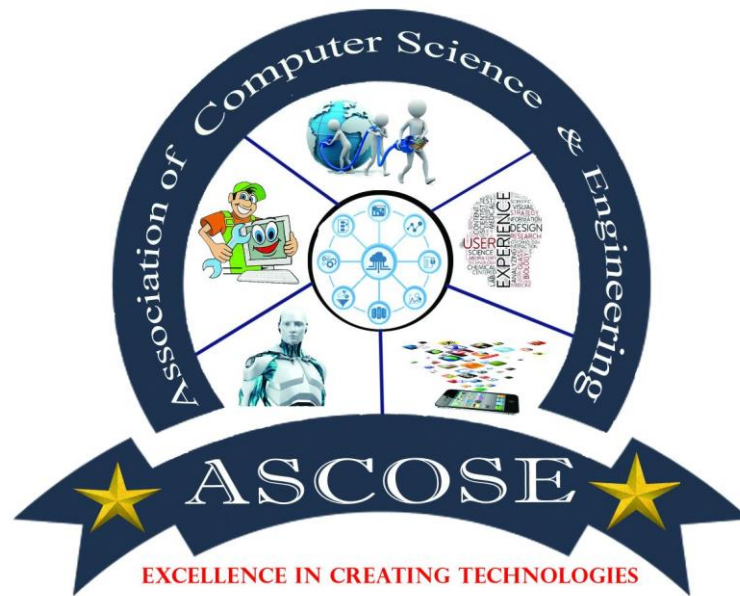




# **SRI VENKATESHWARAA COLLEGE OF ENGINEERING & TECHNOLOGY**

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University, Puducherry.)  
13-A, Villupuram – Pondy Main road, Ariyur, Puducherry – 605 102.  
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## **Department of Computer Science and Engineering**



**Revised  
Regulations, Curriculum & Syllabus  
(for all semesters)  
Effective from the academic year 2013-2014**

**PONDICHERRY UNIVERSITY  
RV NAGAR, KALAPET, PUDUCHERRY – 605 014**

### III Semester

Code	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<b>Theory</b>							
MA T31	Mathematics –III	3	1	-	4	25	75	100
CS T32	Electronics Devices and Circuits	3	1	-	4	25	75	100
CS T33	Object Oriented Programming and Design	3	1	-	4	25	75	100
CS T34	Digital System Design	3	1	-	4	25	75	100
CS T35	Data Structures	3	1	-	4	25	75	100
CS T36	Computer Organization and Architecture	3	1	-	4	25	75	100
	<b>Practical</b>							
CS P31	Electronics Devices and Circuits Laboratory	-	-	3	2	50	50	100
CS P32	Data Structures Laboratory	-	-	3	2	50	50	100
CS P33	Digital System Design Laboratory	-	-	3	2	50	50	100
	<b>Total</b>	<b>18</b>	<b>6</b>	<b>9</b>	<b>30</b>	<b>300</b>	<b>600</b>	<b>900</b>

### IV Semester

Code No	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<b>Theory</b>							
MA T41	Mathematics –IV	3	1	-	4	25	75	100
CS T42	Microprocessors and Microcontrollers	3	1	-	4	25	75	100
CS T43	Automata Languages and Computations	3	1	-	4	25	75	100
CS T44	Design and Analysis of Algorithms	3	1	-	4	25	75	100
CS T45	Object Oriented Programming	3	1	-	4	25	75	100
CS T46	Graphics and Image Processing	3	1	-	4	25	75	100
	<b>Practical</b>							
CS P41	Microprocessors and Microcontrollers Laboratory	-	-	3	2	50	50	100
CS P42	Design and Analysis of Algorithms Laboratory	-	-	3	2	50	50	100
CS P43	Object Oriented Programming Laboratory	-	-	3	2	50	50	100
SP P44	Physical Education *	-	-	-	-	-	-	-
	<b>Total</b>	<b>18</b>	<b>6</b>	<b>9</b>	<b>30</b>	<b>300</b>	<b>600</b>	<b>900</b>

### V Semester

Code	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UEE	TM
	<b>Theory</b>							
CS T51	Operating Systems	3	1	-	4	25	75	100
CS T52	Computer Networks	3	1	-	4	25	75	100
CS T53	Database Management Systems	3	1	-	4	25	75	100
CS T54	Language Translators	3	1	-	4	25	75	100
CS T55	Software Engineering	3	1	-	4	25	75	100
	<b>Practical</b>							
CS P51	Operating Systems Laboratory	-	-	3	2	50	50	100
CS P52	Computer Networks Laboratory	-	-	3	2	50	50	100
CS P53	Database Management System Laboratory	-	-	3	2	50	50	100
HS P54	General Proficiency – I	-	-	3	1	100	-	100
	<b>Total</b>	<b>15</b>	<b>5</b>	<b>12</b>	<b>27</b>	<b>375</b>	<b>525</b>	<b>900</b>

### VI Semester

Code	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<b>Theory</b>							
CS T61	Enterprise Solutions	3	1	-	4	25	75	100
CS T62	Embedded Systems	3	1	-	4	25	75	100
CS T63	Web Technology	3	1	-	4	25	75	100
	Elective –I	3	1	-	4	25	75	100
	Elective –II	3	1	-	4	25	75	100
	<b>Practical</b>							
CS P61	Enterprise Solutions Laboratory	-	-	3	2	50	50	100
CS P62	Embedded Systems Laboratory	-	-	3	2	50	50	100
CS P63	Web Technology Laboratory	-	-	3	2	50	50	100
CS P64	Industrial Visits/Training				1	100	-	100
HS P65	General Proficiency – II	-	-	3	1	100	-	100
	<b>Total</b>	<b>20</b>	<b>4</b>	<b>12</b>	<b>28</b>	<b>475</b>	<b>525</b>	<b>1000</b>

## VII Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<b>Theory</b>							
CS T71	Artificial Intelligence	3	1	-	4	25	75	100
CS T72	Computer Hardware and Network Trouble Shooting	3	1	-	4	25	75	100
CS T73	Platform Technology	3	1	-	4	25	75	100
	Elective-III	3	1	-	4	25	75	100
	<b>Practical</b>							
CS P71	Artificial Intelligence Laboratory	-	-	3	2	50	50	100
CS P72	Troubleshooting Laboratory	-	-	3	2	50	50	100
CS P73	Platform Technology Laboratory	-	-	3	2	100	-	100
CS PW7	Project Work – Phase I	-	-	6	6	200	-	200
	<b>Total</b>	<b>12</b>	<b>4</b>	<b>15</b>	<b>28</b>	<b>500</b>	<b>400</b>	<b>900</b>

## VIII Semester

Code No.	Name of the SubjCSts	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	<b>Theory</b>							
CS T81	Professional Ethics	-	-	3	1	100	-	100
CS T82	Engineering Economics and Management	3	1	-	4	25	75	100
CS T83	Information Security	3	1	-	4	25	75	100
	Elective – IV	3	1	-	4	25	75	100
	Elective-V	3	1	-	4	25	75	100
	<b>Practical</b>							
CS P81	Seminar	-	-	3	1	100	-	100
CS P82	Comprehensive Viva-Voce	-	-	3	1	100	-	100
CS PW8	Projects Work – Phase II	-	-	6	8	300	300	600
	<b>Total</b>	<b>12</b>	<b>4</b>	<b>15</b>	<b>27</b>	<b>700</b>	<b>600</b>	<b>1300</b>

## **Electives for Sixth Semester**

1. CSE61 Object Oriented Analysis and Design
2. CSE62 Network Design and Management
3. CSE63 E-Business
4. CSE64 Principles of Programming Languages
5. CSE65 Information Theory and Coding Techniques
6. CSE66 Language Technologies
7. CSE67 Unix Internals
8. CSE68 Data Mining and Warehousing
9. CSE69 SOA and Web Services
10. CSE610 Distributed Computing
11. CSE611 Agile Methodologies
12. CSE612 Application Outsourcing Services

## **Electives for Seventh Semester**

1. CSE71 Software Testing and Quality Assurance
2. CSE72 Advanced Databases
3. CSE73 Client Server Computing
4. CSE74 Real Time Computing and Communication
5. CSE75 Software Architecture
6. CSE76 High Speed Networks
7. CSE77 Network Protocols
8. CSE78 Modeling and Simulation
9. CSE79 Business Process Domains
10. CSE710 Software Project Management
11. CSE711 Natural Language Processing
12. CSE712 Optical Networks

## **Electives for Eighth Semester**

1. CSE81 Intelligent Information Retrieval
2. CSE82 Soft Computing
3. CSE83 Bio Inspired Computing
4. CSE84 Mobile Computing
5. CSE85 Grid Computing
6. CSE86 Agent Technologies
7. CSE87 Bio Informatics
8. CSE88 High Performance Computing
9. CSE89 Wireless Communication Networks
10. CSE810 Big Data Management
11. CSE811 Cloud Computing
12. CSE812 Mobile Application Development

## III SEMESTER

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
MA T31	MATHEMATICS – III	3	1	-

### UNIT I

**Function of a complex variable:** Continuity, derivative and analytic functions – Necessary conditions - Cauchy-Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions.

### UNIT II

Conformal mapping – Simple and standard transformations like  $w = z+c$ ,  $cz$ ,  $z^2$ ,  $e^z$ ,  $\sin z$ ,  $\cosh z$  and  $z+1/z$  - Bilinear transformation and cross ratio property (excluding Schwarz- Christoffel transformation). Taylor's and Laurent's theorem (without proof) □ Series expansion of complex valued functions - classification of singularities.

### UNIT III

**Complex Integration:** Cauchy's integral theorem and its application, Cauchy's integral formula and problems. Residues and evaluation of residues – Cauchy's residue theorem – Contour integration: Cauchy's and Jordan's Lemma (statement only) □ Application of residue theorem to evaluate real integrals – unit circle and semicircular contour (excluding poles on boundaries).

### UNIT IV

**Fourier Series:** Dirichlet's conditions – General Fourier series - Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

### UNIT V

Root Mean Square Value – Parseval's theorem on Fourier Coefficients. Complex form of Fourier series – Harmonic Analysis.

### TOTAL PERIODS: 60

#### Text Books:

1. Veerarajan T., Engineering Mathematics for first year, Tata-McGraw Hill,2010
2. Venkataraman M.K., Engineering Mathematics, Vol. II & III, NationalPublishing Company, Chennai,2012.

#### Reference Books:

1. Kandasamy P. et al, Engineering Mathematics, Vol. II & III, S. Chand & Co.,New Delhi,2012.
2. Bali N. P and Manish Goyal, Text book of Engineering Mathematics, 3rdEdition, Laxmi Publications (p) Ltd.,2008.
3. Grewal B.S., Higher Engineering Mathematics, 40th Edition, KhannaPublishers, Delhi2007.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 7Th Edition, WileyIndia, 2007.

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T32	ELECTRONIC DEVICES AND CIRCUITS	3	1	-

### UNIT I

**Diode and its Applications :** PN junction diode, Diode equivalent circuit, Diode as a switch – transition and diffusion capacitance – reverse recovery time, Zener diode, Applications of diode – AND/OR gates using diodes, Clippers and clampers – Voltage doubler and tripler – Voltage regulation – Series and shunt voltage regulators.

### UNIT II

**Biasing and Modeling for BJT and FET :** Biasing and operating point, BJT Bias circuits - Fixed-bias, Emitter stabilized bias, Voltage divider bias and DC bias with voltage feedback, FET biasing – Fixed-bias, Self-bias, Voltage-divider bias, MOSFET biasing. Transistor modeling – Important parameters of BJT-  $h$ - parameter model of BJT ( $CE$  only) – Important parameters of JFET, Small signal model of JFET and MOSFET

### UNIT III

RC-coupled amplifier, Operation and Frequency response, Power amplifier – Series fed and transformer coupled Class A amplifiers, Class B amplifier, Circuit and Operation, conversion efficiency, amplifier distortion, Class C and D amplifiers. Concept of feedback- Negative and positive feedback, Barkhausen Criterion - Wien bridge oscillators, Hartley, Colpitts and crystal oscillator - Frequency stability.

### UNIT IV

**Operational Amplifier:** Introduction to op-amp, Characteristics of op-amp. - Differential and common mode operation, op-amp parameters - Applications: Inverting and non-inverting amplifier, summer, subtractor, differentiator, integrator, comparator, analog multiplier, second order low pass and high pass active filters.

### UNIT V

**Special Devices:** Varactor diode, Tunnel diode, PIN diode, LED, LCD, Seven segment displays, Opto-isolator. UJT - Characteristics and equivalent circuit – intrinsic standoff ratio – UJT relaxation oscillator, SCR - Two transistor model, DIAC and TRIAC - Operation, Characteristics and their applications.

### TOTAL PERIODS: 60

#### Text Books:

1. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education, Tenth Edition, 2009.
2. Jacob Millman, C. Halkias and SatyabrataJit, “Electronic Devices and Circuits”, Tata McGraw Hill, Third Edition, 2010.

#### Reference Books:

1. Jacob Millman and Arvin Grabel, “MicroElectronics”, Tata McGraw Hill, Second Edition, 2008.
2. David A. Bell, “Electronic Devices and Circuits”, Oxford University Press, Fifth Edition, 2008

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS T33	OBJECT ORIENTED PROGRAMMING AND DESIGN	3	1	-

### UNIT – I

**Introduction to Object-Oriented Programming:** Evolution of programming methodologies – Disadvantages of conventional programming – programming paradigms – key concepts of object – oriented programming – advantages of OOP – usage of OOP.

**Input and output in C++ :** Limitations of C – Introduction to C++ – Structure of the C++ program – stream classes – formatted and unformatted data – unformatted console I/O operations – Bit fields, Manipulators – Manipulators with multiple parameter **Control structures:** Decision making statements – jump statement – switch case statement – looping statements.

**Classes and objects:** Defining member functions – rules of inline functions – data hiding or encapsulation – classes – objects and memory – static object – array of objects – objects as function arguments, friend functions, member functions and non-member functions – overloading member functions.

**Functions in C++:** Passing arguments – LValues and RValues – return by reference – default arguments – inline functions – function overloading.

### UNIT – II

**Constructors and Destructors:** Purpose of Constructors and Destructors – overloading constructors – constructors with default arguments – copy constructors – calling constructors and destructors – dynamic initialization using constructors – recursive constructor.

**Overloading Functions:** Overloading unary operators – constraint on increment and decrement operators – overloading binary operators – overloading with friend functions – type conversion – one argument constructor and operator function – overloading stream operators.

**Inheritance:** Introduction – Types of Inheritance – Virtual base classes – constructors and destructors and inheritance – abstract classes – qualifier classes and inheritance – common constructor – pointers and inheritance – overloading memberfunction.

### UNIT - III

**Pointers and arrays:** Pointer to class and object – pointer to derived classes and base classes – accessing private members with pointers – address of object and void pointers – characteristics of arrays – array of classes.

**Memory:** Memory models – The new and delete operators – Heap consumption – Overloading new and delete operators – Execution sequence of constructors and destructors – specifying address of an object – dynamic objects.

**Binding, Polymorphism and Virtual Functions:** Binding in C++ – Pointer to derived class objects – virtual functions – Array of pointers – Abstract classes – Virtual functions in derived classes – constructors and virtual functions – virtual destructors – desctructos and virtual functions. Strings - Declaring and initializing string objects – relational operators – Handling string objects – String attributes – Accessing elements of strings – comparing and exchanging and Miscellaneous functions.



