Shivaji University, Kolhapur.

Revised Syllabus And structure of
S.E. Part-I & II
(Information Technology Engineering)
Semester III and IV
(w.e.f. Academic Year 2014-15)
### SHIVAJI UNIVERSITY, KOLHAPUR

*(To be implemented from Academic Year 2014-15)*

**Class : SE Part I (Semester III)  Branch : Information Technology**

<table>
<thead>
<tr>
<th>Name of Subject</th>
<th>Teaching Scheme Per Week</th>
<th>Examination Scheme</th>
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<tbody>
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<tr>
<td>1. Discrete Mathematical Structures</td>
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<tr>
<td>2. Digital System and Microprocessor*</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3. Data Communication*</td>
<td>3</td>
<td>1</td>
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<tr>
<td>4. Fundamentals of Economics and Management</td>
<td>3</td>
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<tr>
<td>5. Statistics &amp; Fuzzy Systems</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>6. Problem solving using C**</td>
<td>3</td>
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<td><strong>Total</strong></td>
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**Class : SE Part II (Semester IV)**

<table>
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<th>Name of Subject</th>
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<tr>
<td>1. Computer Network*</td>
<td>4</td>
<td>-</td>
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<tr>
<td>2. Computer Organization and Architecture*</td>
<td>4</td>
<td>-</td>
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<tr>
<td>3. Data Structures*</td>
<td>4</td>
<td>-</td>
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<tr>
<td>4. Theory of computation</td>
<td>3</td>
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<tr>
<td>5. Software Engineering</td>
<td>3</td>
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<tr>
<td>6. Object Oriented Programming</td>
<td>2</td>
<td>-</td>
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<tr>
<td><strong>Total</strong></td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>
* Note for Online Examinations -:

1. The examination will be having two part viz. part A & part B.
   
   i. Part-A: 50 marks theory paper similar to the existing theory paper exam. The nature of the questions will be descriptive, analytical and problem solving.

   ii. Part-B: 50 marks computer based exam with multiple choice questions (MCQs).

2. The marks obtained in the individual heads should be added and considered as marks of the respective theory paper out of 100 marks.

3. The questions of part-A and part-B will be based on the entire syllabus of the respective subjects.

4. The questions in part-B will be of 1 or 2 marks only.

6. Duration of part-A exam will of 2 hours and that of part-B will be of 1 hour.

7. No separate passing head for part-A and part-B.

8. The scheme of revaluation is not applicable for part-B, however is applicable for part-A

** Theory paper is not applicable to the subject “Problem Solving using C” passing head will be marks obtained in online exam only i.e. minimum 20 marks. Other rules are same.**
SHIVAJI UNIVERSITY, KOLHAPUR  
(To be implemented from Academic Year 2015-16)  

Class : TE Part I (Semester V)  
Branch : Information Technology

<table>
<thead>
<tr>
<th>Name of Subject</th>
<th>Teaching Scheme Per</th>
<th>Examination Scheme</th>
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<td>L  T  P  Total</td>
<td>Theory Paper</td>
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<tr>
<td></td>
<td>Written  Online</td>
<td>T/W    OE   POE</td>
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<td></td>
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<tr>
<td>1. Operating System-I *</td>
<td>3  1  -  4</td>
<td>50    50  25</td>
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<td></td>
<td></td>
<td>125</td>
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<tr>
<td>2. Database Engineering *</td>
<td>4  -  2  6</td>
<td>50    50  25</td>
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<tr>
<td></td>
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<td>-       -       50</td>
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<td>175</td>
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<tr>
<td>3. Computer Algorithms</td>
<td>4  -  -  4</td>
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<td>100</td>
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<tr>
<td>4. System Programming</td>
<td>3  -  -  3</td>
<td>100   -   -</td>
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<td>-       -       -</td>
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<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>5. Object Oriented Modeling and Design</td>
<td>3  1  -  4</td>
<td>100   -   25</td>
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<td></td>
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<td>-       -       -</td>
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<td></td>
<td></td>
<td>125</td>
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<tr>
<td>6. Application Development Tool I</td>
<td>2  -  4  6</td>
<td>-     -   -</td>
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<tr>
<td></td>
<td></td>
<td>50    -   -</td>
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<tr>
<td></td>
<td></td>
<td>-       -       100</td>
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<td>7. Soft skill –I</td>
<td>-  -  2  2</td>
<td>-     -   25</td>
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<td></td>
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<td>-       50      -</td>
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Class : TE Part II (Semester VI)

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<td></td>
<td>L  T  P  Total</td>
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<td>Written  Online</td>
<td>T/W    OE   POE</td>
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<td></td>
<td></td>
<td>Total</td>
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<tr>
<td>1. Computer Graphics*</td>
<td>3  -  2  5</td>
<td>50    50  25</td>
</tr>
<tr>
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<td>-       -       -</td>
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<td></td>
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<td>2. Information Security</td>
<td>3  1  -  4</td>
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<td>3. Internet Technology*</td>
<td>3  -  2  5</td>
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<td>4. Operating System II</td>
<td>3  -  2  5</td>
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<tr>
<td>5. Software Testing &amp; Quality Assurance</td>
<td>3  -  -  3</td>
<td>100   -   -</td>
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<td></td>
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<td>-       -       -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>6. Application Development Tool II</td>
<td>2  -  4  6</td>
<td>-     -   -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50    -   -</td>
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<tr>
<td></td>
<td></td>
<td>-       -       100</td>
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<td>7. Seminar</td>
<td>-  1  -  1</td>
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<td>17  2  10  29</td>
<td>400  100 200</td>
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<td>100   -</td>
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4. The questions in part-B will be of 1 or 2 marks only.

