexer, demultiplexer.

**Text Books :**


1. R.P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0 – 07 – 049492 – 4
2. M Morris Mano "Digital Design" 3rd Edition PEARSON , 2001, ISBN-10 / ASIN: 0130621218 ISBN-13 / EAN: 9780130621214


**Reference Books :**


1. Stephen Brown, "Fundamentals of digital logic design with VHDL" 1st Edition, TMH Publication 2002
2. Wakerly Pearon, "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004
3. Subrata Ghoshal, "Digital Electronics" 1st edition, CENGAGE Learning, 2012 ISBN-13 : 978-81-315-1807-6.




**Termwork :**

Student should perform 8 to 10 experiments based on the following list.

1. Verification of truth table of basic and universal logic gates.
2. Implementation of Boolean functions using Basic and Universal Gates.
3. Implementation of reduced Boolean functions (K – map technique) from Assignment No. 2 using basic and universal gates.
4. Implementation of half adder and full adder.
5. Implementation of half subtractor and full subtractor.
6. Implementation of parity checker.
7. Implementation of flip flops using NAND/NOR gates

    S-R Flip flop
    D flip flop
    J-K Flip flop
    T Flip flop

8. Implementation of basic register with 4 modes and shift register.
9. Implementation of 3 bit Asynchronous counter.
10. Implementation of Mod 5 counter.
11. Implementation of Mod 10 (Decade) Counter using IC 7490.
12. Implementation of
    a. Boolean functions from Assignment No. 2 using multiplexer ICs.
    b. Full adder using 4:1 multiplexers IC.
13. Implementation of 7 segment display using decoder/driver7447.
14. Design of simple combinational circuits: Half adder, Half Subtractor using VHDL.

# SOLAPUR UNIVERSITY, SOLAPUR

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

**Semester – I**

## 5. COMPUTER GRAPHICS

| Teaching Scheme | Examination Scheme |
|---|---|
| **Theory: 3 Hrs/Week** | **Theory: 100 Marks** |
| **Practical: 2 Hrs/Week** | **Term Work: 25 Marks** |

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**Course Objectives:**

To understand the basics of computer graphics and to develop an ability for implementation of computer graphics applications using different algorithms.

**Course Outcomes:**

Students will get acquainted with computer graphics techniques, its use and implementation details.

### SECTION – I

**Unit 1: Introduction: (5 Hrs)**

Application of Computer Graphics, Video display devices: Refresh CRT, Raster scan display, Random scan display, color CRT monitors, color models.



**Unit 2: Raster scan Graphics: (6 Hrs)**

Line drawing algorithms: DDA, Bresenham's algorithm, Bresenhams Circle generation algorithm, RLE, Polygon filling: Scan converting polygon, Edge fill, Edge flag, Seed fill.

**Unit 3: 2D Transformation: (5 Hrs)**

Translation, Rotation, Reflection, Scaling, Shearing, Combined transformation, Rotation about an arbitrary point, Reflection through an arbitrary line.

**Unit 4: 3D Transformation: (5 Hrs)**

Scaling, Shearing, Rotation, Reflection, Translation, Multiple Transformation, Rotation about axis parallel to coordinate axis.

## SECTION – II

**Unit 5 : Clipping & Display File Compilation: (7 Hrs)**

Sutherland-Cohen line clipping algorithm, Midpoint subdivision algorithm, Viewing transformation, Window transformation, segmented display file, Display file compilation.

**Unit 6: Visible Lines & Visible Surfaces: (5 Hrs)**

Z-buffer algorithm, Warnock Algorithm, Antialiasing and Halftoning.

**Unit 7: Plane curves & Space curves: (4 Hrs)**

Curve representation, Non parametric & parametric curves, Bezier curves, B-spline curves.

**Unit 8: Multimedia: (5 Hrs)**

Definition, Elements and Need of multimedia, Texture mapping, Image and applications, image capture, compression, standards.