## UNIT – IV

**Files:** File Stream classes – Checking for errors – file opening modes – file pointers and manipulators – manipulators with arguments – read and write operations – Binary and ASCII files – Random access operation – Error handling functions – command line arguments – stdstreams.

**Generic Programming with Templates:** Generic Functions- Need of Template – Normal function template – class template with more parameters – Function template with more parameters, overloading of function templates, class template with overloaded operators – class templates and inheritance.

**Exception Handling:** Fundamentals of Exception Handling – Catching Class Types – Using Multiple catch statements – Catching All Exception – Rethrowing Exception – Specifying Exception – Exceptions in constructors and destructors – controlling uncaught Exceptions – Exception and operator overloading – Exception and inheritance – Class Template and Exception handling.

## UNIT – V

**Object Modelling and Object Oriented Software development:** Overview of OO concepts – UML – Use case model – Class diagrams – Interaction diagrams – Activity diagrams – state chart diagrams - Patterns – Types – Object Oriented Analysis and Design methodology – Interaction Modelling – OOD Goodnesscriteria.

### TOTAL PERIODS: 60

#### Text Books:

1. Ashok N.Kamthane, Object Oriented Programming with ANSI and TurboC++, Pearson Edition
2. Deitel&Deitel, C++ How to program, Prentice Hall, Eighth Edition, 2011
3. Rajib Mall, “Fundamentals of Software Engineering”. PHI Learning, Third Edition, 2013.

#### Reference Books:

1. Eric Nagler, Learning C++ A Hands on Approach, Jaiho publishinghouse.
2. E Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill, 2nd Edition.

Sotter A Nicholas and Kleper J Scott, Professional C++, Wiley Publishing Inc.

#### Websites:

1. <http://www.cplusplus.com/articles/cpp11>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T34	DIGITAL SYSEM DESIGN	3	1	-

### UNIT – I

**Review of Binary number systems:** Binary, Decimal, Octal, Hexadecimal number systems – Number base conversions – Signed binary numbers – Arithmetic operations – Binary codes – weighted BCD codes, Excess-3 codes, Gray Codes – Alphanumeric Codes – Error detecting and Correction codes – **Boolean Algebra & Theorems:** Fundamental postulates, DeMorgan’s theorems – Sum of Products and Product of Sums functions – Canonical form – Minimization of expressions using Karnaugh Maps and Quine-McCluskey method – Implementation of Boolean functions using universal gates and multilevel gates.

### UNIT – II

**Combinational Logic:** Half & full adders/subtractors – Parallel Adders – Look-ahead carry adders - BCD adders/subtractors – Binary Multiplier – Code convertors – Decoders – Encoders – Parity encoders – Multiplexers – Implementation of combinational logic using Multiplexers - Demultiplexers - Magnitude comparators – Parity generator/checker.

### UNIT – III

**Sequential Logic:** Latches versus Flip Flops – SR, D, JK, Master Slave Flip Flops – Excitation table – Conversion of Flip flops – Counters: Asynchronous, synchronous, decade, presettable – Shift Registers: types, applications – Ring counter – Analysis and design of clocked sequential circuits – Mealy and Moore models – State machine notations – state reduction techniques.

### UNIT – IV

**Reconfigurable Digital Circuits:** Types of Memories – Organization of ROM and RAM – Address Decoding – Programmable Logic Devices (PLDs) – Programmable Logic Arrays (PLAs) – Programmable Array Logic (PAL) devices – Field Programmable Gate Arrays (FPGAs) - Combinational Logic implementation using PROMs, PLAs, PALs.

### UNIT – V

**Digital Design with Verilog HDL:** Hierarchical Modeling concepts – 4-bit ripple carry counter – modules – instances – Data types – Arrays – System tasks – directives – Modules and Ports – Gate-Level Modeling – Dataflow Modeling – Design of Multiplexers, counters and full adders – Introduction to Behavioral Modeling.

### TOTAL PERIODS: 60

#### Text Books:

1. M. Morris Mano and Michael D. Ciletti, “Digital Systems: With an Introduction to the Verilog HDL”, Fifth Edition, Prentice Hall of India,2012
2. Samir Palnitkar, “VERILOG HDL – A Guide to Digital Design and Synthesis”, Pearson Education Inc., Second Edition,2012

#### Reference Books:

1. A. P. Godse and D. A. Godse, “Digital Systems Design”, Technical Publications, Pune,2008.
2. Leach Malvino, “Digital Principles and Applications”, Tata McGraw Hill, Fifth edition,2005.
3. William I. Fletcher, “An Engineering Approach to Digital Design”, Prentice Hall,2009.

#### Websites:

1. NPTEL course on Digital Circuits Design available at <http://www.nptel.iitm.ac.in/video.php?subjectId=117106086>
2. CPLDS and FPGAs tools available at <http://www.xilinx.com>
3. Digital ICs datasheets available at [http://www.electronics-lab.com/downloads/datasheets/ic\\_digital.html](http://www.electronics-lab.com/downloads/datasheets/ic_digital.html).

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS T35</b>	<b>DATA STRUCTURES</b>	3	1	-

### **UNIT – I**

Introduction: Algorithmic notation – Programming principles – Creating programs- Analyzing programs. Arrays: One dimensional array, multidimensional array, pointer arrays. Searching: Linear search, Binary Search, Fibonacci search. Sorting techniques: Internal sorting - Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort and Radix Sort.

### **UNIT – II**

Stacks: Definition – operations - applications of stack. Queues: Definition - operations - Priority queues - De queues – Applications of queue. Linked List: Singly Linked List, Doubly Linked List, Circular Linked List, linked stacks, Linked queues, Applications of Linked List – Dynamic storage management – Generalized list.

### **UNIT – III**

Trees: Binary tree, Terminology, Representation, Traversals, Applications – Binary search tree – AVL tree. B Trees: B Tree indexing, operations on a B Tree, Lower and upper bounds of a B Tree - B + Tree Indexing – Trie Tree Indexing.

### **UNIT – IV**

Graph: Terminology, Representation, Traversals – Applications - spanning trees, shortest path and Transitive closure, Topological sort. Sets: Representation - Operations on sets – Applications.

### **UNIT – V**

Tables: Rectangular tables - Jagged tables – Inverted tables - Symbol tables – Static tree tables - Dynamic tree tables - Hash tables. Files: queries - Sequential organization – Index techniques. External sorting: External storage devices – Sorting with tapes and disks.

### **TOTAL PERIODS: 60**

#### **Text Books:**

1. Ellis Horowitz and SartajSahni, “Fundamentals of Data Structures”, Galgotia Book Source, Pvt. Ltd., 2004.
2. D. Samanta, “Classic Data Structures”, Second Edition, Prentice-Hall of India, Pvt. Ltd., India2012.

#### **Reference Books:**

1. Robert Kruse, C.L. Tondo and Bruce Leung, “Data Structures and Program Design in C”, Prentice-Hall of India, Pvt. Ltd., Second edition,2007.
2. Mark Allen Weiss”, Data Structures and Algorithm Analysis in C”,Pearson Education, Second edition, 2006.

#### **Website:**

1. <http://www.cse.unt.edu>
2. <http://nptel.ac.in/courses/106102064/>

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS T36</b>	<b>COMPUTER ORGANIZATION AND ARCHITECTURE</b>	3	1	-

#### **UNIT – I**

**BASIC STRUCTURES OF COMPUTER:** Functional Units, Multiprocessors and Multicomputer, Memory Locations and Addresses, Memory operations, Instructions and Instruction Sequencing, Addressing modes, Assembly Language, Basic Input/output operations, Stacks and Queues, Subroutines, Shift and rotate Instructions, Byte-Sorting program.

#### **UNIT – II**

The IA-32 Pentium Example: Registers and Addressing, IA-32 Instructions, IA-32 Assembly Language, Program Flow Control, Logic and Shift/Rotate Instructions, I/O Operations, Subroutines, Other Instructions, Program Examples.

#### **UNIT – III**

**INPUT/OUTPUT ORGANIZATION:** Accessing I/O Devices, Interrupts, Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Use Of Interrupts in Operating Systems, Pentium Interrupt Structure, Direct Memory Access, Busses, Interface Circuits, Standard I/O Interfaces.

#### **UNIT – IV**

**THE MEMORY SYSTEM:** Some Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size, and Cost, Cache Memories, Performance Considerations, Virtual memories, Memory Management requirements, Secondary Storage.

#### **UNIT – V**

**BASIC PROCESSING UNIT :** Some Fundamental Concepts, Execution Of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Microprogrammed Control, **PIPELINING:** Basic Concepts, Data Hazards, Instruction Hazards, Influence On Instructions Sets, Datapath and Control Considerations, Superscalar Operations, Performance Considerations

#### **TOTAL PERIODS: 60**

##### **Text Books:**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, fifth edition, TataMcGraw Hill Education, 2011.

##### **Reference Books:**

1. John P. Hayes, “Computer Architecture and Organization”, Third edition, Tata McGraw Hill, 2013
2. William Stallings, “Computer organization and Architecture – Designing for performance”, 9<sup>th</sup> edition, Pearson education, 2012
3. Computer System Architecture – M. Moris Mano, IIIrd Edition, PHI / Pearson, 2006.

##### **Website:**

1. [http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/comp\\_org\\_arc/web/](http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/comp_org_arc/web/)
2. <http://pages.cs.wisc.edu/~markhill/cs354/Fall2008/notes/Pentium.html>
3. <http://williamstallings.com/ComputerOrganization/COA9e-student/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS P31	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	-	-	3

### LIST OF EXPERIMENTS

1. VI characteristics of LED and Zener diodes
2. Application of Diodes - Clippers, Clampers, AND gate and OR gate
3. Input and Output Characteristics of Common Emitter transistor configuration and determination of  $h$ -parameters
4. Drain characteristics of JFET and determination of Drain resistance, Mutual conductance and Amplification factor
5. VI Characteristics of Silicon Controlled Rectifier and Uni-Junction transistor.
6. Frequency Response of RC-coupled amplifier and determination of input and output impedances
7. Class B push – pull power amplifier
8. Applications of Operational amplifier
  - a) Adder and subtractor
  - b) Integrator and differentiator
  - c) Wien bridge oscillator
9. LC Oscillators - Hartley and Colpitts oscillators
10. Frequency response of second order active low pass and high pass filters

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P32</b>	<b>DATA STRUCTURES LAB</b>	-	-	3

### **LIST OF EXPERIMENTS**

1. Searching algorithms - sequential, binary and Fibonacci search algorithms on an ordered list. Compare the number of key comparisons made during these searches
2. Sorting algorithms :Insertion Sort, Selection Sort, BubbleSort,
3. Sorting algorithms: Shell Sort, Quick Sort, HeapSort.
4. Sorting algorithms: Merge Sort, and RadixSort
5. Sparse matrix representation and find its transpose.
6. Evaluation of arithmetic expression to postfix expression.
7. Queue, circular queue, priority queue, Dequeue.
8. Singly Linked List, Doubly Linked List, Circular Linked List
9. Concatenation of linked lists.
10. Tree traversals
11. Graph traversals
12. Implementation of Dijkstra's algorithm
13. Implementation of Hashtables.

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P33</b>	<b>DIGITAL DESIGN LABORATORY</b>	-	-	3
<b>LIST OF EXPERIMENTS</b>				
<ol style="list-style-type: none"> <li>1. Verification of DeMorgan's theorems using basic logic gates.</li> <li>2. Design and implementation of adders and subtractors.</li> <li>3. Design and implementation of Carry Look-Ahead Adders.</li> <li>4. Design and implementation of Parity Generator/Checkers.</li> <li>5. Design and implementation of Priority encoders using logic gates.</li> <li>6. Design and implementation of simplified Boolean expressions using Multiplexers.</li> <li>7. Design and implementation of simplified Boolean expressions using Decoders.</li> <li>8. Design and implementation of Magnitude Comparators.</li> <li>9. Study of clocked RS, D, and JK Flip-Flops.</li> <li>10. Design and implementation of Serial Input Parallel Output (SIPO) and Parallel Input Serial Output (PISO) Shift Registers.</li> <li>11. Design and implementation of ripple and synchronous counters.</li> <li>12. Simulation of a combinational logic using HDL.</li> <li>13. Simulation of a sequential logic using HDL.</li> <li>14. Implementation of given Boolean expressions using multioutput PAL/PLA realization.</li> <li>15. Implementation of a sequential circuit using PAL/PLA realization.</li> </ol>				

## IV SEMESTER

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
MA T41	MATHEMATICS – IV	3	1	-

### UNIT – I

**PARTIAL DIFFERENTIAL EQUATIONS:** Formation by elimination of arbitrary constants and arbitrary functions – General, singular, particular and integrals – Lagrange’s linear first order equation – Higher order differential equations with constant coefficients

### UNIT – II

**PARTIAL DIFFERENTIAL EQUATIONS:** Solution of partial differential equation by the method of separation of variables – Boundary value problems – Fourier series solution – Transverse vibration of an elastic string.

### UNIT – III

**PARTIAL DIFFERENTIAL EQUATIONS:** Fourier series solution for one dimensional heat flow equation – Fourier series solutions for two dimensional heat flow equations under steady state condition – (Cartesian and Polar forms).

### UNIT – IV

**APPLIED STATISTICS:** Curve fitting by the method of least squares – fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large samples test for single proportions, differences of proportions, single mean, difference of means and standard deviations.

### UNIT – V

**APPLIED STATISTICS:** Small samples – Test for single mean, difference of means and correlations of coefficients, test for ratio of variances – Chi-square test for goodness of fit and independence of attributes.

### TOTAL PERIODS: 60

#### Text Books:

1. Venkataraman M. K, “Engineering Mathematics, Third year Part A& B”, 12<sup>th</sup> Edition, The National Publishing Company, Madras 1996.
2. S. C. Gupta and V. K. Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and sons, 1975.

#### Reference Books:

1. Kandasamy P. et al, “Engineering Mathematics, Vol. II & III”, S. Chand & Co., New Delhi, 2012.
2. Grewal B.S., “Higher Engineering Mathematics”, 40<sup>th</sup> Edition, Khanna Publishers, Delhi 2007.
3. Bali N.P., “Manish Goyal, “Engineering Mathematics”, 7<sup>th</sup> Edition, Laxmi Publications, 2007.
4. Erwin Kreyszig, “Advanced Engineering Mathematics”, 7<sup>th</sup> Edition, Wiley India, 2007.  
Ray Wylie C. “Advanced Engineering Mathematics”, 6<sup>th</sup> Edition, Tata McGraw Hill, 2003.



Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS T42	<b>MICROPROCESSORS AND MICROCONTROLLERS</b>	3	1	-

### UNIT – I

**Intel 8085 Microprocessor:** Introduction - Need for Microprocessors – Evolution – Intel 8085 Hardware - Architecture – Pin description - Internal Registers – Arithmetic and Logic Unit – Control Unit – Instruction word size - Addressing modes – Instruction Set – Assembly Language Programming - Stacks and Subroutines - Timing Diagrams. Evolution of Microprocessors – 16-bit and 32-bit microprocessors.

### UNIT – II

**Intel 8085 Interrupts and DMA:** 8085 Interrupts – Software and Hardware Interrupts – 8259 Programmable Interrupt Controller - Data Transfer Techniques – Synchronous, Asynchronous and Direct Memory Access (DMA) and 8237 DMA Controller- 8253 Programmable Interval Timer.