6. Duration of part-A exam will of 2 hours and that of part-B will be of 1 hour.

7. No separate passing head for part-A and part-B.

8. The scheme of revaluation is not applicable for part-B, however is applicable for part-A.
### Class: BE Part I (Semester VII)

<table>
<thead>
<tr>
<th>Name of Subject</th>
<th>Teaching Scheme Per Week</th>
<th>Examination Scheme</th>
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<tbody>
<tr>
<td></td>
<td>L</td>
<td>T</td>
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<tr>
<td>1. Project Management</td>
<td>3</td>
<td>1</td>
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<tr>
<td>2. Mobile Computing</td>
<td>3</td>
<td>1</td>
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<tr>
<td>3. Advance Database Systems</td>
<td>3</td>
<td>-</td>
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<tr>
<td>4. Elective I</td>
<td>3</td>
<td>-</td>
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<tr>
<td>5. Web Technology I</td>
<td>2</td>
<td>-</td>
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<tr>
<td>6. Network Engineering</td>
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<tr>
<td>7. Project I</td>
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### Class: BE Part II (Semester VIII)

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<tbody>
<tr>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1. Storage Networks</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2. Cloud Computing</td>
<td>3</td>
<td>1</td>
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<tr>
<td>3. Information Technology and Business Management</td>
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<td>1</td>
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<tr>
<td>4. Elective II</td>
<td>3</td>
<td>-</td>
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<tr>
<td>5. Advanced Software Technologies</td>
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<td>-</td>
</tr>
<tr>
<td>6. Web Technology II</td>
<td>2</td>
<td>-</td>
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<td>7. Project II</td>
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<td><strong>Total</strong></td>
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<td>3</td>
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<tr>
<td>Elective I</td>
<td>Elective II</td>
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<tr>
<td>1)  Business Intelligence Systems</td>
<td>1)  Introduction To Mainframes</td>
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<tr>
<td>2)  Cyber Forensics</td>
<td>2)  Mobile Apps Development</td>
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<td>3)  Soft Computing</td>
<td>3)  Information Retrieval</td>
<td></td>
</tr>
<tr>
<td>4)  Advanced Computer Architectures</td>
<td>4)  Parallel Programming</td>
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S.E. Information Technology Semester-III (Revised)

1. Discrete Mathematical Structures

Teaching Scheme

Lectures: 4 Hours/week
Tutorial: 1 Hour/Week

Examination Scheme

Theory: 100 marks
Term Work: 25 marks

Prerequisites: Basic knowledge of Set operations and probability theory.

Objectives

To provide knowledge on following topics,

1. Mathematical Logic and its applications
2. Sets, relations and functions
3. Graph theory and its applications
4. Algebraic systems and its applications.

Unit 1. Mathematical Logic (8)
Propositions, logical connectives, Conditionals and Biconditionals, well formed formulas, tautologies, logical equivalences, Inference of Theory for statement Calculus, Predicate Calculus

Unit 2. Sets and Combinatory (8)
Set, finite and infinite sets, Principle of Inclusion and exclusion, Permutations, combinations, Discrete Probability

Unit 3. Relations and Functions (9)
Relations, Properties of binary relations, closure of relations, Equivalence Relations and partitioning, Partial ordering relations and lattices, Functions, composition of functions, invertible functions, recursive functions

Unit 4. Graph Theory (8)
Basic Terminology, Multi graph and weighted graphs, Diagraphs and relations, Representation of graphs, Paths and circuits, Eulerian and Hamiltonian Paths and Circuits, Graph coloring
Unit 5. Groups  
Algebraic Systems, Semi Groups, Groups, Monoid, Abelian Groups, subgroups, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups

Unit 6. Lattices and Algebraic Systems  
Lattices and Algebraic Systems, Principle of duality, Properties of Algebraic system defined by Lattices, Boolean Lattices and Boolean Algebras, Boolean functions and Boolean Expressions, Normal Forms.

Text Books

1) Elements of Discrete Mathematics- C. L. Liu and D. P. Mohapatra, 4Edition McGraw-Hill,

Reference Books

1) Discrete Mathematics - Semyour Lipschutz, Marc Lipson (MGH), Schaum’s outline Series.
3) Discrete mathematics and its applications - Kenneth H. Rosen (AT&T Bell Labs)
4) Discrete Mathematics With Proof, 2nd Ed, ERIC GOSSETT,Wiley India Ltd.