**Text Books:**

1. Computer Graphics (Chapter 1)
   - Donald Hearn, Baker (second edition) PHI publications.
2. Procedural elements for Computer Graphics (Chapter 2,5,6)
   - David F. Rogers (second edition) Tata McGraw Hill publications.
3. Mathematical elements for Computer Graphics (Chapter 3,4,7)
   - Rogers, Adams (second edition) McGraw Hill Publishing Company.
4. Multimedia in practice, Technology and Applications (Chapter 8)
   - Judith Jeffcoate (PHI)
5. Fundamentals of Computer Graphics
   - Peter Shirley and Steve Marschner



**Reference Books:**

1. Computer Graphics with virtual reality systems
   - Rajesh K. Maurya
2. Principals of Interactive Computer Graphics
   - William Newman, Sproull (second edition) McGraw-Hill Publication.

**Termwork :**

Student should perform 8 to 10 experiments based on following guide lines.

1. Implementation of DDA line drawing algorithm.
2. Implementation of Bresenham's line drawing algorithm.

3. Implementation of Bresenham's Circle generation algorithm.
4. Implement Polygon filling algorithms.
5. Implement 2D transformation.
6. Implementation of 3D transformation.
7. Implement Sutherland – Cohen line clipping algorithm.
8. Implementation of Warnock algorithm.
9. Case study of OpenGL
10. Implement Curves.
11. Implement a small animation package.

# SOLAPUR UNIVERSITY, SOLAPUR

**S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)**

**Semester – I**

## 6. Lab - VISUAL BASIC

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: - 2** Hrs/Week | **Term-Work – 25 Marks** |
| **Practical:- 2** Hrs/Week | **Practical Oral Exam:- 50 Marks** |

**Course Objectives:**

To learn event driven GUI programming and database management, using Visual Basic 6.0.

**Course Outcomes:**

Students will be able to develop database applications using Visual Basic 6.0.

**Unit 1. Introduction (2 hrs)**

What is an Event-driven Programming? Introduction to Integrated Development Environment

**Unit 2. Basics of language (3 hrs)**

Variable, Data types, User-defined data types, Variable Scope, Constants, Control Structures, Operators, Arrays



**Unit 3. Visual Basic Activex Controls (5 hrs)**

Properties, Methods and Events of Activex Controls (Toolbox), Common Dialog Box (Microsoft Common Dialog Control 6.0), OLE Control, Control Arrays, Menus

**Unit 4. Functions (3 hrs)**

String Functions, Mathematical Functions, Date Functions, Data type Conversion Functions, User Defined Methods (Functions and Procedures), Error Handling

**Unit 5. Database Management (8 hrs)**

Introduction to Database, Creating database in visual data manager / Ms Access, Database management using Data Control: DBGrid Control, DBCombobox and DBListbox control, Database management using DAO: Database object, Recordset object, Database management using ADO: using ADODC control or Connection object ( unbound control)

**Unit 6. File Handling (3 hrs)**

Sequential file, Random access files

**Unit 7. Creating user defined ActiveX Controls, ActiveX DLLS, ActiveX EXE (2 hrs)**

**Unit 8. Report Generation (Data Reports/ Crystal Reports) (2 hrs)**

**Text Books:**

1) Mastering Visual Basic by Evangelos Petrouts.
2) Complete Reference Visual Basic 6.0 by Noel Jerke

**Reference Books:**

1) Visual Basic 6.0 Programming Black book by Steven Holzner
2) Visual Basic 6.0 - Peter Wright
3) Visual Basic 6.0 – Corhell
4) Visual Basic 6.0 in 21 days - Perpy Greg

**Termwork :**

Student should perform 8 to 10 experiments based on following list.

1. Introduction to Visual Basic IDE.
2. Implement various applications based on each ActiveX control.
3. Implementation of an application based on standard VB functions.
4. Implement database functions using data control.
5. Implement database functions using DAO.
6. Implement database functions using ADO.
7. File Handling.
8. Create user defined ActiveX control.
9. Create ActiveX DLL and ActiveX EXE.
10. Report Generation.
11. Implementation of a mini project.