### UNIT – III

**Memory & I/O Interfacing:** Types of memory – Memory mapping and addressing – Concept of I/O map – types – I/O decode logic – Interfacing key switches and LEDs – 8279 Keyboard/Display Interface - 8255 Programmable Peripheral Interface – Concept of Serial Communication – 8251 USART – RS232C Interface.

### UNIT – IV

**Intel 8086 Microprocessor:** Introduction-Intel 8086 Hardware – Pin description – External memory Addressing – Bus cycles – Interrupt Processing. Addressing modes - Instruction set – Assembler Directives.

### UNIT – V

**Microcontroller:** Intel 8051 Microcontroller: Introduction – Architecture – Memory Organization – Special Function Registers – Pins and Signals – Timing and control – Port Operation – Memory and I/O interfacing – Interrupts – Instruction Set and Programming.

**TOTAL PERIODS: 60**

#### Text Books:

1. Ramesh S. Gaonkar, “Microprocessor Architecture, Programming and Applications with 8085”, Penram International Publications, Fifth Edition.
2. Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2008.

#### Reference Books:

1. N. Senthil Kumar, M Saravanan and S. Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press, First Edition 2010.

2. A. P. Godse and D.A Godse, “Microprocessors and Microcontrollers”, Technical Publications, Fourth Edition,2008.
3. Barry B. Brey, “The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386 and 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III Pentium 4 – Architecture, Programming and Interfacing, 7<sup>th</sup>Edn., PHI, 2008.
4. Ajay V Deshmukh, “Microcontrollers – Theory and Applications”, Tata McGraw- Hill, Seventh Edition, 2007.

**Websites:**

1. <http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dai0211a/index.html>
  2. <http://www.arm.com/products/processors/classic/arm7/index.php>
  3. <http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dai0211a/index.html>
- <http://www.embeddedindia.com/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T43	AUTOMATA LANGUAGES AND COMPUTATION	3	1	-

#### UNIT – I

**Finite Automata and Regular Expressions:** Formal Languages and Regular expressions, Deterministic and Non-Deterministic Finite Automata, Finite Automata with  $\epsilon$ -moves, Equivalence of NFA and DFA, Minimization of finite automata, Two-way finite automata, Moore and Mealy machines, Applications of finite automata.

#### UNIT – II

**Regular Sets and Context Free Grammars:** Properties of regular sets, Context-Free Grammars – Derivation trees, Chomsky Normal Forms and Greibach Normal Forms, Ambiguous and unambiguous grammars.

#### UNIT – III

**Pushdown Automata and Parsing Algorithms:** Pushdown Automata and Context-Free Languages; Top-down parsing and Bottom-up parsing, Properties of CFL, Applications of Pumping Lemma, Closure properties of CFL and decision algorithms.

#### UNIT – IV

**Turing machines:** Turing machines (TM) – computable languages and functions – Turing Machine constructions – Storage in finite control – variations of TMs – Recursive and Recursive Enumerable languages, Recursive Function, Partial and Total Recursive Function, Primitive Recursive Function.

#### UNIT – V

**Introduction to Computational Complexity:** Time and Space complexity of TMs – Complexity classes – Introduction to NP-Hardness and NP-Completeness.

**TOTAL PERIODS: 60**

#### Text Books:

1. John E. Hopcroft and Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Narosa Publishers, 2002.

#### Reference Books:

1. Michael Sipser, “Introduction to the Theory of Computations”, Brooks/Cole, Thomson Learning, 1997.
2. John C. Martin, “Introduction to Languages and the Theory of Computation”, Tata McGraw-Hill, 2003.

#### Website:

1. <http://nptel.iitm.ac.in/courses/106106049/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T44	DESIGN AND ANALYSIS OF ALGORITHMS	3	1	-

### UNIT – I

**Algorithms:** Definitions and notations: standard notations - asymptotic notations – worst case, best case and average case analysis; big oh, small oh, omega and theta notations; Analysis of Sorting and Searching: Heap, shell, radix, insertion, selection and bubble sort; sequential, binary and Fibonacci search. Recursive algorithms, analysis of non- recursive and recursive algorithms, solving recurrence equations, analyzing control structures.

### UNIT – II

**Divide and Conquer Method:** General Method – binary search – maximum and minimum – merge sort - quick sort – Strassen’s Matrix multiplication. Greedy Method: General method – knapsack problem – minimum spanning tree algorithms – single source shortest path algorithm – scheduling, optimal storage on tapes, optimal merge patterns.

### UNIT – III

**Dynamic Programming:** General method – multi-stage graphs – all pair shortest path algorithm – 0/1 Knapsack and Traveling salesman problem – chained matrix multiplication. Basic Search and Traversal technique: Techniques for binary trees and graphs – AND/OR graphs – biconnected components – topological sorting.

### UNIT – IV

**Backtracking:** The general method – 8-queens problem – sum of subsets – graph coloring – Hamiltonian cycle – Knapsack problem.

### UNIT – V

**Branch and Bound Method:** Least Cost (LC) search – the 15-puzzle problem – control abstractions for LC-Search – Bounding – FIFO Branch-and-Bound - 0/1 Knapsack problem – Traveling Salesman Problem. Introduction to NP-Hard and NP- Completeness.

**TOTAL PERIODS: 60**

#### Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia Publications Pvt. Ltd., 2008.

#### Reference Books:

1. Gilles Brassard and Paul Bratley, “Fundamentals of Algorithms”, PHI, 1997.
2. Anany Levitin, “Introduction to Design and Analysis of Algorithms”, Pearson Education, 2005.
3. Thomas H. Corman, Charles E. Leiserson, Ronald and L. Rivest, “Introduction to Algorithms”, Prentice-Hall of India, Second edition, 2003.
4. Richard Johnsonbaugh and Marcus Schaefer, “Algorithms”, Pearson Education, 2004.

#### Website:

1. nptel.iitm.ac.in

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS T45</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	3	1	-

#### **UNIT – I**

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes and Objects, Constructors – Destructors - Packages and Interfaces – Internationalization.

#### **UNIT – II**

Overloading - Inheritance – Files and Stream – Multithreading – Exception Handling

#### **UNIT – III**

GUI Components - AWT package - Layouts – Containers - Event Package - Event Model – Painting – Garbage Collection – Java Applets – Applet Application - Swing Fundamentals – SwingClasses.

#### **UNIT – IV**

Generics – Collections - Utility Packages – Input Output Packages - Inner Classes - Java Database Connectivity – Java Security

#### **UNIT – V**

Java Beans - Application Builder Tools - Using the Bean Developer Kit -Jar Files- Introspection – BDK - Using BeanInfo Interface – Persistence - Java Beans API Using Bean Builder - Networking Basics - Java and the Net – InetAddress – TCP/IP Client Sockets – URL – URL Connection – TCP/IP Server - Sockets - A Caching Proxy HTTP Server – Datagrams – RMI.

**TOTAL PERIODS: 60**

#### **Text Books:**

1. Deitel and Deitel, “JAVA How to Program” Prentice Hall,2006
2. Hari Mohan Pandey, “JAVA Programming”, Pearson,2012

#### **Reference Books:**

1. Herbert Schildt, Dale Skrien, “Java Fundamentals – A Comprehensive Introduction”, Tata McGraw Hill,2013
2. John Dean, Raymond Dean, “ Introduction to Programming with JAVA – A Problem Solving Approach”, Tata McGraw Hill,2012
3. Ralph Bravaco, Shai Simonson, “Java Programming : From the Ground Up”, Tata McGraw Hill Edition, 2012

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS T46	GRAPHICS AND IMAGE PROCESSING	3	1	-

#### UNIT – I

**Graphics Systems and Graphical User Interface:** Pixel – Resolution – types of video display devices – Graphical input devices – output devices – Hard copy devices – Direct screen interaction – Logical input function – GKS User dialogue – Interactive picture construction techniques.

#### UNIT – II

**Geometric Display Primitives and Attributes:** Geometric display primitives – Points – Lines and Polygons – Point display method – Line drawing methods.

**2D Transformations and Viewing:** Transformations – types – matrix representation – Concatenation – Scaling – Rotation – Translation – Shearing – Mirroring – Homogeneous coordinates.

**Window to view port transformations:** Windowing And Clipping: Point – Lines – Polygons - boundary intersection methods.

#### UNIT – III

**Digital Image Fundamentals and Transforms:** Nature of Image processing – related fields – Image representations – Image types – Image processing operations – Applications of Image processing – Imaging system – Image Acquisition – Image Sampling and Quantization – Image quality – Image storage and file formats - Image processing operations - Image Transforms - need for Transforms – Fourier Transforms and its properties – Introduction to Walsh, Hadamard, Discrete Cosine, Haar, Slant, SVD, KL and Hotelling Transforms.

#### UNIT – IV

**Image Enhancement and Restoration:** Image Quality and need for Enhancements – Point operations - Histogram Techniques – Spatial filtering concepts – Frequency Domain Filtering – Image Smoothing – Image Sharpening - Image degradation and Noise Models – Introduction to Restoration Techniques.

#### UNIT – V

**Image Compression:** Compression Models and measures – coding types – Types of Redundancy - Lossless compression algorithms – Lossy compression algorithms – Introduction to compression standards.

**Image Segmentation:** Detection of Discontinuities – Edge Detection – Thresholding – Region Based Segmentation.

**Introduction to Color Image Processing. Introduction to Morphological operations.**

**TOTAL PERIODS: 60**

**Text Books:**

1. Donald D. Hearn, M. Pauline Baker and Warren Carithers, “Computer Graphics with OpenGL”, Fourth Edition, Pearson Education, 2010.
2. S. Sridhar, “Digital Image Processing”, Oxford Press, First edition, 2011

**Reference Books:**

1. Anil Jain K, "Fundamentals of Digital Image Processing", Prentice-Hall of India, 1989.
2. Sid Ahmed, "Image Processing", McGraw-Hill, 1995.
3. Gonzalez R. C and Woods R.E., "Digital Image Processing", Pearson Education, Second edition, 2002.
4. Newmann W.M. and Sproull R.F., "Principles of Interactive Computer Graphics", Tata McGraw-Hill, Second edition, 2000.  
Foley J.D., Van Dam A, Fiener S.K. and Hughes J.F., "Computer Graphics", Second edition, Addison-Wesley, 1993.

**Website:**

1. <http://nptel.ac.in/courses/106106090/> forgraphics  
<http://nptel.ac.in/courses/106105032/> for digital imageprocessing

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS P41	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY	-	-	3

### LIST OF EXPERIMENTS

**Experiment Using 8085 Microprocessor:**

1. Study of 8085 Microprocessor TrainerKit
2. 8-bit Arithmetic Operations (Addition, Subtraction, Multiplication and Division)
3. Block Operations (Move, Exchange, Compare, Insert and Delete)
4. Code Conversions
5. Digital Clock simulation
6. Moving Display
7. Serial Communication
8. Interrupt Programming
9. Elevator Simulation
10. Traffic Light Control

**Experiments Using 8086 Microprocessor with MASM**

11. Arithmetic Operations
12. Sorting and Searching

**Experiments Using 8051 Microcontroller**

13. Arithmetic operations
14. ADC & DAC Interfacing
15. Stepper Motor and DC Motor Interface



<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P42</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS LAB</b>	-	-	3

### **LIST OF EXPERIMENTS**

1. Implementation of binary search using Divide-and-Conquer technique.
2. Implementation of merge sort algorithms using Divide-and-Conquer technique.
3. Implementation of quick sort algorithms using Divide-and-Conquer technique.
4. Implementation of Knapsack using Greedy technique.
5. Implementation of Single-Source Shortest Paths algorithms using Greedy technique.
6. Implementation of Multi-Stage Graphs using Dynamic Programming technique.
7. Implementation of 0/1 Knapsack using Dynamic Programming technique.
8. Implementation of All Pairs Shortest Paths using Dynamic Programming technique.
9. Implementation of Traveling Salesman algorithms using Dynamic Programming technique.
10. Implementation of Pre-order, In-order, Post-order traversals using DFS traversal techniques.
11. Implementation of Pre-order, In-order, Post-order traversals using BFS traversal techniques.
12. Implementation of 8 Queens with the design of Backtracking.
13. Implementation of sum of subsets with the design of Backtracking.
14. Implementation of 0/1 Knapsack problems with Branch-and-Bound technique.
15. Implementation of Traveling Salesman problems with Branch-and-Bound technique.

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS P43	OBJECT ORIENTED PROGRAMMING LABORATORY	-	-	3

#### LIST OF EXPERIMENTS

**Note: All these experiments to be done using C++ and JAVA.**

1. Program to implement classes and objects.
2. Program to implement constructors and destructors with array of objects.
3. Program to demonstrate function overloading.
4. Program to implement different types of inheritances like multiple, Multilevel and hybrid.
5. I/O Program to demonstrate the use of abstract classes.
6. Program to demonstrate I/O streams and functions.
7. Program to perform all possible type conversions.
8. Program to demonstrate exception handling technique.
9. Program to implement networking concepts.
10. Program to implement RMI concepts.
11. Program to implement AWT concepts.
12. Program to implement swing concepts.
13. Program to design and implement applet.
14. Program to design and implement JDBC
15. Program to design an event handling event for simulating a simple calculator.

## V SEMESTER

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T51	OPERATING SYSTEMS	3	1	-

### UNIT – I

**Introduction:** Mainframe Systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems - Real Time Systems – Hardware Protection – System Components – Handheld Systems - Operating System Services – System Calls – System Programs – Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

### UNIT – II

**Threads:** Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

### UNIT – III

**System Model** – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management – Swapping – Contiguous Memory allocation – Paging –Segmentation – Segmentation with Paging.

### UNIT – IV

**Virtual Memory** – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection.

### UNIT – V

**File System Structure** – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Kernel I/O Subsystems - Disk Structure – Disk Scheduling – Disk Management – Swap-Space Management.

**Case Study:** The Linux System, Windows.

### TOTAL PERIODS: 60

#### Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts Essentials”, John Wiley & Sons (ASIA) Pvt. Ltd, 9th edition, 2011.
2. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, Prentice Hall, Third edition, 2003.

#### Reference Books:

1. William Stallings, Operating Systems: Internals and Design Principles, Prentice - Hall of India, Seventh edition, 2009.
2. Gary J. Nutt, “Operating Systems: A Modern Perspective”, Addison-Wesley, Second edition, 2001.

#### Website:

1. [web.cs.wpi.edu/~cs3013/c07/lectures/Section01-Overview.ppt](http://web.cs.wpi.edu/~cs3013/c07/lectures/Section01-Overview.ppt)
2. <http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T52	COMPUTER NETWORKS	3	1	-

#### UNIT – I

**Introduction** – Uses – Network hardware – software – reference models – example networks – Theoretical basis for communication – transmission media – wireless transmission – Communication satellites

#### UNIT – II

**Data link layer** – design issues – Services - Framing - Error Control - Flow Control - Error detection and correction codes - data link layer protocols -Simplex Protocol – Sliding window Protocols - Medium Access control sublayer – Channel allocation problem – Multiple Access protocols – ALOHA – CSMA Protocols - Collision-Free Protocols - Limited-Contention Protocols - Wireless LANs - 802.11 Architecture- 802.16 Architecture – Data link layer Switching - Uses of Bridges - Learning Bridges - Spanning Tree Bridges - Repeaters, Hubs, Bridges, Switches, Routers, and Gateways - Virtual LANs.