Term Work: It should consist of minimum 06-08 assignments based on above subjects and GATE papers.
S.E. Information Technology Semester-III (Revised)

2. Digital System and Microprocessor

Teaching Scheme

Lectures: 3 hrs / week  
Practical : 2 hrs / week  
Tutorial : 1 hr/Week

Examination Scheme

Theory:50 marks  
Online Exam:50  
Term work: 25 marks  
POE: 50 marks

Prerequisites:  
Fundamentals of Electronics and Computers, basic number system.

Objectives:

1) To provide knowledge of basic arithmetic and logical operations in digital systems.  
2) To provide hands on knowledge about different sequential and combinational logic design.  
3) To provide knowledge about construction & working of basic 8 bit microprocessor and peripheral.  
4) To provide knowledge about assembly language programming.  
5) To provide knowledge about working of different instructions using timing diagrams.

Unit 1. Fundamental Concepts:-  
Analog and digital systems, representation of signed numbers,2’s complement arithmetic, BCD addition & subtraction, octal & Hexadecimal addition and subtraction, Derived gates.

Unit 2. Boolean algebra & combinational logic design:  
Reduction of Boolean expressions, Boolean function representation, expansion of Boolean expression (standard SOP & POS),simplification of boolean expressions using K-map (upto 5 variable), prime implicants, Adders & Subtractors design using gates, Multiplexer, implementation of expression using MUX, Demultiplexer, decoder(74138), BCD to 7 segment decoder.

Unit 3. Sequential Logic Design:  
Unit 4. Microprocessor Architecture & Memory Interfacing: 

The 8085 MPU, Microprocessor communication and bus timing, De-multiplexing address and Data bus, Generating control signals, The 8085 Architecture, op-code fetch machine cycle, memory read and write machine cycle. Memory interfacing-memory structure, memory interfacing & address decoding.

Unit 5. Programming techniques: 

8085 instruction groups, addressing modes Writing and execution assembly language program, counters & delays, Stack, Instruction related to stack execution of CALL and RET, The 8085 interrupt, RST instructions, vectored interrupts, RIM and SIM instructions.

Unit 6. Interfacing I/O devices: 

Basic interfacing concepts, peripherals i/o instructions - IN, OUT, I/O execution, memory mapped I/O, I/O mapped I/O. The 8255 programmable peripheral interface, operating modes (I/O, BSR).

Textbook:

2. Microprocessor architecture, programming & applications-Ramesh S. Gaonkar, New Age International publication.

Reference Books:

2. Digital Design –Morris Mano, Pearson Education

Term work:

Term work should consist of minimum of 10-12 experiments based on following topics.

1. Study of Basic gates.
2. Study of Universal gates.
3. Study of Boolean algebra & De Morgan’s theorem using gates.
4. Study of MUX/DEMUX.
5. Study of 74138.
6. Study of R-S and J-K flip-flops
7. Study of counters
8. Interfacing of counters to seven segment display

9. Realization of 4/5 variable K-maps

10. Study of 8085 processor data transfer instructions using timing diagrams.

11. Assembly language programming for 8085 (Arithmetic, Logical and data transfer, interrupts-Minimum 6 programs using kits)
S.E. Information Technology Semester-III (Revised)

3. Data Communication

Teaching Scheme

Lectures: 3 hrs / week
Tutorial: 1 hrs / week

Examination Scheme

Theory: 50
Online: 50
Term Work: 25

Prerequisites: Basic knowledge of Computer fundamentals.

Objectives

1) To provide knowledge about various types of networks, topologies.
2) To learn data encoding techniques
3) To understand concepts of OSI reference model and real world protocol suite TCP/IP
4) To provide students in-depth knowledge of multiplexing techniques.
5) To get familiar with hardware components required to build network.

Unit 1. Data Communication Fundamentals

Data Communication – Definition, Components, Data representation, Data Flow
Networks – Definition, Uses, Topologies, Categories, Internet – History, ISP hierarchy,
Protocols & Standards – Protocols, Standards, Standards Organizations

Unit 2. Data & Signals

Analog & Digital data, Analog & Digital signals, Transmission Impairments,
Data Rate Limits, Performance.

Unit 3. Data Encoding

Digital-to-Digital conversion – Line coding, Block coding, scrambling, Analog-to-Digital
conversion – Pulse code modulation, delta modulation, Digital-to-Analog conversion – ASK,
FSK, PSK, Analog-to-Analog conversion – AM, FM, PM
Unit 4. Multiplexing & Switching [6]
Parallel and serial transmission, Asynchronous and Synchronous transmission, Multiplexing – Frequency, Wavelength, Time-division, Switching – Circuit switched, Packet switched, Message switched, Structure of switches

Unit 5. Network Models [6]
Layered architecture, OSI reference model, TCP/IP reference model, ATM model, Network Addressing – Physical, Logical Port

Unit 6. Networking Components [8]

Text Books:

Reference Books:
3. Data Communication & Networks: An Engineering Approach by Irvine, Wiley India Ltd.