# SOLAPUR UNIVERSITY, SOLAPUR.

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

**Semester – II**

## 1. APPLIED MATHEMATICS-II

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: - 3** Hrs/Week | **Theory – 100** Marks |
| **Tutorial: - 1** Hr/Week | **Term-Work - 25** Marks |

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**Course Objectives**

1. To introduce numerical methods for solving linear and non-linear equations.
2. To introduce numerical methods for evaluating definite integrals.
3. To introduce fuzzy sets and fuzzy logic for dealing with uncertainty.

**Course Outcome**

At the end of the course the students are able to-

1. Identify and to classify the numerical problem to be solved.
2. Choose the most appropriate numerical method for its solution based on characteristics of the problem
3. To understand organization of fuzzy sets and fuzzy logic for any field X and any theory Y can be fuzzified by replacing concept of crisp set.

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### SECTION – I

**Unit1.Solution of Algebraic and Transcendental Equations**: **(8 hrs)**

Introduction, Basic properties of equations. Bisection Method, False position Method, Newton-Raphson Method, Multiple Roots, Newton's iterative formula for obtaining square root, Muller's Method.System of non linear equations by Newton Raphson Method.

**Unit 2.Solution of linear simultaneous Equations**: **(7 hrs)**

Direct Methods- Gauss Elimination Method, Gauss Jordan Method, Method of Factorization, Iterative Methods- Jacob's Method, Gauss-Seidal Method. Eigen values and Eigen vectors (complex Eigen values), Power Method.

**Unit 3. Numerical Integration**- **(6 hrs)**

Numerical Integration using Newton's Cote's formulae-Trapezoidal rule, Simpson's $1\backslash 3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddels rule, Gaussian Quadrature, Romberg Integration, Double Integration.

### SECTION - II

**Unit 4: Classical (Crisp) sets to Fuzzy sets:** **(8 hrs)**

Crisp sets, Basic types of Fuzzy sets, Basic concepts of Fuzzy sets. Fuzzy sets versus Crisp sets: Additional properties of α-cuts, representation of Fuzzy sets, and Extension principle of Fuzzy sets.

**Unit 5: Fuzzy Arithmetic:** **(7hrs)**

Fuzzy numbers, Arithmetic operations on intervals, Arithmetic operations on Fuzzy numbers, Lattice of Fuzzy numbers, Fuzzy equations.

**Unit 6: Fuzzy Logic & fuzzy relations:** **(6hrs)**

Crisp Vs Fuzzy relation, binary fuzzy relations, binary relation on single set, fuzzy equivalence relations. Introduction to fuzzy logic, fuzzy propositions, fuzzy quantifiers.

**Instructions:**

Separate answer sheets shall be provided for each of the section of theory paper.

**Text Books:**


1. B.S Grewal, Numerical Methods, Khanna Publications - New Delhi.
2. S.S.Shastry, Introductory mothods of Numerical Analysis - PHI Learning Publication
3. George J. Klir and Bo Yuan, Fuzzy Sets And Fuzzy Logic –PHI India


**Reference Books:**


1. George J. Klir and Tina A. Folger, Fuzzy Sets, Uncertainity and Information, PHI India.
2. Robert J. Schilling, Sandra L. Harris, Applied Numerical Methods for Engineers (using MATLAB and C) - Cengage Publications.
3. M. K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Methods for scientific and engineering computations - New Age International Ltd.
4. Pundir & Pundir, Fuzzy sets & their applications, Pragati publications.


**Termwork :**



Student should perform 6 to 8 assignments based on above mentioned syllabus shall be given.

# SOLAPUR UNIVERSITY, SOLAPUR

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

## Semester – II

## 2. THEORY OF COMPUTATION

| Teaching Scheme | Examination Scheme |
|---|---|
| **Theory: - 3** Hrs/Week | **Theory – 100** Marks |
| **Tutorial: - 1** Hr/Week | **Term-Work – 25** Marks |

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**Course Objectives**

1) To introduce the fundamental computational principles which are foundation of Computer Science.
2) To address misconception about computer science theory which is considered to be irrelevant, dry & complex to understand.
3) To heighten the aesthetic sense & prepare students to develop best computer design & applications.