#### UNIT – III

**Network layer** – design issues – Routing algorithms - The Optimality Principle - Shortest Path Algorithm – Flooding - Distance Vector Routing - Link State Routing - Hierarchical Routing - Broadcast Routing - Multicast Routing Congestion Control – Approaches - Traffic-Aware Routing - Admission Control - Traffic Throttling - Load Shedding – Internetworking - Tunneling - Internetwork Routing - Packet Fragmentation - IP v4 - IP Addresses – IPv6 - Internet Control Protocols – OSPF - BGP

#### UNIT – IV

**Transport layer** - Services - Berkeley Sockets -Example – Elements of Transport protocols – Addressing - Connection Establishment - Connection Release - Flow Control and Buffering – Multiplexing – Congestion Control - Bandwidth Allocation – Regulating the Sending Rate –UDP- RPC – TCP - TCP Segment Header - Connection Establishment  
- Connection Release - Transmission Policy - TCP Timer Management - TCP Congestion Control

#### UNIT – V

**Application Layer** – DNS – Name space – Resource records – name servers – e-mail - Architecture and Services - The User Agent - Message Formats - Message Transfer - Final Delivery – WWW – Architecture - Static Web Pages - Dynamic Web Pages and Web Applications - HTTP – Network Security - Introduction to Cryptography - Substitution Ciphers - Transposition Ciphers – Public key algorithms – RSA – Authentication Protocols - Authentication Using Kerberos.

### TOTAL PERIODS: 60

#### Text Books:

1. Tanenbaum, A.S. and David J. Wetherall “Computer Networks”, 5<sup>th</sup>ed., Prentice Hall, 2011

#### Reference Books:

1. Larry L. Peterson and Bruce S. Davie, “Computer Networks- A system approach”, 5<sup>th</sup> edition, ELSEVIER, 2012
2. Stallings, W., 'Data and Computer Communications', 10th Ed., Prentice Hall Int. Ed., 2013
3. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Third edition, 2006.

#### Website:

1. <http://depa.usst.edu.cn/chenjq/www2/wl/ComputerNetworksTanenbaum.htm>
2. <http://booksite.mkp.com/9780123850591/lec.php>
3. <http://williamstallings.com/DataComm/DCC10e-Student/>

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS T53	DATABASE MANAGEMENT SYSTEMS	3	1	-

### UNIT – I

**INTRODUCTION:** History-purpose-view of Data-Database languages-Data Models- Data Storage and Querying-Transaction management-Database Architecture-Two tier- Three tier- Database users and Authorization. Relational Algebra-Structure-keys-schema diagrams- Relational operations Formal Relational Query Languages- Relational Algebra-Tuple Relational calculus- Domian Relational Calculus.

**SQL-Overview**-Data Definition-basic Structure-basic operations-Set Operations-Null Values-Aggregate Functions-Nested Subqueries-Modifications of the Databases-Join Expressions- Integrity Constraints-views-Authorization-Functions-Procedures-Triggers- Recursive Queries.

### UNIT – II

**Database Design and the ER Model:** Overview of the Design Process- The Entity-Relationship Model- Constraints- Removing Redundant Attributes- Entity-Relationship Diagrams- Reduction to Relational Schemas- Entity-Relationship Design Issues - Extended E-R Features- Alternative Notations for Modeling data -Other Aspects of Database Design - Storage and File Strucure-Indexing and Hashing-Basic Concepts- Ordered Indices- B+-Tree Index Files- Static Hashing-Dynamic Hashing- Comparison of Ordered Indexing and Hashing-Bitmap Indices- Index Definition in SQL

### UNIT – III

**Relational Database Design:** Features of Good Relational Designs- Atomic Domains and First Normal Form- Second Normal Form-Decomposition Using Functional Dependencies-Functional-Dependency Theory-Algorithms for decomposition- Decomposition Using Multivalued Dependencies-More Normal Forms- Database-Design Process- Modeling Temporal Data

### UNIT – IV

**Query Processing:** Measures of Query Cost- Selection Operation- Sorting-Join Operation- Other Operations- Evaluation of Expressions

**Query optimization** - Overview -Transformation of Relational Expressions- Estimating Statistics of Expression Results- Choice of Evaluation Plan

Transactions-Concept - A Simple Transaction Model- Storage Structure- Transaction Atomicity and Durability-Transaction Isolation- Serializability- Transaction Isolation and Atomicity- Transaction Isolation Levels-Implementation of Isolation Levels-Transactions as SQL Statements

## UNIT – V

Concurrency Control-Lock-Based Protocols-Deadlock Handling- Multiple Granularity-Timestamp Based Protocols- Validation-Based Protocols- Multiversion Schemes- Snapshot Isolation - Insert Operations, Delete Operations and Predicate Reads- Weak Levels of Consistency-Concurrency in Index Structures- Recovery - Failure Classification- Storage - Recovery and Atomicity- Recovery Algorithm- Buffer Management- Failure with Loss of Nonvolatile Storage- Early Lock Release and Logical Undo Operations. Case Studies IBM DB2 Universal Database – My SQL.

**TOTAL PERIODS: 60**

### **Text Books:**

1. AviSilberschatz, Henry F. Korth and S.Sudarshan, “Database System Concepts”, McGraw-Hill International Inc., Sixth edition,2011.

### **Reference Books:**

1. Fred R McFadden, Jeffery A. Hoffer and Mary B. Prescott, “ModernDatabase Management”, Addison-Wesley, 2000.
2. Elmasri and Navathe, “Fundamentals of Database Systems”, Addison-Wesley, Seventh edition,2012.
3. JeffreyD.Ulman and Jenifer Widom, “A First Course in Database Systems”, Prentice-Hall,2007.
4. Bipin C Desai, “An Introduction to Database Systems”, Galgotia Publications Pvt. Ltd.,1990.

### **Website:**

1. <http://db-book.com/>
2. <http://nptel.ac.in/video.php?subjectId=106106093>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T54	LANGUAGE TRANSLATORS	3	1	-

### UNIT – I

**Introduction to System Software and Machine Structure:** System programs – Assembler, Interpreter, Operating system. Machine Structure – instruction set and addressing modes. **Assemblers:** Basic assembler functions, machine – dependent and machine independent assembler features. Assembler design – Two-pass assembler with overlay structure, one – pass assembler and multi-pass assembler.

### UNIT – II

**Loaders and Linkers:** Basic loader functions, machine – dependent and machine – independent Loader features. Loader design – Linkage editors, dynamic linking and bootstrap loaders.

### UNIT – III

**Source Program Analysis:** Compilers – Analysis of the Source Program – Phases of a Compiler – Cousins of Compiler – Grouping of Phases – Compiler Construction Tools. **Lexical Analysis:** Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – A Language for Specifying Lexical Analyzer.

### UNIT – IV

**Parsing:** Role of Parser – Context free Grammars – Writing a Grammar – Predictive Parser – LRParser. **Intermediate Code Generation:** Intermediate Languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back Patching – Procedure Calls.

### UNIT – V

**Basic Optimization:** Constant-Expression Evaluation – Algebraic Simplifications and Reassociation – Copy Propagation – Common Sub-expression Elimination – Loop- Invariant Code Motion – Induction Variable Optimization. **Code Generation:** Issues in the Design of Code Generator – The Target Machine – Runtime Storage management – Next-use Information – A simple Code Generator – DAG Representation of Basic Blocks – Peephole Optimization – Generating Code from DAGs.

**TOTAL PERIODS: 60**

#### Text Books:

1. Alfred Aho, V. Ravi Sethi, and D. Jeffery Ullman, “Compilers Principles, Techniques and Tools”, Addison-Wesley, Second Edition, 2006.
2. Leland L. Beck, “System Software – In Introduction to System Programming”, Addison-Wesley, 1990.

#### Reference Books:

1. Allen Holub, “Compiler Design in C”, Prentice-Hall of India, 1990.
2. Charles N. Fischer and Richard J. Leblanc, “Crafting a Compiler with C”, Benjamin Cummings, 1998.
3. Steven S. Muchnick, “Advanced Compiler Design Implementation”, Morgan Koffman, 1997.
4. Damdhare, “Introduction to System Software”, McGraw Hill, 1986.

#### Website:

1. <http://freevideolectures.com/Course/3051/Compiler-Design#>
2. <http://www.dreamincode.net/forums/topic/260592-an-introduction-to-compiler-design-part-i-lexical-analysis/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T55	SOFTWARE ENGINEERING	3	1	-

### UNIT – I

**Introduction to Software Engineering:** The Software Engineering Discipline – Evolution and Impact – Software Development projects – Emergence of Software Engineering – Computer System Engineering – Software Life Cycle Models – classic Waterfall model – Iterative Lifecycle model – prototyping model – Evolutionary model – spiral model – Comparison of Life cycle models.

### UNIT – II

**Software Project Management and Requirements Analysis:** Responsibilities of a Software Project Manager – Project Planning – Metrics for Project Size Estimation – Empirical Estimation Techniques – COCOMO – Halstead’s Software Science – Staffing Level Estimation – Scheduling – Organization and Team structures – Staffing – Risk Management – Software Configuration Management – Requirements Gathering and Analysis – Software Requirements specification – Formal System Specification – Axiomatic Specification - Algebraic Specification –4GL.

### UNIT – III

**Software Design and Function Oriented Software Design:** Outcome of a Design Process – Characteristics of a Good Software Design – Coupling and Cohesion – Approaches to Software Design – Object Oriented Vs Function Oriented Software Design approaches – Structured Analysis – Data Flow Diagrams – Applying DFD to Real time systems – Structured and Detailed Design.

### UNIT – IV

**Object Modelling and Object Oriented Software development:** Overview of OO concepts – UML – Use case model – Class diagrams – Interaction diagrams – Activity diagrams – state chart diagrams – Patterns – Types – Object Oriented Analysis and Design methodology – Interaction Modelling – OOD Goodness criteria.

### UNIT – V

**User Interface Design and Testing:** Characteristics of a good User Interface – Types – Fundamentals of Component based GUI Development – A User Interface Design methodology – Coding – Software Documentation – Testing – Unit Testing – Black Box testing – White Box testing – Debugging – Program Analysis tools – Integration testing – Testing Object Oriented programs – System Testing – Issues.

**TOTAL PERIODS: 60**

#### TEXT BOOK

1. RajibMall, “Fundamentals of Software Engineering”, PHI Learning, Third Edition, 2013.

#### REFERENCE BOOKS

1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, McGraw-Hill International Edition, Seventh edition, 2009.
2. S. L. Pfleeger and J.M. Atlee, “Software Engineering Theory and Practice”, Pearson Education, Third edition, 2008.
3. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa, Third edition, 2008.
4. Ian Sommerville, “Software Engineering”, Pearson Education, Eighth edition, 2008.

#### Website:

1. <http://www.nptel.iitm.ac.in/courses/Webcourse-Contents/IITKharagpur/SoftEngg/>
2. <http://www.computer.org/portal/web/swebok>



<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P51</b>	<b>OPERATING SYSTEM LABORATORY</b>	-	-	3

**LIST OF EXPERIMENTS**

1. Study of basic UNIX/Linux commands
2. Shell Programming.
3. Programs using the following system calls of UNIX/Linux operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
4. Programs using the I/O system calls of UNIX operating system: (open, read, write, etc).
5. Simulations of UNIX/Linux commands like ls, grep, etc.
6. Simulation of processes scheduling algorithms.
7. Simulation of synchronization problems using Semaphore.
8. Simulation of basic memory management schemes.
9. Simulation of virtual memory management schemes.
10. Simulation of disk scheduling algorithms
11. Simulation of filesystems.
12. Develop an application using any RTOS.

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS P52	COMPUTER NETWORKS LABORATORY	-	-	3

### LIST OF EXPERIMENTS

1. Implementation of a socket program for Echo/Ping/Talkcommands.
2. Creation of a socket between two computers and enable file transferbetween them. Using (a.) TCP (b.)UDP
3. Implementation of a program for Remote Command Execution (Two M/Csmay beused).
4. Implementation of a program for CRC and Hamming code for errorhandling.
5. Writing a code for simulating Sliding WindowProtocols.
6. Create a socket for HTTP for web page upload &Download.
7. Write a program for TCP module Implementation.(TCPservices).
8. Write a program to implement RCP (Remote CaptureScreen).
9. Implementation (using NS2/Glomosim) and Performance evaluation ofthe following routingprotocols:
  - a. Shortest pathrouting
  - b. Flooding
  - c. LinkState
  - d. Hierarchical
10. Broadcast /Multicastrouting.
11. Implementation ofARP.
12. Throughput comparison between 802.3 and802.11.
13. Study of Key distribution and Certificationschemes.
14. Design of an E-Mailsystem
15. Implementation of Security Compromise on a Node using NS2 /Glomosim
16. Implementation of Various Traffic Sources using NS2 /Glomosim

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS P53	<b>DATABASE MANAGEMENT SYSTEMS LABORATORY</b>	-	-	3

### LIST OF EXPERIMENTS

1. Study of Database Concepts: Relational model – table – operations on tables – index – table space – clusters – synonym – view – schema – data dictionary – privilege – role – transactions.
2. Study of SQL: Primitive Data Types – User Defined data Types – Built-in Functions – Parts of Speech of create, alter, drop, select, insert, delete, update, commit, rollback, save point, grant, revoke.
3. Study of Query Types: Queries involving Union, Intersection, Difference, Cartesian product, Divide Operations – Sub Queries – Join Queries – Nested Queries – Correlated, Queries – Recursive Queries.
4. Study of Procedural Query Language: Blocks, Exception Handling, Functions, Procedures, Cursors, Triggers, Packages.
5. Application: Design and develop any two of the following:
  - a. Library Information System
  - b. Logistics Management System
  - c. Students' Information System
  - d. Ticket Reservation System
  - e. Hotel Management System
  - f. Hospital Management System
  - g. Inventory Control
  - h. Retail Shop Management
  - i. Employee Information System
  - j. Payroll System
  - k. Any other Similar System

## VI SEMESTER

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T61	ENTERPRISE SOLUTIONS	3	1	-

### UNIT – I

Introduction : ERP - Definition – Concept – Fundamentals – Need for ERP - Advantages of ERP – Implementation of ERP – Key issues and Characteristics of ERP Typical architecture components of ERP – ERP system Architecture. ERP and related technologies: Business Process RE-engineering – Management Information System– Decision Support System - Executive Support System – On-Line Analytical Processing, Supply Chain Management, Customer Relationship Management.

### UNIT – II

SAP : History – SAP R/2 – SAP R/3 – Characteristics of SAP R/3 – Architecture of SAP R/3 - SAP Modules, Net Weaver, Customer Relationship Management, Business Warehouse, Advanced Planner and Optimizer. ABAP/4: Workbench - Workbench Tools - ABAP/4 Data Dictionary - ABAP/4 Repository Information – Structure of ABAP/4 program - ABAP/4 syntax – Data types – Constants and Variables – Statements : DATA, PARAMETERS, TABLE, MOVE, MOVE-CORRESPONDING, CLEAR, WRITE, CHECK, FORMAT. LOOP STRUCTURES. Sample programs.

### UNIT – III

Oracle Suite : Oracle Apps 11i - Application Framework - File System - Workflow Analysis - SQL / PLSQL fundamentals - Creating Forms - Oracle Reports. Oracle Electronic Data Interchange – functions of EDI – Data File Structure - Oracle Data, Oracle Database - Oracle Database - DW vs OLTP - DW Connectors.