Open Source Resources:
1. www.ietf.org
2. www.ietf.org/rfc.html

Term Work: It should consist of minimum 06-08 assignments based above syllabus
S.E. Information Technology Sem.-III (Revised)


Teaching Scheme                                                  Examination Scheme
Lectures: 3 Hours/Week                                            Theory: 100 marks

Objectives: To provide knowledge of following,

1) The fundamentals of economics and its application
2) The basics of cost concepts
3) The importance of market
4) The principles of management
5) The basic financial concepts

Unit 1. Introduction to Economics
Definitions, Scope of Economics (Macro, Micro, International Industrial, Environmental, Public Finance, Managerial economics etc.) Managerial Economics meaning definition and decision making process. Basic terms in Economics: Economic Resources, firm - type of firms, goods, services, utility, value & wealth.

Unit 2. Demand and Supply Analysis
Meaning of Demand - types, determinants, demand function, law of Demand, and elasticity of demand supply - determinants, supply function and elasticity of supply.

Unit 3. Basic Cost Concepts
Production function, Law of variable proportions, Returns to scale, production optimization and uses of production function. Cost Concepts - Types - Short run and long run costs - (total, fixed, variable, marginal Average and opportunity cost )
Unit 4. Markets

Meaning of market – Types of Market-Perfect competition, Monopoly, oligopoly and monopolistic competition

Unit 5. Principles of management

Nature and importance of management, levels of management, fundamental managerial skills, functions of management, Henry Fayol’s principles of management, motivation theory: X and Y

Unit 6. Basic Financial concepts

Basic concept of :- Business, Capital, Assets, Liabilities, interest, Profit & Loss, Balance Sheet and related concept Profit & Loss Statement and related concepts.

Text Books:

1. Managerial Economics by Geetika, Payalii Ghosh, Puraba Roy Choudhury Publisher The Tata McGraw-Hill companies, New Delhi 2008 (units 1 to 4)
2. Essential of management by Harold koonez and Heinz, Weihrich- Tata McGraw Hill for Principles of management (unit-5)

Reference Books:

1. Fundamentals of Engineering Economics by Pravin Kumar, Wiley India Ltd.
S.E. Information Technology Semester-III (Revised)

5. Statistics and Fuzzy Systems

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination scheme</th>
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</thead>
<tbody>
<tr>
<td>Lectures: 4 Hours per Week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Tutorial: 1 Hour per Week</td>
<td>Term Work: 25 Marks</td>
</tr>
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</table>

Prerequisites: Knowledge of basics Probability theory & statistics.

Objective:
To provide knowledge on following topics

1) Curve fitting and Numerical Methods Techniques
2) Probability Distribution
3) Linear Programming Techniques
4) Fuzzy Logic and its applications
5) Transportation problems and its solutions

Unit 1. Curve Fitting and Numerical Methods (12)

Unit 2. Probability Distribution: (8)
Random variable, Binomial Distribution, Poisson Distribution, Normal Distribution

Unit 3. Linear Programming Problem (8)
Introduction and formulation of LPP, Simplex Method to solve maximization type LPP only

Unit 4. Introduction to Fuzzy sets: (6)
Basic concepts of fuzzy sets, Crisp set and Fuzzy set, membership functions, Basic operations on fuzzy sets, Properties of fuzzy sets
Unit 5. Fuzzy Arithmetic: (8)

Fuzzy numbers, Fuzzy cardinality, Operations on Fuzzy numbers, Fuzzy equations of type $A + X = B$ and $A.X = B$

Unit 6. Transportation and Assignment Problems: (10)

Text Books:
3. Operations Research by S. D. Sharma
4. Fuzzy sets and Fuzzy Logic by George J. Klir, Bo Yuan.

Reference Books:
1. Fuzzy logic with Engineering Applications 3ed Ross, Wiley India.

General Instructions:
1. For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch should be as per university pattern for practical batches.
2. Minimum number of assignments should be 8 which should cover all topics.
S.E. Information Technology Semester-III (Revised)

6. Problem Solving using C

Teaching Scheme

Lectures: 3 Hours/week
Practicals: 4 Hours/Week

Examination Scheme

Online Exam: 50 marks
TermWork: 50 marks
POE: 50 marks

Prerequisites: Basic knowledge of Electronics and Computers.

Objectives

1. To understand C programming environment.
2. To develop problem solving skills amongst the students.
3. To write, compile and debug programs in C language.
4. Implement C programs for various problem statements.

Unit 1. Introduction to Programming and Problem Solving (6)

The meaning of algorithms, Flowcharts, Pseudo codes, Writing algorithms and drawing flowcharts for simple exercises, Memory concepts, C Program development environment, Types of problems, problems solving with computers, difficulties with problem solving, Problem Solving Aspects, Problem Solving Concepts for computer, Programming Concepts – communicating with computers, organizing the problem, using the tools, Top down design

Unit 2. Introduction to ‘C’ Language (6)

Importance of ‘C’ Language, Sample ‘C’ Program, Structure of ‘C’ Program, Constants, variables and data types. Operators and expressions, Managing input / output operations, Control statements.
Unit 3. Functions

Need for user defined functions, elements of User defined functions, defining functions, return values and their types, function calls, function declaration, methods of parameter passing, user defined and library functions.

Unit 4. Arrays and Strings

The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, multidimensional arrays. Declaring and initializing string variables, reading string from terminal, writing string to screen, arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions.