**Course Outcome**

Upon completion of the course a student should possess the following skills

1) Synthesize finite automata with specific properties
2) Design systems & find the output achieved from them
3) Detect ambiguity in a system & overcome it.



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### SECTION-I

**Unit 1: Regular Expressions** **(5 Hrs)**

Regular expressions & corresponding regular languages, examples and applications, unions, intersection & complements of regular languages

**Unit 2 : Finite Automata** **(6 Hrs)**

Finite automata definition and representation, Non-deterministic F.A., NFA with ^ transitions, Equivalence of DFA & NFA

**Unit 3 : Kleen's Theorem** **(4 Hrs)**

Statements & proofs, minimizing number of states in an FA.

**Unit 4: Grammars & Languages** **(6 Hrs)**

Definition and types of grammars and languages, derivation trees and ambiguity, BNF and CNF notations, Union, Concatenation and *'s of CFLs, Eliminating ^ production and unit productions from a CFG, Eliminating useless variables from a Context Free Grammar.

## SECTION-II

**Unit 5: Push down Automata** **(6 Hrs)**
Definition, deterministic PDA & types of acceptance, equivalence of CFGs & PDAs.

**Unit 6: CFL's & Non CFL's** **(4 Hrs)**
Pumping Lemma & examples, intersection and complements.

**Unit 7: Turing machines** **(6 Hrs)**
models of computation, definition of TM as language Acceptors, Combining Turing machines, computing a function with a TM.

**Unit 8: Variations in TM** **(5 Hrs)**
TMs with doubly infinite tapes, more than one tape, Non-deterministic TM and universal TM.

**Books :**

1. Introduction to languages & theory of computation -- John C. Martin (MGH)
2. Formal Languages & Automata Theory-- Basavraj S. Anami, Karibasappa K.G., Wiley Precise Textbook-Wiley India

**References :**

1. Theory of Computation—Rajesh K Shukla (CENGAGE Learning)
2. Introduction to Automata theory, languages and computations – John E. Hopcraft, Rajeev Motwani, Jeffrey D. Ullman (Pearson Edition).
3. Discrete mathematical structures with applications to Computer science -- J.P.Tremblay & R.Manohar (MGH)



**Termwork** :
Students should perform 8 to 10 assignments based on the topics below:

1. Regular Expression & Corresponding Languages (Examples)
2. Union, Intersection & Complements of Regular languages (Examples)
3. Design & Simulation of Simple Finite Automata (can be downloaded from Internet & demonstrated)
4. Nondeterministic Finite Automata & NFA with ^ transitions (Examples)
5. Conversion of NFA to DFA(Examples with steps)
6. Examples of types of grammars
7. Removing ambiguity from a grammar (Give grammars which are ambiguous as input)
8. Conversion to BNF & CNF form (Give example grammars & convert them )
9. Simple Simulation of Push Down Automata(can be downloaded from Internet & demonstrated)
10. Pumping Lemma & Examples for regular sets & regular languages
11. Simulation of Simple Turing Machine(can be downloaded from Internet & demonstrated)

# SOLAPUR UNIVERSITY, SOLAPUR

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

### Semester – II

### 3. MICROPROCESSORS

**Teaching Scheme**
**Theory:** 4 Hrs/Week
**Practical:** 2 Hr/Week

**Examination Scheme**
**Theory:** 100 Marks
**Term-Work:** 25Marks
**Practical Oral Exam:** 50 marks

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**Course Objectives**

1) This course aims to provide fundamental principles of 8085 microprocessor, its hardware interfacing and programming.
2) To meet challenges of growing advanced microprocessor technology
3) To provide strong foundation of computer hardware systems.

**Course Outcome**

Students will be able to

1) Study advanced microprocessors with the base of 8085.
2) Understand various instructions that can be further used to design ISA-Instruction Set Architecture
3) Develop good logic for writing programs
4) Understand the basic principles of interfacing and use them for application development.



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**SECTION I**

**Unit 1** : **8085 Architecture** : **(7 Hrs)**
Introduction to microprocessor, Features and pin diagram of 8085, 8085 MPU architecture, Demultiplexing of address and data bus, 8085 clock circuit, Instruction fetching and execution operations of microprocessors, 8085 programming model.