### UNIT – IV

PeopleSoft: Basic PeopleSoft Functionality – Opening Multiple Windows - Database structure – Understanding People Soft Data Mover – Records - Pages vs. Forms. PeopleSoft HRMS: Introduction to PeopleSoft HRMS database - PeopleSoft products - Functional PeopleSoft - financial management system - PeopleSoft Enterprise HRMS.

### UNIT – V

Siebel Enterprise Applications - Siebel eBusiness Applications – Siebel Tools – Tables and Columns – Business Component – Business Objects – Applets – Joins – Links – Views – Screens – Configuring applications.

### TOTAL PERIODS: 60

#### Text Books:

1. V.K. Garg and N.K. Venkatkrishnan, ERP Concepts and Planning, PHI,2004.
2. SAP ABAP/4, Black Book, DreamTech Press, 2012.
3. Oracle EDI Gateway User guise, OracleCorporation.
4. Jim J. Marion, PeopleSoft PeopleTools: Tips and Techniques, Oracle Press, 2010.

#### Reference Books:

1. Christopher Allen, Oracle Database PL/SQL, TMH,2004.
2. Paula Dean and Jim J. Marion, PeopleSoft PeopleTools: Data Management and Upgrade

Handbook, Oracle Press, 2013.

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorials (Periods)</b>	<b>Practical (Periods)</b>
<b>CS T62</b>	<b>EMBEDDED SYSTEMS</b>	3	1	-

#### **UNIT – I**

Introduction to Embedded Systems - Processor in Embedded System – Other Hardware Units in the Embedded System - Software Embedded into a System - ARM Architecture: ARM Design Philosophy - Registers - Program Status Register - Instruction Pipeline - Interrupts and Vector Table - Architecture Revision - ARM Processor Families.

#### **UNIT – II**

ARM Programming - Instruction Set - Data Processing Instructions - Addressing Modes - Branch, Load, Store Instructions - PSR Instructions - Conditional Instructions.

#### **UNIT – III**

Thumb Instruction Set - Register Usage - Other Branch Instructions - Data Processing Instructions - Single-Register and Multi Register Load-Store Instructions - Stack - Software Interrupt Instructions

#### **UNIT – IV**

ARM Programming using C: Simple C Programs using Function Calls – Pointers – Structures - Integer and Floating Point Arithmetic - Assembly Code using Instruction Scheduling – Register Allocation - Conditional Execution and Loops.

#### **UNIT – V**

Real Time Operating Systems: Brief History of OS - Defining RTOS - The Scheduler - Objects – Services - Characteristics of RTOS - Defining a Task - Tasks States and Scheduling - Task Operations – Structure – Synchronization - Communication and Concurrency. Defining Semaphores - Operations and Use - Defining Message Queue - States – Content – Storage - Operations and Use

### **TOTAL PERIODS: 60**

#### **Text Books:**

1. Shibu K.V, Introduction to Embedded Systems, First Edition, McGraw Hill,2009.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, ARM Systems Developer's Guides- Designing & Optimizing System Software, Elsevier,2008.  
Qing Li , Real Time Concepts for Embedded Systems, Elsevier,2011

#### **Reference Books:**

1. Santanu Chattopadhyay, "Embedded System Design", Second Edition, PHI,2013.
2. Andrew N Sloss, D. Symes and C. Wright, "ARM System Developers Guide", Morgan Kaufmann / Elsevier,2006.
3. Wayne Wolf, "Computer as Components: Principles of Embedded Computer System Design", Elsevier,2006

#### **Websites:**

1. <http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dai0211a/index.htm>
2. <http://www.arm.com/products/processors/classic/arm7/index.php>

3. <http://infocenter.arm.com/help/index.jsp?topic=/com.arm.doc.dai0211a/index.htm>

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS T63	WEB TECHNOLOGY	3	1	-

#### UNIT – I

**Internet Principles and Components:** History of the Internet and World Wide Web- – HTML - protocols – HTTP, SMTP, POP3, MIME, and IMAP. Domain Name Server, Web Browsers and Web Servers. HTML-Style Sheets-CSS-Introduction to Cascading Style Sheets-Rule-Features- Selectors-Attributes. **Client-Side Programming:** The JavaScript Language- JavaScript in Perspective-Syntax-Variables and Data Types- Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers and Regular Expression.

#### UNIT – II

**Server Side Programming: servlet-** strengths-Architecture-Life cycle- Generic and HTTP servlet-Passing parameters- Server Side Include- Cookies- Filters. **JSP-** Engines- Syntax- Components-Scriptlets- JSP Objects-Actions-Tag Extensions- Session Tracking- Database connectivity- Sql statements-J2EE - Introduction - Beans-EJB.

#### UNIT – III

**XML:** Introduction- Revolutions of XML-XML Basics – Defining XML Documents: DTD-XML Schema-Namespaces – XFiles: XLink – XPointer - XPath - XML with XSL – XSL-FO-Parsing XML using DOM-SAX-Integrating XML with database – Formatting XML on theweb.

#### UNIT – IV

**Multimedia and Web Application:** Multimedia in web design, Audio and video speech synthesis and recognition - Electronic Commerce – E-Business Model – E-Marketing – Online Payments and Security – N-tier Architecture. Search and Design: Working of search engines -optimization- Search interface.

#### UNIT – V

**Web Services:** Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services.**Ajax** – Improving web page performance using Ajax, Programming in Ajax.

#### TOTAL PERIODS: 60

#### TEXT BOOKS

1. Deitel and Deitel, Goldberg, “Internet and World Wide Web – How to Program”, Pearson Education Asia,2001.
2. UttamK.Roy, “Web Technologies”, Oxford University Press,2012.
3. Rajkamal, “Web Technology”, Tata McGraw-Hill,2001.
4. Ron Schmelzer, Travis Vandersypen, Jason Bloomberg, MadhuSiddalingaiah, Sam hunting, MichealD.Qualls, David Houlding, Chad Darby, DianeKennedy, “XML andWebServices”, Sams, Feburary2002.
5. Eric Newcomer, “Understanding Web Services: XML, WSDL, SOAP, and UDDI”, Addison-Wesley, 2002.

#### Reference Books:

1. Phillip Hanna, “JSP 2.0 - The Complete Reference”, McGraw-Hill,2003.

2. Mathew Eernisse, “Build Your Own AJAX Web Applications”, SitePoint,2006.

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS P61	ENTERPRISE SOLUTIONS LABORATORY	-	-	3
<p><b>LIST OF EXPERIMENTS</b></p> <p><b>I. ERP</b></p> <ol style="list-style-type: none"> <li>1. Simple application using any of ERP packages.</li> <li>2. ERP solutions related to Business problems, HRM and financial applications.</li> </ol> <p><b>II. Oracle:</b></p> <ol style="list-style-type: none"> <li>1. Study and usage of : Primitive Data Types – User Defined data Types – Built-in Functions – DDL, DML, TCL commands CREATE, ALTER, DROP, SELECT, INSERT, DELETE and UPDATE, COMMIT, ROLLBACK, SAVEPOINT, GRANT and REVOKE.</li> <li>2. Study of PL/SQL Blocks, Exception Handling, Functions, Procedures, Cursors, Triggers, Packages.</li> <li>3. Application : Design and develop any two of the following:               <ol style="list-style-type: none"> <li>a) Online Voting system</li> <li>b) Railway Ticket reservation system</li> <li>c) RTO office - Driving License issuing system</li> <li>d) National Identity Card (AADHAR Card) preparation.</li> <li>e) Any other Similar System</li> </ol> </li> </ol> <p><b>III. SAP</b></p> <ol style="list-style-type: none"> <li>1. Working with structures in SAP</li> <li>2. Write programs in ABAP/4 to date and time calculations, processing strings, table controls.</li> <li>3. Write a program in ABAP/4 to create and maintain table in SAP.</li> <li>4. Forecasting application of a product using SAP.</li> </ol> <p><b>IV. PeopleSoft : Using PeopleSoft, design and develop</b></p> <ol style="list-style-type: none"> <li>1. Student Administration</li> <li>2. PeopleSoft Based HR/Payroll applications</li> <li>3. PeopleSoft Supply Chain Management.</li> </ol> <p><b>V. SIEBEL : Using Siebel, design and develop</b></p> <ol style="list-style-type: none"> <li>1. Any One industry application</li> <li>2. Any One CRM applications</li> </ol>				

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS P62	EMBEDDED SYSTEMS LABORATORY	-	-	3

### LIST OF EXPERIMENTS

**The following programs are to be implemented on ARM based Processors/Equivalent.**

1. Simple Assembly Program for Addition, Subtraction, Multiplication and Division
2. Simple Assembly Program for System Calls and Interrupts, Loops and Branches
3. Write an Assembly programs to configure and control General Purpose Input/Output (GPIO) portpins.
4. Write an Assembly programs to read digital values from external peripherals and execute them with the Targetboard.
5. Program to demonstrate Time delay program using built in Timer / Counter feature on IDE environment
6. Program to demonstrate a simple interrupt handler and setting up a timer
7. Program to Interface 8 Bit LED and Switch Interface
8. Program to implement Buzzer Interface on IDE environment Program to Displaying a message in a 2 line x 16 Characters LCD display and verify the result in debug terminal.
9. Program to demonstrate I<sup>2</sup>C Interface on IDE environment
10. Program to demonstrate I<sup>2</sup>C Interface – Serial EEPROM
11. Demonstration of Serial communication. Transmission from Kit and reception from PC using
12. Serial Port on IDE environment use debug terminal to trace the program.

**Write the following programs to understand the use of RTOS with ARM Processor on IDE Environment using ARM Tool chain and Library:**

1. Write an application that creates a task which is scheduled when a button is pressed, which illustrates the use of an event set between an ISR and a task
2. Write an application that Demonstrates the interruptible ISRs (Requires timer to have higher priority than external interrupt button)
3. Write an application that creates a two task to Blinking two different LEDs at different timings
4. Write an application that creates a two task displaying two different messages in LCD display in two lines.
5. Sending messages to mailbox by one task and reading the message from mailbox by another task.
6. Sending message to PC through serial port by three different tasks on priority Basis.
7. Basic Audio Processing on IDE environment.



<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P63</b>	<b>WEB TECHNOLOGY LABORATORY</b>	-	-	3

### **LIST OF EXPERIMENTS**

1. Creation of HTMLFiles
2. Working with Client SideScripting
  - 2.1 VBScript
  - 2.2 JavaScript
3. Configuration of webservers
  - 3.1 Apache WebServer
  - 3.2 Internet Information Server (IIS)
4. Working with ActiveX Controls in webdocuments.
5. Experiments in Java ServerPages
  - 5.1 Implementing MVC Architecture usingServlets
  - 5.2 Data Access Programming (usingADO)
  - 5.3 Session and Applicationobjects
  - 5.4 File SystemManagement
6. Working with other Server SideScripting
  - 6.1 Active ServerPages
  - 6.2 JavaServlets
  - 6.3 PHP
7. Developing Web Applications usingXML.
8. Experiments in AjaxProgramming
9. Developing WebServices
10. Developing any E-commerce application (MiniProject)

## Electives for Sixth Semester

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E61	<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b>	3	1	-

### UNIT – I

**Object Oriented Methodologies:** Software System Life Cycle – Traditional cycle models – Object Oriented approach – Rumbaugh et al Object Modeling Technique – Booch Methodology – Jacobson et al methodology – Rational Unified Process (RUP) – Unified Modeling Language (UML) – UML Models.

### UNIT – II

**UML Diagrams:** Use case diagram – UML class diagram – interaction diagram – state diagram – activity diagram – Requirements for ATM banking system – case study.

### UNIT – III

**Object Oriented Analysis :** Use case driven Object analysis – approaches for identifying classes – identifying objects, relationships attributes, methods for ATM banking system – Object oriented design process – design axioms.

### UNIT – IV

**Object Oriented Design:** Designing Classes, methods – access layer object storage and object interoperability – access layer for the ATM banking system. View layer – designing interface objects – prototyping User interface – view layer for the ATM banking system

### UNIT – V

**Design Patterns:** Design Patterns – Describing design patterns - catalog of design patterns – organizing the catalog – How design patterns solve design problems – How to select a design pattern – How to use a design pattern – creational pattern: Abstract factory – structural pattern : Adapter – behavioral pattern : chain of responsibility.

### TOTAL PERIODS: 60

#### Text Books:

1. Ali Bahrami, Object Oriented systems development, Tata Mcgraw Hill Education Private Ltd, 1999.
2. Carol Britton and Jill Doake, A student Guide to Object Oriented Development, Elsevier, Butterworth – Heinemann, Eighth Edition, 2007.
3. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Design Patterns – elements of reusable object oriented software, Addison Wesley, 1994

#### Reference Books:

1. Craig Larman, "Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and iterative development", Third Edition, Pearson Education, 2005
2. Mike O'Docherty "Object-Oriented Analysis & design – understanding system development with UML 2.0", John Wiley, 2005.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, "The UML user Guide", Pearson Education, 2005

#### Websites:

1. [www.omg.org](http://www.omg.org)
2. <http://www.ibm.com/developerworks/rational/products/rose/>
3. <http://www.smartdraw.com/resources/tutorials/jacobson-oose-diagrams/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E62	NETWORK DESIGN AND MANAGEMENT	3	1	-

#### UNIT – I

**INTRODUCTION TO NETWORK MANAGEMENT:** Overview of Analysis, Architecture and Design Process-System Methodology, Service methodology, Service Description - Service characteristics - Performance Characteristics - Network supportability - Requirement analysis – User Requirements – Application Requirements – Device Requirements – Network Requirements – Other Requirements - Requirement specification and map.

#### UNIT – II

**REQUIREMENTS ANALYSIS:** Requirement Analysis Process – Gathering and Listing Requirements- Developing service metrics – Characterizing behavior – Developing RMA requirements – Developing delay Requirements - Developing capacity Requirements - Developing supplemental performance Requirements – Requirements mapping – Developing the requirements specification.

#### UNIT - III

**FLOW ANALYSIS:** Individual and Composite Flows – Critical Flows - Identifying and developing flows – Data sources and sinks – Flow models- Flow prioritization – Flow specification algorithms – Example Applications of Flow Analysis.

#### UNIT – IV

**NETWORK ARCHITECTURE:** Architecture and design – Component Architectures – Reference Architecture – Architecture Models – System and Network Architecture – Addressing and Routing Architecture – Addressing and Routing Fundamentals – Addressing Mechanisms – Addressing Strategies – Routing Strategies – Network Management Architecture – Network Management Mechanisms Performance Architecture – Performance Mechanisms – Security and Privacy Architecture – Planning security and privacy Mechanisms.

#### UNIT – V

**NETWORK DESIGN:** Design Concepts – Design Process - Network Layout – Design Traceability – Design Metrics – Logical Network Design – Topology Design – Bridging, Switching and Routing Protocols- Physical Network Design – Selecting Technologies and Devices for Campus and Enterprise Networks – Optimizing Network Design

**TOTAL PERIODS: 60**

#### Text Books:

1. Network Analysis, Architecture, and Design By James D. McCabe, MorganKaufmann, Third Edition, 2007.ISBN-13:978-0123704801
2. Integrated Management of Networked Systems: Concepts, Architectures, and Their Operational Application (The Morgan Kaufmann Series in Networking), Heinz-GerdHegering, Sebastian Abeck, and Bernhard Neumair,1999.
3. Network Design and Management – by Steven T.Karris, Orchard publications,Second edition,2009.