Unit 5. Structures and Pointers

Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, operations on individual members, array of structures, structures and functions, Unions.

Understanding pointers, accessing the address space of a variable, declaring and initialization pointer variables, accessing a variable through its pointer, pointer expressions, pointers and arrays, pointer and character strings.

Unit 6. File Management in C

Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments.
**Text Books**


**Reference Books**

1. The ‘C’ Programming Language, By B.W. Kernigghan and D. M. Ritchie, Pearson Education.
2. C Programming Laboratory : Handbook for Beginners by Sidnal, Wiley India Limited.

**List for Practicals**

Lab Work will consist of minimum 15 experiments to be completed by students in a batch on following topics. For programming student should use open source software.

Simple Programs using basic datatypes, scanf, printf, format specifiers
Programs using conditional control statements if-else, Switch-case
Programs using looping constructs while, do-while, for
Programs on following problem statements :-:
Finding biggest of three numbers, to find roots of given quadratic equation, to find the biggest and smallest of given set of numbers, Exchanging values of two variables, Counting, summation of set of numbers, factorial computation, sine function computation, Fibonacci series, reverse of digit, BCD conversion, Char to number conversion, Factoring methods - Square root of number, smallest divisor, GCD of two number, prime number, prime factors of integer, pseudo random number generation, raising the number to a large power, Matrix operations (addition, multiplication, transpose etc.), String operations and manipulation (finding length, reverse, change case etc.), Demonstrate structures
S.E. Information Technology Semester-IV (Revised)

1. Computer Network

Teaching Scheme
Lectures: 4 Hours per Week
Practicals: 2 Hour per Week

Examination scheme
Term Work: 25 Marks
Theory: 50 Marks
Online: 50 Marks
POE: 50 Marks

Prerequisites: Data Communication

Objectives:

1) To provide knowledge about local area networks, types of computer networks.
2) To understand computer network protocols and wireless protocols.
3) To understand functionalities of different layers
4) To provide knowledge about internet layer protocol.
5) To provide knowledge about routing protocol and functionality of application layer.

Unit 1: Introduction to Computer Network

Define Networking, Advantages & Use of networks, types of Networks, Addressing, Underlying technologies for LAN, WAN and switched WAN. [4]

Unit 2: Data Link Layer [10]

Framing, Error Control, Flow Control, Error detection & correction codes
Elementary data link protocols- Simplex, Stop & Wait, Simplex for noisy channel.
Sliding window protocols – 1-bit, go back n, selective repeat
Channel allocation- static, dynamic
Multiple access protocols: Aloha, CSMA, Collision Free Protocols
IEEE 802 Standards for LAN and MAN – 802.3, 802.4, 802.5

Unit 3: Network Layer [10]

Unit 4: Internet Protocol

IP Datagram format, Fragmentation and reassembly models, ARP and RARP, ICMP and IGMP

Unit 5: Transport Layer

The Transport service primitives
UDP: Process to Process communication, User Datagram Format, Operation and uses of UDP.
TCP: TCP Services and Features, TCP segment format, TCP Connections, Flow and error control in TCP, TCP Timers
Berkeley Sockets: Socket Addresses, Elementary Socket system calls byte ordering and address conversion routines, connectionless iterative server, Connection Oriented concurrent server, TCP and UDP Client server Programs.

Unit 6: Routing Protocols and Application Layer

Routing Protocols : Introduction and background, RIP, OSPF, BGP
Application Layer : DNS, Electronic Mail, Telnet, FTP, HTTP ,WWW, Multimedia.

Text Books:

2. TCP/IP protocol suite , B A Forouzan ,TMGH.

Reference Books:

1. Unix Network Programming , W Richard Stevens, PHI.

Term Work: It should consist of 10-12 experiments based on the syllabus and should be implemented by using Socket Programming. The study experiments should consist of some practical work and observation.
Set of assignments is listed below:
1. Study and demo of LAN, WAN and various connecting devices and components
   List out component and devices required for a std. LAN, WAN
2. Study, design and configuration of IEEE 802.3 Ethernet and IEEE 802.11 Wireless LANs (Referring RFCs)
3. Study of following connectivity test tools with all its options –
   • ifconfig, arp, route, traceroute
   • nmap, netstat, finger
4. Implementing Framing methods
5. Implementing Elementary data link protocol (Stop & wait protocol)
6. Implementation of Error correction and Error detection codes
7. Program to understand IP addressing, classful & classless addressing.
8. Implementation of sliding window protocol.
9. Implement shortest path routing algorithm
10. Programs for connection oriented (TCP) client-server using socket programming
11. Programs for connection less (UDP) client-server using socket programming
12. Study of network protocol analyzer (Wire-Shark) and understanding packet formats for UDP, TCP, ARP, ICMP protocols.
S.E. Information Technology Semester-IV (Revised)

2. Computer Organization and Architecture

Teaching Scheme  
Lectures: 4 Hours per Week

Examination scheme  
OnlineExam: 50 Marks
Theory: 50 Marks

Prerequisites: Fundamentals of Electronics and Computer, Digital System and Microprocessor

Objectives:
To provide knowledge of

1) Different components of CPU and their interaction

2) Different processor architectures

3) Overall CPU design and its memory organization.