**Unit 2 : 8085 Instruction Set** **(7 Hrs)**
Classification of instruction set, Instruction formats, Addressing modes, Programming techniques with examples.

**Unit 3 : Instruction Timing and State Diagram** **(7 Hrs)**
Timings diagrams of machine cycles and instructions, 8085 WAIT ,HOLD and HALT state, 8085 transition state diagram, Single step and single cycle.

**Unit 4 : Memory and I/O Interfacing** **(5 Hrs)**
Interfacing Multiple Memory Components, Keyboard Interfacing Interfacing and Thumbwheel switches.

## SECTION II

**Unit 5 : Interrupts and Direct Memory Access(DMA) (7 Hrs)**

Hardware and Software Interrupts Interrupt Logic Control Instructions, Interrupt Priority, and Timing Characteristics of Interrupts, Interrupt Acknowledgement Cycle, The 8259 programmable Interrupt Controller, Features and Block Diagram of DMA Controller 8257,Operating modes of 8257.

**Unit 6 : Programmable Peripheral Devices (5 Hrs)**

Block Diagram of 8255 Programmable Peripheral Interface, Modes of 8255, 7 Segment Display using 8255.

**Unit 7 : Serial Data Communication : (5 Hrs)**

Concepts in serial I/O, Study of 8251, Asynchronous and synchronous transmitter and receiver.

**Unit 8 : 8086,80286,80386 Processors (9 Hrs)**

Introduction to the 8086, 80286, 80386 microprocessors. Features and architecture of 8086, 80286, 80386.Segmentation in the 8086 microprocessor.8086 memory system.

**Text Books:**

1. Microprocessor Architecture ,Programming ,and Applications with the 8085 - Ramesh Gaonkar ,Fifth edition.
2. 8 Bit microprocessor –V.J.Vibhute and P.B.Borole.



**Reference Books :**

1. The Intel microprocessors - Barry B.Bray.
2. Microprocessors and interfacing: programming and hardware - Douglas V. Hall

**Termwork:**

Student should perform 8 to 10 experiments from the list given below.

1. Addition and Subtraction of two 16 bit nos.
2. Addition and Subtraction of two 32 bit nos.
3. Multiplication of 8 bit numbers by successive addition and left shift and add methods.
4. Division of 16 bit by 8 bit number.
5. Find the factorial of a given number.
6. Generate the Fibonacci series
7. Arranging N numbers in ascending & descending order.
8. Block transfer –Without overlapping, with overlapping and block reverse.
9. Program to control the speed and direction of stepper motor.
10. Program to implement key board sensing using 8255
11. Implementation of 7-segment display using 8255
12. Program to handle RST 7.5 interrupts.
13. Masking of interrupt using 8259.

# SOLAPUR UNIVERSITY, SOLAPUR

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

### Semester – II

### 4. DATA COMMUNICATION

| Teaching Scheme | Examination Scheme |
|---|---|
| **Theory: 3** Hrs/Week | **Theory:** 100 Marks |
| **Practical:** 2 Hr/Week | **Term-Work:** 25 Marks |

**Course Objectives**

1) To Understand the Fundamentals of Data Communication.
2) To get acquainted with Basics of Computer Networks.
3) To understand the working of different types of Networks.

**Course Outcome**

1) Students will be acquainted with the knowledge of Computer Networks.

### SECTION – I

**Unit 1: Data Communication Fundamentals: (8 Hrs)**

Concepts & Terminology, Analog & Digital data transmission, Transmission impairments, Channel capacity, guided transmission media, Digital data to digital signal encoding.



**Unit 2: Reference Models: (7 Hrs)**

Uses of Computer network, Network hardware, Network software, Types of Network Topologies, OSI reference model, TCP/IP protocol, ATM reference model.

**Unit 3: Data Link Layer (6 Hrs)**

DLL design issues, Error detection & correction, Elementary DLL protocols, Sliding window protocols.

### SECTION – II

**Unit 4: Medium Access Control: (8 Hrs)**

**C**hannel allocation problems, Multiple access protocol: ALOHA, CSMA, CSMA/CD, Collision free protocols, Limited contention protocols, IEEE standards 802.3,802.4,802.5 & 02.6(DQDB), Bridges.