#### Reference Books:

1. Mani Subramanian, “Network Management Principles and practice ”, Addison Wesley New York,2000.
2. Salah Aiidarous, Thomas Plevayk, “Telecommunications Network Management Technologies and Implementations”, eastern Economy Edition IEEE press, NewDelhi, 1998.
3. Lakshmi G. Raman, “Fundamentals of Telecommunication NetworkManagement”, Eastern Economy Edition IEEE Press, New Delhi,1999.

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E63	E-BUSINESS	3	1	-

#### UNIT – I

**Electronic Commerce Environment and Opportunities:** Background – The Electronic Commerce Environment – Electronic Marketplace Technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to Open EDI – Electronic Commerce with WWW/Internet – Commerce Net Advocacy – Web Commerce going forward.

#### UNIT – II

**Approaches to Safe Electronic Commerce:** Overview – Secure Transport Protocols – Secure Transactions – Secure Electronic Payment Protocol(SEPP) – Secure Electronic Transaction (SET)- Certificates for Authentication – Security on Web Servers and Enterprise Networks – Electronic cash and Electronic payment schemes: Internet Monetary payment and security requirements – payment and purchase order process - Online Electronic cash.

#### UNIT – III

**Internet/Intranet Security Issues and Solutions:** The need for Computer Security – Specific Intruder Approaches – Security strategies – Security tools – Encryption – Enterprise Networking and Access to the Internet – Antivirus programs – Security Teams.

#### UNIT – IV

**MasterCard/Visa Secure Electronic Transaction:** Introduction – Business Requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of Email - MIME: Multipurpose Internet Mail Extensions – S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.

#### UNIT – V

**Internet and Website Establishment:** Introduction – Technologies for web servers – Internet tools relevant to Commerce – Internet Applications for Commerce – Internet charges – Internet Access and Architecture – Searching the Internet- Case study.

#### TOTAL PERIODS: 60

##### Text Books:

1. Daniel Minoli and Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw-Hill, 2005.

##### Reference Books:

1. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, “Frontiers of Electronic Commerce”, Tata McGraw-Hill, 2004.
2. Bruce C. Brown, “How to Use the Internet to Advertise, Promote and Market Your Business or Website with Little or No Money”, Atlantic Publishing Company, 2006.

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E64	PRINCIPLES OF PROGRAMMING LANGUAGES	3	1	-

#### UNIT - I

**Introduction:** The art of Language design – Programming language spectrum - Compilation and Interpretation – Evaluation of Programming languages – Syntax and Semantics of language C-lite – Names – Types – Type Systems - Binding – Scope – Static – Dynamic – Abstract Datatypes

#### UNIT – II

**Semantics:** Expression – Assignment - Control flow – Input/output – exception handling – state transformation – partial functions – semantics with dynamic typing – Formal treatment of semantics

#### UNIT – III

**FUNCTIONS:** Call and Return – Parameter passing – function declaration – semantics of call and return – formal treatment of types and semantics – memory management – dynamic arrays – garbage collection

#### UNIT – IV

**Programming techniques:** Imperative programming – C – ADA – Perl – Object Oriented Programming – Small Talk- Java – Python – Functional Programming – Scheme – Haskell

#### UNIT - V

**Modern programming techniques:** Logic programming – prolog – Event-Driven programming – Concurrent Programming – Concepts – Synchronization strategies – Language level mechanism - Interprocess communication – Scripting languages.

**TOTAL PERIODS: 60**

#### Text Books:

1. Allen B. Tucker and Robert E. Noonan, Programming Languages - Principles and Paradigms, Second Edition, Tata McGraw Hill, 2009

#### Reference Books:

1. Robert W. Sebesta, Concepts of Programming Languages, Sixth Edition, Addison Wesley, July 24, 2003.
2. Michael L Scott, Programming Language Pragmatics, Third Edition, Morgan Kaufman, 2009

#### Websites:

1. [http://en.wikipedia.org/wiki/Programming\\_language](http://en.wikipedia.org/wiki/Programming_language)
2. <http://www.dmoz.org/Computers/Programming/Languages/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E65	INFORMATION THEORY & CODING TECHNIQUES	3	1	-

#### UNIT – I

**INFORMATION THEORY:** Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding – Joint and conditional entropies, Mutual information – Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.

#### UNIT - II

**Block Codes:** Error Control Coding – Error Detection and Correction – Parameters – Algebraic Structures – Groups, Rings and Finite Fields - Vector spaces – Binary Fields – Linear Block Codes – Syndrome Error Detection – Minimum Distance – Hamming Codes – FEC – ARQ.

#### UNIT – III

**Cyclic Codes:** Polynomial representation – Generator Polynomial – Cyclic codes in systematic form – Generator matrix – Syndrome calculation - Error Detection – Decoding – Cyclic Redundancy Codes. **BCH Codes:** Minimal Polynomial – Vandermonde Determinant – Decoding – Error location – Error Evaluation polynomials – Euclidian Algorithm.

#### UNIT - IV

**Reed-Solomon Codes:** Error Correction capability – RS codes in systematic form – Syndrome Decoding – Euclidean Algorithm – Berlekamp–Massey Algorithm – Error Control Code for Compact Disks – Encoding and Decoding of RS codes – Interleaving. **Convolutional Codes:** D-transform domain – Linear Sequential Circuits – FIR and IIR FSSMs - Distance Properties – Maximum likelihood detection – Trellis Diagram - Viterbi Algorithm – Hard and Soft Decisions.

#### UNIT - V

**Turbo Codes:** Encoder – Decoder – Markov sources of discrete channels – BCJR algorithm- Iterative Coefficient – Construction Methods of Turbo Codes – EXIT charts. **Low Density Parity Check Codes:** Construction – Sum-Product Algorithm – Logarithmic LDPC decoder EXIT Charts for LDPC – Fountain and LT codes.

#### TOTAL PERIODS: 60

##### Text Books:

1. Andre Neubauer, Jurgen Freudenberger, Volker Kuhn, “Coding Theory: Algorithms, Architectures and Applications” John Wiley, 2007
2. Ranjan Bose, “Information Theory, Coding and Cryptography”, PHI, 2007.

##### Reference Books:

1. Jorge Castiñeira Moreira, Patrick Guy Farrell, “Essentials of Error-Control Coding”, John Wiley, 2006.
2. Viterbi, “Information Theory and Coding”, TMH, 1982.

##### Websites:

1. NPTEL lecture on Information Theory and Coding. Available at <http://www.nptel.iitm.ac.in/courses/117101053/>
2. An Introduction to Reed Solomon Codes. Available at <http://www.ece.tamu.edu/~hpfister/courses/ecen604/rspoly.pdf>  
Forward Error Correction Codes available at [http://www.princeton.edu/~achaney/tmve/.../Forward\\_error\\_correction.html](http://www.princeton.edu/~achaney/tmve/.../Forward_error_correction.html)

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E66	LANGUAGE TECHNOLOGIES	3	1	-

#### UNIT – I

**Introduction:** Natural Language Processing – Linguistic Background – Spoken Language Input and Output Technologies – Written Language Input – Mathematical Methods – Statistical Modeling and Classification Finite State Methods Grammar For Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation.

#### UNIT – II

**Information Retrieval :** Information Retrieval Architecture – Indexing– Storage – Compression Techniques – Retrieval Approaches – Evaluation – Search Engines – Commercial Search Engine Features– Comparison– Performance Measures – Document Processing – NLP Based Information Retrieval – Information Extraction.

#### UNIT – III

**Text Mining:** Categorization – Extraction Based Categorization – Clustering – Hierarchical Clustering – Document Classification and Routing – Finding and Organizing Answers From Text Search – Use Of Categories and Clusters For Organizing Retrieval Results – Text Categorization and Efficient Summarization Using Lexical Chains – Pattern Extraction.

#### UNIT – IV

**Generic Issues :** Multilinguality – Multilingual Information Retrieval and Speech Processing – Multimodality – Text and Images – Modality Integration – Transmission and Storage – Speech Coding – Evaluation Of Systems – Human Factors and User Acceptability.

#### UNIT – V

**Applications:** Machine Translation – Transfer Metaphor – Interlingua and Statistical Approaches – Discourse Processing – Dialog and Conversational Agents – Natural Language Generation – Surface Realization and Discourse Planning.

### TOTAL PERIODS: 60

#### Text Books :

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Prentice Hall, Second edition, 2008.
2. Christopher D. Manning and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, MIT Press, Sixth edition, 2003.

#### Reference Books:

1. James Allen, “Natural Language Understanding”, Benjamin/Cummings Publishing Company, 1995.
2. Gerald J. Kowalski and Mark T. Maybury, “Information Storage and Retrieval Systems”, Kluwer Academic Publishers, 2000.
3. Tomek Strzalkowski, “Natural Language Information Retrieval”, Kluwer Academic publishers, 1999.

#### Website:

1. [http:// clt.gu.se/page/natural-language-processing-lecture-notes](http://clt.gu.se/page/natural-language-processing-lecture-notes)
2. <http://lrc.iiit.ac.in/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E67	UNIX INTERNALS	3	1	-

#### UNIT – I

**Introduction to the Kernel:** Architecture of the UNIX operating system – Introduction to the system concepts – Kernel Data Structures; The Buffer Cache: Buffer Headers – Structure – Retrieval of a buffer – Reading and writing disk blocks – Advantages and Disadvantages; Internal Representation of Files: Inode – Structure of a regular file – Directories – Conversion of a pathname to an Inode – Super Block – Inode Assignment – Allocation of diskblocks

#### UNIT – II

**System Calls for the file system:** Open – Read – Write – lseek – Close – file creation – creation of special files – change directory and change root – change owner and change mode – Pipes – Dup – Mounting and unmounting file systems; **The Structure of Processes:** Process states and transitions – Layout of system memory – The context – saving the context – manipulation of the process address space – sleep.

#### UNIT – III

**Process Control:** Process creation – Signals – Process Termination – Awaiting Process Termination – Invoking other programs – The user ID of a process – The shell – System Boot and the INIT Process; **Process Scheduling and Time:** Process scheduling – System calls for Time – Clock – Scheduler goals – Process priorities – Scheduler Implementation – Run Queue Manipulation.

#### UNIT – IV

**Memory Management Policies:** Swapping – Demand Paging – A Hybrid System with swapping and demand paging; **The I/O Subsystem:** Driver Interfaces, Disk Drivers, Terminal Drivers, Streams.

#### UNIT – V

**Inter Process Communication:** Process Tracing – System V IPC – Network Communications – Sockets – Messages – Ports – Message Passing – Port Operations.

**Multiprocessing:** Multiprocessor Systems – Semaphores – Read-Write Locks – Deadlock Avoidance – Recursive Locks.

**TOTAL PERIODS : 60**

#### Text Books:

1. Maurice J. Bach, “The Design of the UNIX Operating System”, Prentice-Hall of India, 2004.
2. Uresh Vahalia, “UNIX Internals: The New Frontiers”, Pearson Education Asia, 2002.

#### Reference Books:

1. William Stallings, “Operating Systems – Internals and Design Principles”, Pearson Education, Sixth Edition, 2009.
2. Silberschatz, Galvin and Gagne, “Operating System Concepts”, Wiley, Sixth edition, 2003.
3. Graham Glass and King Ables, “The New Frontiers”, Pearson Education, 2001.
4. Daniel P. Bovet and Marco Cesati, “Understanding the LINUX kernel”, O’Reilly Publication, Third edition, 2005.

#### Website:

1. <http://www.ee.surrey.ac.uk/Teaching/Unix/>
2. [http://www.ccse.kfupm.edu.sa/~akbar/ICS431\\_031/IndexPages/MainIndex.htm](http://www.ccse.kfupm.edu.sa/~akbar/ICS431_031/IndexPages/MainIndex.htm)



Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E68	DATA MINING AND WAREHOUSING	3	1	-

### UNIT - I

Data Preprocessing, Language, Architectures, Concept Description: Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

### UNIT - II

Association Rule: Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases-mining multidimensional Association rules –association mining to correlation analysis-constraint based association mining.

### UNIT - III

Classification and Prediction: Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy.

### UNIT - IV

Cluster Analysis: Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, hierarchical methods, density based methods, grid based methods - Outlier Analysis. Recent trends - Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining

### UNIT - V

Data Warehousing: Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation - Data Warehousing to Data Mining -Data warehousing components-building a data warehouse – mapping the data warehouse to an architecture – data extraction - cleanup- transformation tools- metadata – OLAP - Patterns and models - Data visualization principles.

### TOTAL PERIODS: 60

#### Text Books:

1. J. Han and M. Kamber, “Data Mining: Concepts and Techniques”, HarcourtIndia Morgan Kauffman,2012.
2. Alex Berson and Stephen J. Smith, “Data Warehousing, Data mining andOLAP”, Tata McGraw-Hill, 2004.

#### Reference Books:

1. Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education,2004.
2. Sam Anahory and Dennis Murry, “Data Warehousing in the Real World”, Pearson Education,2003.

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E69	SOA AND WEB SERVICES	3	1	-

#### UNIT – I

XML – benefits – Advantages of XML over HTML, EDI, Databases – XML based standards – Structuring with schemas - DTD – XML Schemas – XML processing – DOM –SAX – presentation technologies – XSL – XFORMS – XHTML – Transformation – XSLT – XLINK – XPATH – XQuery

#### UNIT – II

Roots of Service Oriented Architecture (SOA) – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate - Principles of service orientation

#### UNIT – III

Business motivations for web services – B2B – B2C – Technical motivations – limitations of Component Technologies – Architecting web services – Implementation view – web services technology stack – logical view – composition of web services – deployment view – from application server to peer to peer – process view – life in the runtime.

#### UNIT – IV

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

#### UNIT – V

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WS- Security.

#### TOTAL PERIODS: 60

##### Text Books:

1. AtulKahate,” XML and Related technologies”, PearsonEducation,2008.
2. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”, Pearson Education,2005.
3. Newcomer, Lomow, “Understanding SOA with Web Services”,Pearson Education,2005.
4. Ron Schmelzer et al. “ XML and Web Services”, Pearson Education,2002.

##### Reference Books:

1. Keith Ballinger, “. NET Web Services Architecture and Implementation”, Pearson Education,2003.
2. David Chappell, “Understanding .NET A Tutorial and Analysis”, Addison Wesley,2002.
3. Kennard Scibner and Mark C.Stiver, “Understanding SOAP”, SAM publishing.
4. B. V. Kumar, S. V. Subrahmanya ,”Web Services: An Introduction”,2nd Edition, TMH India 2012

##### Websites:

1. [http://docs.oracle.com/cd/E17802\\_01/webservices/webservices/docs/1.6/tutorial/doc/JavaWSTutorial.pdf](http://docs.oracle.com/cd/E17802_01/webservices/webservices/docs/1.6/tutorial/doc/JavaWSTutorial.pdf)
2. <http://www.w3schools.com/xml/>
3. [www.soa.com](http://www.soa.com)

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E610	DISTRIBUTED COMPUTING	3	1	-

### UNIT – I

**Introduction:** Goals – Types of Distributed systems – Architecture styles – System Architecture. Architectures Versus Middleware – Self Management in distributed systems - Processes – Threads – Virtualization – Clients – Servers – Code Migration

### UNIT – II

**Communication:** Fundamentals - Remote Procedure Call – Stream oriented communication – Message oriented communication – Multicast communication.

**Naming** – Names, Identifiers, and addresses – Flat Naming - Structured Naming – Attribute based Naming.

### UNIT – III

**Synchronization:** Clock Synchronization – Logical clocks - Mutual Exclusion – Global positioning of nodes - Election Algorithms.