Unit 1. Computing and Computers: (6)


Unit 2. Design Methodology (10)

System Design: System Representation, Design Process: The Gate level- Combinational logic—Full Adder, Four bit ripple carry adder, Sequential logic: serial adder, 4-bit stream serial adder, The Register level: Register level components- Word Gates, Multiplexers to implement a full adder, Decoders, Encoders Arithmetic Elements: Design of 4-bit magnitude comparator, Registers, Programmable Logic Devices: PLA implementation of adder, Register Level Design: 4-bit stream serial adder, Processor level design: prototype structure, performance measurement, Queuing models

Unit 3. Processor Basics: (8)

CPU Organization: Fundamentals, Study of design and architecture of a small accumulator based CPU, Architecture extensions, A typical CPU with general register
organization, pipelining, RISC Machines: Organization of ARM6, CISC Machines: Organization of 68020, Data representation: Fixed- Point Numbers, Floating Point Number- The IEEE 754 floating pointing numbers, Instruction Set: Instruction Formats, Addressing Modes, Instruction Types.

Unit 4. Datapath Design


Unit 5. Control Design

Hardwired Control: Design of DMA controller, Design Examples: Multiplier Control, Implementing a multiplier control unit, CPU control unit: Control unit design: Implementing a program control unit.

Unit 6. Memory Organization

Memory: Memory device Characteristics, Random access memories: A commercial 64Mb DRAM chip, Serial-Access Memories: A commercial magnetic hard-disk memory unit, Memory Systems: Multilevel memories, Address translation, Memory allocation, Caches: Cache organization, Cache operation, Address Mapping.

Text Books:


Reference Books:

2) Computer Architecture & Organization An Integrated Approach , Miles Murdocca, Vincent Heuring Wiley India Edition
S.E. Information Technology Semester-IV(Revised)

3. Data Structures

**Teaching Scheme**
Lectures: 4 Hours per Week  
Practical: 4 Hours per Week

**Examination scheme**
Term Work: 50 Marks  
POE: 50 Marks  
Online Exam: 50 Marks  
Theory: 50 Marks

**Prerequisites:** Fundamentals of Electronics and Computer, Problem solving using C

**Objectives:**
To provide knowledge on following topics,
1) The concept of Algorithms, its Pseudo code representation and Analysis
2) The concept of abstract Data type and its application in implementing linear and Non Linear Data Structures
3) Various operations on Data Structures like searching, sorting and their complexities
4) Techniques to analyze a problem, select and Design the appropriate Data structure and Algorithms for the problem

**Unit 1. Algorithm Basics and Recursion** (7)

**Unit 2. Sequential Representation of Linear Data Structures** (7)
Stack, Operations on Stack, Applications of Stack, Queue, Operations on Queue, Applications of Queue, Priority Queues

**Unit 3. Linked Representation of Linear Data Structures** (8)
Limitations of static memory allocation. Dynamic memory allocation, Singly, doubly and circular linked list, stack using linked list, Linear and circular queue using linked list, Operations like insertion, deletion, traversal & other operations on these data structures.
**Unit 4. Nonlinear Data Structures : (TREES)**

Basic Concept and Terminology, Data structure for binary trees. Algorithms for tree traversals, Heaps, Binary search trees (BST), algorithms on BST and applications, AVL tree. B and B++ trees (Theoretical aspects only).

**Unit 5. Non Linear Data Structures (Graphs)**

Concepts and terminology of graph, Representation of graph using adjacency matrix and adjacency list, Graph traversal Techniques (Depth first and Breath first search), Applications of Graphs as Minimum spanning Tree and shortest path algorithm.

**Unit 6. Searching and Sorting Techniques:**

Need of sorting and searching, Sequential Search, Binary Search, Analysis of Searching Techniques (Best, Average and worst case)., Hashing Techniques, Types of Hash Functions, Collision resolution techniques, open and closed hashing, Bubble sort, insertion sort, selection sort, heap sort, Merge sort, quick sort, Analysis of sorting Techniques (Best, Average and worst case).

**Text Books:**

1) Data structures A pseudocode Approach with C. Richard Gilberg & Behrouz Forouzan Cengage Learning (*For Unit:1,2,3,4,5*)

2) Data structures with C by Semour Lipschutz, Schaum Series (TMH) (*For Unit:6*)

**Reference Books:**

1) Fundamentals of Data Structures in C E. Horowitz , S.Sahani, S. Anderson-Freed
2) Data Structures through C Yashwant Kanetkar BPB Publication
**List of Practical**

Lab Work should consist of minimum 15 experiments to be completed by students in a batch on following topics. For programming student should use open source software such as Code – Block, GCC on Linux/Ubuntu platform and for debugging GDB tool can be used.