**Unit 5: Network Layer (7 Hrs)**

Network layer design issues, Routing algorithms: shortest path routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical routing, Congestion control algorithms, Internetwork.

**Unit 6: IPv4 Addresses (6 Hrs)**

Introduction, Classful Addressing, Classless Addressing, Special Addressing, NAT

**Text Books:**

1. Data & Computer Communication ( Unit 1)
   William Stallings. (seventh edition) PHI publications.
2. Computer Networks (Unit 2, 3, 4, 5)
   Andrew S. Tanenbaum (third edition) PHI publications.
3. TCP/IP Protocol Suite (Unit 6)
   Behroz A. Forozen (Third Edition)

**Termwork :**

Student should perform 8 to 10 experiments based on the following guidelines.

1. Implementation of simplex, half duplex and full-duplex using RS 232 C (9 pin) standard and bioscom function.
2. File transfer using RS 232C std. and bioscom function.
3. Simulation of different Framing methods. (character count, starting and ending flag etc)
4. Implement error detection method –CRC
5. Implement error detection and correction method of hamming code.
6. Implementation and conversion of frame- sliding window protocol.
7. Implement functions of Bridge for converting 802.x frame into 802.y frame.
8. Implementation of Shortest path routing algorithm.
9. Implementation of Flow – based routing algorithm.
10. Given the IP address find out class , subnetsmask, netid and hostid.

# SOLAPUR UNIVERSITY, SOLAPUR

**S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)**

**Semester – II**

## 5. DATA STRUCUTRES

| **Teaching Scheme** | **Examination Scheme** |
|---|---|
| **Theory: 3** Hrs/Week | **Theory:** 100 Marks |
| **Practical:** 4 Hrs/Week | **Term-Work:** 25Marks |
| | **Practical Oral Exam** : 50 Marks |

**Course Objectives**

1) To develop skills to design and analyze linear and non linear data structures.
2) To strengthen the ability to identify and apply the suitable data structure for problem solving.

**Course Outcome**

1) Students will be able to represent and implement different data structures.
2) Students will be capable to build real time applications using these data structures.

### SECTION I

**Unit 1**: **Stack** **(5 Hrs)**

Definition, representation, Operations, Implementation and applications like conversion of polish notations, evaluation of postfix expressions.



**Unit 2: Queues** **(4 Hrs.)**

Definition, representation, Operations, Implementation: Linear Queue, Circular Queue, Priority Queue.

**Unit 3: Lists** **(7 Hrs.)**

Definition, representation, Operations , Types of Lists: Singly Linked list, Doubly Linked list, Circular Linked list, Stack using linked list, Queue using Linked list, Application of Linked list: Addition and Subtraction of two polynomials.

**Unit 4: Trees** **(6 Hrs.)**

Definition, Traversal of Binary trees, Linked implementation of Binary trees, Operations on Binary trees, Binary search trees, Threaded Binary trees, Introduction to Red-Black Trees.

## SECTION II

**Unit 5: Multiway Trees** **( 5 Hrs.)**

Multiway search Trees, Balanced Multiway Trees, Traversing a Multiway Tree, Insertion in Multiway Tree: B Trees, $B^+$ Trees

**Unit 6: Height Balance Trees** **(7 Hrs.)**

AVL Trees: Definition, Height Of an AVL Tree, Insertion and Deletion of node in AVL Trees, Single and Double Rotation of AVL trees.

**Unit 7: Graphs** **( 8 Hrs.)**

Definition and Examples, Undirected and Directed Graphs, Computer Representation of Graphs, Graph Traversal methods:-Depth First and Breadth First algorithms, Topological Sorting: Depth First and Breadth first, Application: Shortest Path using Dijkstra's algorithm.