**Consistency and Replication:** Introduction – Data centric consistency models – Client centric consistency models – Replica management – Consistency protocols.

### UNIT – IV

**Fault Tolerance:** Introduction – Process resilience – Reliable client server communication – Reliable group communication – Distributed commit - Recovery Security – Introduction – Secure channels – Access control – Security management.

### UNIT – V

Distributed File Systems – Distributed web based systems – Distributed object based systems

### TOTAL PERIODS: 60

#### Text Books:

1. Andrew S. Tanenbaum and Maarten Van Steen, “Distributed Systems – Principles and Paradigms”, Prentice- Hall of India, Pvt. Ltd, Second edition, 2008.
2. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Design Patterns – elements of reusable object oriented software, Addition Wesley, 1994

#### Reference Books:

1. Pradeep K Sinha, “Distributed Operating Systems, Prentice-Hall of India, New Delhi, 2001.
2. Jean Dollimore, Tim Kindberg, George Coulouris, “Distributed Systems- Concepts and Design”, Pearson Education, Fourth edition, 2005.
3. M.L. Liu, “Distributed Computing Principles and Applications”, Pearson Education, 2004.
4. HagitAttiya and Jennifer Welch, “Distributed Computing: Fundamentals, Simulations and Advanced Topics”, Wiley, 2004.

#### Websites:

1. <http://www.ida.liu.se>

2. <http://www.cis.upenn.edu>
3. <http://simgrid.gforge.inria.fr/>

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS E611</b>	<b>AGILE METHODOLOGIES</b>	<b>3</b>	<b>1</b>	<b>-</b>

#### **UNIT – I**

Iterative and Evolutionary: Definition – comparison - major activities. Agile: Basic concepts - Major activities - available agile methods. Story: Overview-estimated hours remaining.

#### **UNIT – II**

Motivation: Change on software projects – key motivation-requirement challenge – problems of water fall. Evidence: Research and early historical – standard and though leader-business case -water fall validity.

#### **UNIT – III**

Scrum: Concepts – deliverable and methods. Extreme Programming: Concepts – deliverable – methods.

#### **UNIT – IV**

Unified Process: Concepts – deliverable - methods.Evo: Concepts – methods – deliverable.

#### **UNIT – V**

Practice Tips: Project – management – environment – requirements – tests. Case Study : Bomb Shelter Studios

**TOTAL PERIODS: 60**

#### **Text Books:**

1. Craig Larman, “Agile and Iterative Development A Manager’s Guide” Pearson Education, First Edition, India, 2004.
2. Mike Cohn, “Agile Estimating and Planning”, First Edition, Pearson, 2006.

#### **Reference Books:**

1. Shore, “Art of Agile Development”, Shroff Publishers & Distributors, 2007.

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
CS E612	<b>APPLICATION OUTSOURCING SERVICES</b>	3	1	-

#### **UNIT – I**

**Business Consulting:** Introduction – What a Business consultant does?, Developing Consulting Skills and Knowledge, Getting Clients, types of consulting- Human Resources consulting, e-business consulting, Technology consulting (IT consulting), Small Business consulting, any other areas / organizations need professional advice and ways to learn business consulting.

#### **UNIT – II**

**Business Process Outsourcing:** Overview, Reasons for outsourcing of Business Processes, BPO categories, Planning stage, Selecting the vendor, BPO contracts, Transformational outsourcing, International considerations, key issues in BPO agreements, Information privacy and security issues, negotiations, Renegotiation and terminations. Call centers: telemarketing and telesales.

#### **UNIT – III**

**Enterprise Integration :** Setting Enterprise Integration design objects, Assessing the technology Landscape- legacy systems, Web enabled applications, XML, UML, Agent Technology, Model Driven Architecture, creating business system domain, Integrating with XML, DOM, simple API for XML (SAX), Component based Technology and Enterprise Intelligence. **Software supports Enterprise Integration: Vitria, TIBCO, MQ Series, Web Sphere and etc.**

#### **UNIT – IV**

**Business Intelligence :** Business Intelligence foundation, Bridging the analysis gap, BI case studies, Microsoft Data warehousing framework: SQL server, Data Analyser, Microsoft Business Intelligence accelerator, ETL tool and OLAP: Data Mining techniques and tools, Applications.

#### **UNIT – V**

**Web-Computing:** Introduction, Web – centric architecture, Building Interactive and non –interactive web applications: Web-computing softwares: HTML, CGI, PERL, Servelets, CSS, J2EE, AJAX, JNI, JFC, Web logic and PHP.

#### **TOTAL PERIODS: 60**

##### **Text Books:**

1. “Become a Business Consultant (2012)” by Craig Coolahan, Marg Archibald, TagGoulet
2. Business Process Outsourcing: Process Strategies and Contracts, John K Halvey and Barbara M. Melby, John Wiley & sons Inc, Second Edition, April- 2007.
3. Enterprise Integration: An Architecture for Enterprise application and Systems Integration by Fred A. Cummins, OMG Press,2002.

##### **Reference Books:**

1. Business intelligence: A managerial approach - Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King.2007.
2. Webcentric Local Business Marketing: How to Market Your Business on the Web and Beyond by DavidSandy.
3. HTML and CSS: Design and Build Websites by Jonduckett.

##### **Website:**

1. <http://www.fabjob.com/businessconsultant.asp>
2. [http://en.wikibooks.org/wiki/Business\\_Intelligence](http://en.wikibooks.org/wiki/Business_Intelligence)
3. [http://en.wikipedia.org/wiki/Data\\_mining](http://en.wikipedia.org/wiki/Data_mining)
4. <http://web.cs.dal.ca/~jamie/CS3172/Resources/readings/ref-books.htm>

## VII SEMESTER

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS T71	ARTIFICIAL INTELLIGENCE	3	1	-

### UNIT – I

Introduction: History of AI - - problem spaces and search- Heuristic Search techniques – Best-first search- Problem reduction-Constraint satisfaction-Means Ends Analysis. Intelligent agents: Agents and environment – structure of agents and its functions

### UNIT – II

Knowledge Representation: Approaches and issues in knowledge representation- Propositional Logic –Predicate logic-Forward and backward reasoning - Unification- Resolution- Weak slot-filler structure – Strong slot-filler structure- Knowledge- Based Agent

### UNIT – III

Reasoning under uncertainty: Logics of non-monotonic reasoning-Implementation- Basic probability notation - Bayes rule – Certainty factors and rule based systems-Bayesian networks – Dempster - Shafer Theory - Fuzzy Logic.

### UNIT – IV

Planning and Learning: Planning with state space search-partial order planning-planning graphs-conditional planning-continuous planning-Multi-Agent planning. Forms of learning- inductive learning-learning decision trees-ensemble learning-Neural Net learning and Genetic learning

### UNIT – V

Advanced Topics: Game Playing: Minimax search procedure-Adding alpha-beta cutoffs Expert System: Representation-Expert System shells-Knowledge Acquisition. Robotics: Hardware-Robotic Perception-Planning-Application domains

**TOTAL PERIODS: 60**

#### Text Books:

1. Elaine Rich and Kevin Knight and ShivashankarB.Nair, ArtificialIntelligence, 3rd edition, Tata McGraw Hill,2009.
2. Ben Coppin, “Artificial Intelligence Illuminated”, Jones and BartlettPublishers, 1<sup>st</sup> edition,2004.
3. Stuart J.Russell and Peter Norvig, Artificial Intelligence: A ModernApproach, Pearson Education Asia, II edition,2003.
4. N.P.Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 2<sup>nd</sup> edition, 2005.

#### Reference Books:

1. RajendraAkerkar, “Introduction to Artificial Intelligence”, Prentice hall ofIndia, 2005.
2. Patrick Henry Winston, “Artificial Intelligence”, 3rd edition Pearson Education, Inc.,2001.

#### Website:

1. <http://aima.cs.berkeley.edu/ai.html>
2. [www.stanford.edu/class/cs221/](http://www.stanford.edu/class/cs221/)

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T72	COMPUTER HARDWARE & NETWORK TROUBLESHOOTING	3	1	-

### UNIT – I

**Personal Computer:** Introduction – History of the Personal Computers – System Components - Data flow inside the PC – Processor types and specifications – 16-bit to 64-bit evolution – specifications – Cache Memory – Processor Features: System Management Mode – Super scalar execution – Dynamic Execution - Dual independent bus architecture – Hyper threading – Dual and multi core technology - socket and slot types – Intel’s Pentium and Core Processors – AMD K6 to K8 seriesprocessors.

### UNIT – II

**Mother board components:** Chip sets – Traditional North/South Bridge architecture – Sixth and Seventh generation Chipsets – VIA, SiS and NVIDIA chipsets. Desktop versus Laptop motherboards.

**Bus standards:** ISA – PCI – PCI Express – AGP –MCA – System Resources – Interrupts – DMA channels – I/O Port addresses.

**Power Supply:** SMPS – Power specifications - Connectors – Switches – RTC/NVRAM batteries.

**BIOS:** Shadowing – Upgrading – CMOS setup – Plug and Play – Error messages.

### UNIT – III

**Primary Memory:** Basics- RAM types and performance – Fast page mode DRAM – EDO RAM – SDRAM – DDRx RAM – RDRAM - Memory modules: SIMM, DIMM, DDR DIMM – Memory banks – Parity and ECC – logical memory layout.

**Secondary Storage:** Magnetic Storage: Data Encoding Schemes - Hard disk drive – SATA. Flash memory devices: CompactFlash, MMC, Secure Digital, SSD, RAM disk, USB Flash disks. Optical Storage - CD, DVD, BD – Disk formats - Optical Drive Performance specifications - Troubleshooting memory problems.

### UNIT – IV

**Input and Output Devices:** Keyboard – Signals and Interface standards – Pointing devices: Mouse - mechanical and optical – Joystick.

**Video hardware:** Video Display Adaptors – Interfaces – 3D graphics accelerators – LCD and LED monitors - **Printers:** dot matrix – laser jet - ink jet – Pen plotters – BIOS and DOS Interrupt services for I/O devices – Troubleshooting I/O related problems.

## UNIT – V

**External I/O Interfaces:** Serial versus Parallel - USB: system, data transfer, and controller – Hot plugging – Low speed connections: RS232C and Parallel port: SPP, EPP, ECP – Local Area Networking: Requirements – Wired – Wireless – Bluetooth – Network Interface Cards – Wired Topologies – Switches/Access Points – Wireless Ethernet hardware – Network Protocols: IP and TCP/IP, IPX, NetBEUI. – Cables and Connections. Troubleshooting network problems.

**PC Diagnostics, Testing & Maintenance:** POST – Boot process – Maintenance tools – Preventive Maintenance.

### TOTAL PERIODS: 60

#### Text Books:

1. Scott Mueller, “Upgrading and Repairing PCs”, Pearson Education, 21<sup>st</sup> Edition, 2013.
2. Hans Peter Messmer, “The Indispensable PC Hardware Book”, Addison- Wesley, 4<sup>th</sup> Edition, 2001.

#### Reference Books:

1. Scott Mueller, “Upgrading and Repairing Laptops”, Pearson Education, 3<sup>rd</sup> Edition, 2012.
2. “The undocumented PC: A Programmer’s Guide to I/O, CPUs, and Fixed Memory Areas” Pearson Education, 2<sup>nd</sup> Edition.

#### Websites:

1. Scott Mueller’s Upgrading and Repairing PCs discussion forum, Available at <http://forum.scottmueller.com>
2. Computer Troubleshooting Guides for Common Errors and Symptoms, Available at <http://pcsupport.about.com>
3. BIOS interrupts, Available at <http://www.bioscentral.com>



Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T73	PLATFORM TECHNOLOGY	3	1	-

### UNIT – I

Introduction: NET Framework - Common Language Runtime (CLR) - .NET Framework Class Library - .NET Windows Forms – Uses of Web Forms & Web Services - Common Language Runtime (CLR) – Common Type System - Microsoft Intermediate Language (MSIL) - Components of the CLR - Distinguish Between the .NETCompilers – Organising and Executing Managed Code. NET Framework Class Library – Namespace – Input and Output - Serialisation – Working with XML – Remoting – Enterprise Services – Interoperability – GUIs.

### UNIT – II

.NET Languages: C# Language Fundamentals – Classes and Objects – Methods – Fields and Properties - Inheritance and Polymorphism – Operator Overloading – Struts - Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions – Handling Exceptions – Delegates and Events.

### UNIT – III

VB .NET: Language Fundamentals – Classes and Objects – Methods – Fields and Properties - Inheritance and Polymorphism – Operator Overloading – Interfaces – Arrays – Indexers and Collections – Strings and Regular Expressions.

### UNIT – IV

VB .NET: Handling Exceptions – Delegates and Events - Accessing Data – ADO .NET Object Model- .NET Data Providers – Direct Access to Data – Accessing Data with Datasets.

### UNIT – V

J2EE: Enterprise Edition Overview - Multi-Tier Architecture - Best Practices- Comparison between J2EE and .NET

### TOTAL PERIODS: 60

#### Text Books:

1. David Chappell, “Understanding .NET – A Tutorial and Analysis”, Addison Wesley,2002.
2. Herbert Schildt, “C# 3.0 The Complete Reference”, McGraw-Hill Professional, Third Edition,2008.
3. Harvey M. Deitel, Paul J. Deitel, Tem R. Nieto, Contributor Paul J. Deitel, and Tem R. Nieto, “Visual Basic .NET – How to Program”, Prentice Hall, Second edition,2001.
4. Keogh, “J2EE The Complete Reference”, Tata McGraw-Hill,2008.

#### Websites:

1. <http://msdn.microsoft.com/en-us/library/vstudio/w0x726c2%28v=vs.100%29.aspx>
2. <http://msdn.microsoft.com/en-us/library/vstudio/w0x726c2.aspx>
3. <http://msdn.microsoft.com/en-us/library/gg145045.aspx>

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P71</b>	<b>ARTIFICIAL INTELLIGENCE LABORATORY</b>	-	-	3
<p><b>LIST OF EXPERIMENTS</b></p> <ol style="list-style-type: none"> <li>1. Executing simple programs using Prolog like Missionaries and cannibals Problem</li> <li>2. Graph coloring problem</li> <li>3. Blocks world problem</li> <li>4. Water Jug Problem using DFS,BFS</li> <li>5. Heuristic algorithms (A * Algorithm, best first search)</li> <li>6. Representation of Knowledge using Prepositional Logic and Querying</li> <li>7. Representation of Knowledge using Predicate Logic and Querying</li> <li>8. Forward chaining and Backward chaining</li> <li>9. Unification</li> <li>10. Min max algorithm</li> <li>11. Developing a Spellchecker</li> <li>12. Development of Expert System</li> </ol>				

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P72</b>	<b>COMPUTERS AND NETWORK TROUBLESHOOTING LABORATORY</b>	-	-	3

### **LIST OF EXPERIMENTS**

1. Assembling of a Personal Computer:
  - a. Identifying parts of mother board, power connections and locating other connectors.
  - b. Interconnection of disk drive units, keyboard, mouse and monitor.
2. Hard disk partitioning and OS installation:
  - a. Partitioning the hard disk using FDISK/ Partition Magic/ Disk Manager
  - b. Installation of Windows 98/XP/2000
  - c. Installation of Linux kernel (possibly with dual boot option).
3. Study of In-Circuit Emulator:
  - a. The target processor could be 8085/8088/8031 depending on the availability.
  - b. Learn the different commands and their usages.
4. Study of Logic Analyser:
  - a. Standalone or PC based with multiple channels depending on availability.
  - b. Capture important signals and perform timing/state analysis with known processor/controller environment.
5. Circuit Tracing: Using Multimeter and continuity test mode, to trace a given circuit board and draw the schematic.
6. Interfacing a timer/programmable I/O using PCI bus.
7. Serial Communication: To establish serial communication (RS232C) between a pair of PCs. The program shall be developed using C/C++/MASM with functions provided by BIOS and DOS interrupt services.
8. Parallel port interfacing:
  - a. To interface two PCs via ECP and perform file transfer using Direct Cable Connection feature of Windows OS
  - b. Interface a seven segment LED/LCD using SPP environment.
9. USB port programming and interfacing:
 

To interface ADC, DAC, LED/LCD and push buttons.
10. Troubleshooting printer port problems using Logic Analyzer and multimeter.
11. Troubleshooting serial port problems using Logic Analyzer and multimeter.
12. Troubleshooting USB port problems using Logic Analyzer and multimeter.
13. Troubleshooting PCI bus problems using Logic Analyzer and multimeter.
14. Simulation of a given circuit using PSPICE circuit simulator.
15. Formatting and partitioning of hard disk using SATA programming.
16. Networking PCs: setting up Wired/ Wireless LANs and troubleshooting
17. Networking of devices using Bluetooth interface.