**Suggested List of Experiments:**

1. Implement Sorting Methods using functions- Bubble Sort, Selection Sort, Insertion Sort.
2. Implement Sorting Methods using recursion- Quick Sort and Merge Sort.
3. Implement Searching Methods- Sequential Search, Binary Search.
4. Implement Stack as an ADT using Array. Use this ADT to perform expression conversion and evaluation (infix to postfix, infix to prefix, prefix to infix, prefix to Postfix, postfix to infix and postfix to prefix).
5. Represent Circular Queue using Linked List and write a program to perform Operations like Insert, Delete, Finding front and rear element, Display.
6. Write a menu driven program to perform following operations on singly linked list/Circular linked list/ Doubly linked list: Create, Insert – Start, end, In Between, Search & delete, Display etc.
7. Create two Singly Linked lists, sort them and Merge these two lists into one list without creating a new node or swapping of the data.
8. Represent a polynomial using Circular Linked List and write a menu driven program to perform Addition.
9. Creation of binary search tree and perform recursive and non recursive in order, preorder and post order Traversals.
10. Write a program to represent a given graph using adjacency list and perform DFS and BFS.
11. Implementation of Heap sort
12. Implementation of Hashing
4. Theory of Computation

**Teaching Scheme**
- Lectures: 3 Hours per Week
- Tutorial: 1 Hours per Week

**Examination scheme**
- Term Work: 25Marks
- Theory: 100 Marks

**Prerequisites:** Discrete Mathematical Structures

**Objectives:**
To provide knowledge on following topics,

1) Formal languages like Regular Language and Context free Language

2) Representation of Regular language as Regular Expression and Context free languages as context free grammar

3) Model of Language acceptors like Finite Automata for Regular Language and Push Down Automata for Context free Language

4) Turing Machines and its types

5) Turing Machine as model of computation

**Unit 1. Regular Expressions** (6)
- Recursive Definitions, Definition and types of grammars and languages, Regular expressions and corresponding regular languages, examples and applications, unions, intersection & complements of regular languages, Applications of regular expressions

**Unit 2. Finite Automata** (8)
- Finite automata definition and representation, Nondeterministic F.A. , NFA with null transitions, Equivalence of FA’s , NFA’s and NFA’s with null transitions. Equivalence of
regular expressions and finite automata, Minimization of Finite Automata, Application of Finite Automata

Unit 3. Context Free Grammars

Context Free Grammar- Definition, derivations, languages of a grammar, BNF and CNF notations, derivation and parse tree, Ambiguity in grammars and languages: removal of ambiguity, Union, Concatenation and *'s of CFLs, Normal forms, Eliminating unit productions, and Null-productions, Regular Grammar, Application of Context free grammar

Unit 4. Push Down Automata

Definition, The Language of PDA, Deterministic PDA and Non Deterministic PDA, Acceptance by Final state and empty stack, Equivalence of PDA's and CFG- CFG to PDA, PDA to CFG

Unit 5. Parsing and Properties of Context Free Language

Parsing – Top-Down, Recursive Descent and Bottom-Up Parsing, Pumping lemma for Context free language, intersection and complement of Context free language

Unit 6. Turing Machine

Turing Machines-models of computation, definition of TM as Language acceptors, combining Turing machines, computing a function with a TM, Variations in TM- TMs with doubly-infinite tapes, more than one tape, Non-deterministic TM and Universal TM.

Text Books:

1) Introduction to languages & Theory of computations – John C. Martin (MGH)

Reference Books:

2) Introduction to Theory of Computations – Michael Sipser (Thomson Brooks / Cole)
3) Theory of Computation : A problem solving Approach by Mahesh, Wiley India Ltd.

Term work: It should consist of minimum 10 to 12 assignments based on above topics
S.E. Information Technology Semester-IV(Revised)

5. Software Engineering

Teaching Scheme
Lectures: 3 Hours per Week
Tutorial: 1 Hour per Week

Examination scheme
Term Work: 25 Marks
Theory: 100 Marks

Prerequisites: Problem solving using C

Objectives:
To provide knowledge on following topics,

1) A general understanding of software process models such as the waterfall and evolutionary models.
2) An understanding of software requirements and the SRS document.
3) An understanding of design and implementation issues such as modularity and coding standards.
4) An understanding of approaches to verification and validation including static analysis, and reviews
5) An understanding of software testing approaches such as unit testing and integration testing

Unit 1. Introduction and Software Process (6)

Unit 2. Software Requirement Analysis and Specifications (6)
Software Requirements, Problem Analysis, Requirements Specification, Functional Specifications with use cases, Validation, Metrics

Unit 3. Function Oriented Design (6)
Design Principles, Module-Level Concepts, Design Notation and Specification, Structured Design Methodology, Verification, Metrics

**Unit 4. Object Oriented Design & Detailed Design**

OO Analysis and OO Design, OO Concepts, Design Concepts, UML, A design Methodology, Metrics, Detailed Design and PDL, Verification, Metrics

**Unit 5. Coding**

Programming Principles and Guidelines, Coding Process, Refactoring, Verification, Metrics

**Unit 6. Testing**


**Text Books:**

1) An Integrated approach to Software Engineering’ 3rd edition , Narosa publication,

**Reference Books:**

1) Software Engineering- A Practitioner’s Approach – Roger S. Pressman (TMH)
2) Software Engineering- Ian Sommerville – Pearson
3) Software Engineering by Kogent Wiley India Limited.