**Text Books:**


1. Data Structure and Program Design in C by Robert Kruse/C.L.Tonda/BruceLeung second edition, Pearson Education, Prentice Hall.
2. Data Structures: A Pseudo Approach with C. by Richard.F.Gilberg & Behrouz .A. Forouzan, second edition, Cengage Learning
3. Data Structure using C and C++ by Rajesh.K.Shukla, Wiley Publication




**Reference Books :**


1 Data Structures using C and C++ , second edition by Yedidyah Langram, Moshe J, Augensteen, Aason .M. Tanenbaum.

2 Data Structures and Algorithms by Prof Maria .S. Rukadikar, Shroff Publications.

3 Data Structures Through C in Depth by S.K. Shrivastava, Depali Shrivastava, BPB Publications

# SOLAPUR UNIVERSITY, SOLAPUR

## S. E. (COMPUTER SCIENCE & ENGINEERING / INFORMATION TECHNOLOGY)

### Semester – II

## 6. OBJECT ORIENTED DESIGN AND PROGRAMMING

| Teaching Scheme | Examination Scheme |
|---|---|
| **Theory : - 2 Hrs/Week** | **Term Work :–25 Marks** |
| **Practical : - 2 Hrs/Week** | **Practical Oral Exam: 50 Marks** |

**Course Objectives**

1. To learn fundamental concepts and principles of Object oriented programming with basic C++ syntax and convention.
2. To apply the OO concepts for writing simple Object oriented programs.

**Course Outcome**

1. Students are able to read, understand and analyze simple C++ program.
2. Students are able to apply principle of OOP concept and explorer their skill to develop complex C++ program.

### SECTION I

**Unit 1: OOP Concepts** **(3 Hrs.)**

C++ Programming basics, objects and classes, Array of objects, constructors & Destructors, types of constructors.



**Unit 2: Functions**: **(3 Hrs.)**

Reference arguments, overloaded functions, inline functions, default arguments, returning by reference, friend functions and static functions

**Unit 3: Operator Overloading**: **(4 Hrs.)**

Overloading unary and binary operators, Overloading extraction and insertion operators, data Conversions.

**Unit 4: Inheritance**: **(3 Hrs.)**

Derived class and base class, derived class constructors, over riding member functions, public and private inheritance, multiple inheritances, nesting of classes.

### SECTION II

**Unit 5: Pointers and virtual funtions**: **(4 Hrs.)**

Memory management - new and delete operators, pointers to objects, pointers to Derived classes, this pointer, late binding, pure virtual functions, Abstract classes, Virtual base classes

**Unit 6: Manipulators and File handling**: **(4 Hrs.)**

Introduction, C++ Streams, C++ stream classes, managing output with manipulator, file

stream classes, working with file, object I/O, command line arguments.

**Unit 7: Template and Exception handling** **(4 Hrs.)**

Class Templates, Function template, Exception handling, throwing-catching-rethrowing an exception.

**Unit 8: Introduction to Standard Template library**: **(3 Hrs.)**

Components of STL, Containers, Algorithms, Iterators, Application of Container classes.

**Text Books:**

1. Object Oriented Programming with C++ - E. Balagurusamy (McGraw-Hill)
2. Object oriented programming in Turbo C++ - Robert Lafore (Galgotia)

**Reference Books :**

1. C++ programming language - Bjarne Stroustrup (AT & T)
2. Programming with C++ - D. Ravichandran (TMGH)

**Term Work**:

Student should perform 10 to 12 experiments. Students of different batches should implement different programs based on the following guidelines preferably in Unix/Linux platform.

(A) 8-10 assignments should consist of implementing ALL following concepts –Constructor, Destructor, Function overloading, Constructor overloading, Operator overloading, Multiple inheritance, Multilevel inheritance, Static variables & Function in class, Virtual function, Virtual class, Virtual destructor, Function template, Class template, Friend class and function, File handling, Exception.

(B) 4-5 assignments on implementing object oriented programs for the following

1. Evaluating polynomial expressions (PE) using linked list and performing operations on PE like Multiplication, addition, subtraction, etc.
3. Implementing sorting/searching algorithms using function template and virtual function.
4. Implementing stack/queue using class template.
5. Create a linked list as a object. Perform merging of two objects (linked lists) and splitting of object. (Use operator overloading).
6. Implementing program using STL.