**Guidelines for conducting tutorials:**

Students in a batch shall be divided in a group of 3-4 students for the purpose of tutorial. Case studies shall be based on the text books and reference book given in the syllabus.

For tutorials brainstorming sessions, group discussions and presentations shall be used as assessment tools. Some case studies from industries may be considered.

The focus will on creating the software engineering documents for a sample project for the whole SDLC. Templates for the case studies are currently available at the link [http://www.iiitd.edu.in/~jalote/jalotesebook/JaloteSEbook/](http://www.iiitd.edu.in/~jalote/jalotesebook/JaloteSEbook/). Please use the same templates

The performance of a student in a batch shall be periodically assessed by the concerned batch teacher. The assessment will be considered for determining term work marks
S.E. Information Technology Semester-IV (Revised)

6. Object Oriented Programming

Teaching Scheme
Lectures: 2 Hours per Week
Practical: 2 Hours per Week

Examination scheme
Term Work: 25 Marks
POE: 50 Marks

Prerequisites:
Problem solving using C

Objectives:
To provide knowledge on following topics,

1) Limitations of Procedural programming and Benefits of Object Oriented Programming

2) OOPs concepts like Class, Objects, Data hiding, Data Encapsulation, Data Abstraction, Inheritance and polymorphism and their implementation using C++

3) File handing using object oriented concepts

4) Advanced features like Generic programming using Templates, STL and Exception Handling

Unit 1. Introduction to Object Oriented Programming:
Introduction to procedural, object-oriented programming, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism.

Unit 2. Basics of C++ programming:
Variable declarations, global scope, const variables, reference variables, function prototypes, functions with default arguments, call by value, call by reference, returning by reference, call by pointer, inline functions, constant arguments, ‘cin’, ‘cout’, formatting and I/O manipulators, Classes and Objects defining Class, data members, member functions, Access specifiers – public, private, protected, constructor, destructor, array of objects, passing objects to functions, returning object.

Unit 3. Inheritance:
Need of Inheritance, Concept, public, private, protected inheritance, Single inheritance, Multiple and multilevel inheritance, Hybrid Inheritance, Virtual base class, overriding of member functions, static variable, static function, friend function, friend class
Unit 4. Polymorphism:
Pointers basics of memory management, New and delete operators, Pointer to object, Pointer to data members, this pointer. Need of Polymorphism, concept, Compile time polymorphism or early binding: function over loading and operator overloading, operator overloading using member function and friend function, overloading - unary, binary, arithmetic operators, relational operators, Overloading new and delete operators, insertion and extraction operators, Run time polymorphism or late binding using Virtual function, pure virtual function, Abstract class, Type conversion

Unit 5. Files and Streams:
Concept of Streams, concept of File, opening and closing a file, detecting end-of-file, file modes, file pointer, reading and writing characters, strings and objects to the file, operations to move file pointers i.e seekg, seekp, tellg, tellp.

Unit 6. Advanced C++ features:
Introduction to Generic Programming using Templates: Function template and class template, Introduction to Standard Template Library (STL), containers, iterators and algorithms, study of container template classes for vectors and stacks and related algorithms
Exception handling: Introduction, syntax for exception handling code: try-catch-throw, Multiple Exceptions, Exceptions with arguments

Text Books:
3) C++ programming: From Problem Analysis to Program Design Fifth Edition -D.S. Malik (Cengage Learning)
4) C++ Programming with language –Bjarne Stroustrup (AT & T)

Reference Books:
2) Object oriented Programming in C++ 3rd Edition-R.Lafore (Galgotia Publications)
3) C++ programming –John Thomas Berry(PHI)
4) Object –Oriented Analysis & Design: Understanding System Development with UML 2.0 , Docherty, Wiley India Ltd.
5) http://www.spoken-tutorial.org/ NMEICT Project of Govt. Of India.

Laboratory Work:
Minimum 10-12 Experiments are to be performed in batches, on above topics.

Term work
It should comprise detailed documentation on the below 10-12 experiments. Students in batches should implement programs based on the following topics preferably on Linux platform.

1. Implementation of Inline functions, functions with default arguments, reference parameters
2. Implementation of Class Objects, Constructor, destructor, constructor overloading
3. Implementation of Functions overloading
4. Implementation of Operator overloading
5. Implementation of Multiple and multilevel inheritance using virtual base class
6. Implementation of Virtual function
7. Implementation of Static variable, Static functions
8. Demonstration of Pointers- new, delete operators
9. Implementation of Friend function, friend class
10. Implementation of class and function Templates
11. Implementation of Exception Handling
12. Implementation of File Handling using OOP concepts
13. Demonstration of STL in C++
### S.E.( Information Technology ) SEM III and IV (Revised)

**Equivalent Subjects for 2014-15 onwards syllabus**

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<th>Sr. No.</th>
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<td>Discrete Mathematical Structures</td>
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<td>Data Structure and Algorithms</td>
<td>Data Structures</td>
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<td>Digital System and Microprocessor</td>
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<td>4.</td>
<td>Theory of Computer Science</td>
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<td>Applied Mathematics - II</td>
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