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS P73</b>	<b>PLATFORM TECHNOLOGY LABORATORY</b>	-	-	3

**LIST OF EXPERIMENTS**

Programs using C#.NET

1. Classes and Objects, Inheritance, Polymorphism
2. Interfaces, Operator Overloading, Delegates and Events
3. Exception Handling, Multi-Threading
4. ADO.NET

Program using VB .NET

1. Console & Windows Forms
2. Layout Managers & Containers
3. SDI & MDI
4. Database Controls

Application any one of the following or similar application using .NET framework

1. Inventory Control
2. Retail Shop Management
3. Employee Information System
4. Personal Assistant Program
5. Students' Information System
6. Ticket Reservation System
7. Hotel Management System
8. Hospital Management System

## Electives for Seventh Semester

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E71	<b>SOFTWARE TESTING AND QUALITY ASSURANCE</b>	3	1	-

### UNIT -I

Software Testing Fundamentals: Need for Testing - SDLC and Testing – Functional and Non-Functional Testing – Verification and Validation - Testing levels - Unit, Integration, System and Acceptance Testing – Testing and Debugging – Test Case Design – Test Management (Planning, Monitoring and Reporting) –Weyuker's Adequacy Axioms – Metrics and SDLC.

### UNIT – II

Testing Types – White Box, Black Box and Grey Box – White box testing techniques - Statement coverage, Branch Coverage, Condition coverage, Decision/Condition coverage, Multiple condition coverage, Dataflow coverage, Mutation testing – Black box testing techniques – Boundary value analysis, Equivalence partitioning, Syntax testing, Finite state testing.

### UNIT – III

Testing Object Oriented (OO) Software: Challenges – Differences from Testing non-OO Software – Testing and SDLC – Testing Strategies – Test Case Design – Testing Methods – Class testing strategies - Class Modality - State-based Testing - Message Sequence Specification.

### UNIT – IV

Software Quality: Introduction – Quality and SDLC – Software Quality Assurance (SQA) – SQA Plan, Team, Characteristics, Documentation, Review and Audits –Software Quality Models (McCall, FURBS and GQM) – Software Quality Measurement Metrics – Product quality, Process quality and Maintenance metrics – Quality Cost – Quality Control –

### UNIT – V

Software Quality Standard – CMM Model, ISO 9000 Series, Introduction to PCMM, CMMI and Six Sigma concept. Testing Specialized Environment – Testing Client-Server applications, Testing GUI, Testing compilers and language processors, Testing Real- time Systems. Testing Tools – Automated Tools for Testing – Win Runner, Load Runner– Static code analyzers - Test case generators - GUI Capture/Playback.

**TOTAL PERIODS: 60**

**Text Books:**

1. Roger S. Pressman, “Software Engineering. A Practitioners Approach”, McGraw- Hill International Edition, Seventh edition,2009.
2. William E.Perry, “Effective Methods for Software Testing (2nd Edition) ”, John Wiley & Sons,2000.
3. Glenford J. Myers, Tom Badgett, Corey Sandler, and Todd M. Thomas, “TheArt of Software Testing”, John Wiley & Sons, Second edition,2004.

**Reference Books:**

1. William E. Perry, “Effective Methods for Software Testing”, John Wiley &Sons, Second edition,2000.
2. Boris Beizer, “Software Testing Techniques”, Van Nostrand Reinhold,Second edition,1990.
3. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”,Pearson Education (Singapore) Pte Ltd., 2002.

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E72	ADVANCED DATABASES	3	1	-

#### UNIT – I

**PARALLEL AND DISTRIBUTED DATABASES:** Inter and Intra Query Parallelism – Architecture – Query evaluation – Optimization – Distributed Architecture – Storage – Catalog Management – Query Processing - Transactions – Recovery – Large-scale Data Analytics in the Internet Context - MapReduce Paradigm - run-time system for supporting scalable and fault-tolerant execution - paradigms: PigLatin and Hive and parallel databases versus MapReduce.

#### UNIT – II

**ACTIVE DATABASES:** Syntax and Semantics (Starburst, Oracle, DB2) – Taxonomy – Applications – Integrity Management – Workflow Management – Business Rules – Design Principles – Properties – Rule Modularization – Rule Debugging – IDEA methodology – Open Problems.

#### UNIT – III

**TEMPORAL AND OBJECT DATABASES:** Overview – Data types – Associating Facts – Temporal Query Language – TSQL2 – Time Ontology – Language Constructs – Architecture – Temporal Support – Object Database and Change Management – Change of Schema – Implementing Database Updates in O2 – Benchmark Database Updates – Performance Evaluation.

#### UNIT – IV

**COMPLEX QUERIES AND REASONING:** Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Datalog – Fixpoint semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues.

#### UNIT – V

**SPATIAL, TEXT AND MULTIMEDIA DATABASES:** Traditional Indexing Methods (Secondary Keys, Spatial Access Methods) – Text Retrieval – Multimedia Indexing – 1D Time Series – 2d Color images – Subpattern Matching – Open Issues – Uncertainties.

**TOTAL PERIODS: 60**

#### Text Books:

1. Ramakrishnan, Gehrke, “Database Management System”, Tata McGraw Hill Publications, Third Edition.
2. Carlo Zaniolo, Stefano Ceri “Advanced Database Systems”, Morgan Kaufmann Publishers.

#### Reference Books:

1. Rajesh Narang, “Object Oriented Interfaces and Databases”, Prentice-Hall of India, Pvt. Ltd., 2004.
2. Jeffrey A. Hoffer, Mary B. Prescott and Fred R. McFadden, “Modern Database Management”, Prentice Hall, 2007.
3. Ramez Elmasri, Sham Navathe, “Fundamentals of database Systems”, Addison- Wesley, 2000.
4. C.S.R. Prabhu, “Data Warehousing – Concepts, Techniques, Products and Applications”, Prentice-Hall of India, Pvt. Ltd., 2004.

#### Websites:

1. <http://nptel.ac.in/courses/106106093/>
2. <https://www.coursera.org/course/bigdata>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E73	CLIENT SERVER COMPUTING	3	1	-

#### UNIT - I

**Basic Concepts:** Characteristics - File Server - Database Server - Transaction Server- Groupware Server - Object Server – Middleware - Building Blocks. **Client Server Operating System:** Anatomy of server program - Server needs from OS – Server Scalability - Client Anatomy - Client need from OS - Client OS trends - Server OS trends.

#### UNIT – II

**Client Server Middleware:** NOS Middleware – Transparency - Global Directory Services - Distributed Time Service - Distributed Security Service - RPC, Messaging and Peer to Peer to Peer Communication - RPC-Messaging and Queuing (MOM)- MOM Vs RPC-NOSTrends.

#### UNIT – III

**SQL Database Server:** Stored Procedure, Triggers and Rules - Database Connectivity Solutions - ODBC – Architecture – Components of ODBC. **Data Warehouse:** Elements- Warehouse Hierarchies- Replication Vs Direct Access –Mechanics of Data Replication – Cleansing and Transforming the Raw Data - EIS/DSS. **Client Server Groupware:** Groupware - Component of Groupware.

#### UNIT – IV

**Client Server Transaction Processing:** ACID properties - Transaction Model - TP Monitor and Operating System - TP Monitor and Transaction Management - TP Monitor Client Server interaction types - Transactional RPCs, Queues and Conversations - TP lite or TP Heavy - TP lite Vs TPHeavy.

#### UNIT – V

**Client Server with Distributed Objects:** Distributed Objects and Components – From - Distributed Objects to Components - CORBA-Distributed objects CORBA style – Object Management Architecture - Intergalactic ORB - Object Services - Common Facilities –Business Objects - Next Generation - COM+ - Other Component bus – COM history - COM 101 - OLE/DCOM. **Client Server and Internet:** Web Client Server interaction – 3 Tier client Server web style – CGI– Server side of the web.

#### TOTAL PERIODS: 60

##### Text Books:

1. Robert Orfali, Dan Harkey and Jerri Edwards, “Essential Client Server Survival Guide”, John Wiley & Sons, Third edition, 2007

##### Reference Books:

1. Goldman, James E Rawles, Philip T Mariga and Julie R, “Client Server Information Systems: A Business Oriented Approach”, Wiley,1999.
2. Eric Johnson, Susan McDermott, “The Complete Guide to ClientServer Computing”, Prentice Hall,2001.
3. Smith and Steven L Guengerich, “Client Server Computing”, Prentice-Hall of India,2002.

##### Website:

1. <http://www.infomotions.com/musings/waves/clientservercomputing.html>
2. <http://www.slideshare.net/jayasreep3/client-servercomputing>
3. <http://www.studentshangout.com/topic/142825-client-server-computing-notes/>
4. <http://www.networkcomputing.com/netdesign/1005part1a.html>
5. [http://www.ehow.com/list\\_6706533\\_benefits-client-server-computing\\_.html](http://www.ehow.com/list_6706533_benefits-client-server-computing_.html)

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E74	REAL-TIME COMPUTING AND COMMUNICATION	3	1	-

#### UNIT – I

**Introduction to Real-Time System:** Characteristics – Types of Real-Time tasks – Timing constraints – Real-Time Scheduling - Basic concepts and classification of Algorithms – Clock- Driven Scheduling – Event-Driven Scheduling – Hybrid schedulers – EDF Scheduling – RM Scheduling and its Issues.

#### UNIT – II

**Resource Sharing and Dependencies among Real-Time Tasks:** Resource sharing in Real Time tasks, Priority Inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Handling Task dependencies – Scheduling Real-Time Tasks in Multiprocessor and Distributed Systems – Resource Reclaiming in Multiprocessor Real-Time Systems – Fault- Tolerant Task Scheduling in Multiprocessor Real-Time Systems.

#### UNIT - III

**Real-Time Operating System (RTOS):** Features of RTOS, Commercial Real-Time Operating Systems, Real-Time Databases - Applications, Design issues, Characteristics of Temporal Data, Concurrency control, Commercial Real-Time Databases.

#### UNIT – IV

**Real-Time Communication in Wide Area Networks:** Introduction, Service and Traffic Models and Performance Requirements, Resource Management, Switching Subsystem, Route Selection in Real-Time Wide Area Networks - Basic Routing Algorithms, Routing during Real-Time Channel Establishment, Route Selection Approaches, Dependable Real-Time Channels

#### UNIT – V

**Real-Time Communication in a LAN:** Soft Real-Time Communication in a LAN – Hard Real- Time Communication in a LAN – Bounded Access Protocols for LANs – Real-Time Communications over Packet Switched Networks – QoS requirements – Routing and Multicasting.

#### TOTAL PERIODS: 60

##### Text Books:

1. C. Siva Ram Murthy and G. Manimaran, “Resource Management in Real-Time Systems and Networks”, Prentice-Hall of India, 2005. (UNITs I, II, IV &V)
2. Jane W.S. Liu, “Real-Time Systems”, Prentice Hall, USA, 2000. (UNITIII)

##### Reference Books:

1. Rajib Mall, “Real-Time Systems Theory and Practice”, Pearson Education, India, 2007.
2. C.M. Krishna and Kang G. Shin, “Real-Time Systems”, McGraw-Hill International Editions, 1997.

##### Website:

1. <http://www.ics.uci.edu/~eli/courses/cs244-w12/lecture4-244.ppt>
2. [http://engineeringppt.net/wp-content/uploads/2012/08/Lecture\\_21.ppt](http://engineeringppt.net/wp-content/uploads/2012/08/Lecture_21.ppt)
3. <http://www.cs.virginia.edu/~son/cs851/rtdb.ppt>
4. <http://cse.spsu.edu/pbobbie/Embsysfiles/chp6.ppt>
5. <http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Real%20time%20system/pdf/module6.pdf>



Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E75	SOFTWARE ARCHITECTURE	3	1	-

#### UNIT – I

**Concepts of Design:** Characteristics of design activities – Elements of design – Software quality models and their effects – Quality Attributes – Basic rules of software design – Design process.

#### UNIT - II

**Software Architecture:** Architecture – Software Architecture – Architectural styles – Visual Notation- Active and passive elements – Data, control and relationships – composition and decompositions – Data Flow Style – Call and Return – Independent components – Data centered and virtual machine.

#### UNIT – III

**Styles in design and design space:** Choices of styles and their combination – Hierarchical styles – Simultaneously heterogeneous style – Locationally heterogeneous style– Theory of design spaces – Design Space of elements – Design Space of Styles.

#### UNIT – IV

**Architecture Evaluation:** Concept of Scenario – Evaluating modifiability – Evaluating Performance – SAAM Method – The process : Analysis and Evaluation of modifiability

#### UNIT – V

**Architecture Evaluation Methods:** ATAM – Analysis Process – Analysis Activities – Quality Models – Construction of quality models – Derivation of quality features.

**TOTAL PERIODS: 60**

#### Text Books:

1. Hong Zhu, “Software Design Methodology: From Principles to Architectural Styles.”, Butterworth-Heinemann Elsevier Publishers, 2013.

#### Reference Books:

1. Ian Gorton, “Essential Software Architecture”, Springer – Verlag, Berlin Heidelberg, 2008.
2. Paul Clements, Rick Kazman and Mark Klein, “Evaluating Software Architectures – Methods and Case Studies”, Pearson Low Price Edition, India, 2008.
3. Mary Shaw and David Garlan, “Software Architecture – Perspectives of an Emerging Discipline”, Prentice-Hall of India, 2008.
4. Mahesh P. Matha, “Object Oriented Analysis and Design using UML”, Prentice- Hall of India, 2008.

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E76	HIGH SPEED NETWORKS	3	1	-

#### UNIT – I

Introduction to computer networks - Review of OSI/ISO model – Introduction to high speed networks - High speed LANs – Fast Ethernet - Switched Fast Ethernet - Gigabit Ethernet – ISDN: Conceptual view – Standards – Transmission structure, FDDI, Frame relay - operations and layers.

#### UNIT – II

Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories – AAL - Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control – ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

#### UNIT – III

TCP/IP protocol Suite – IP Packet Header – TCP packet header – User services – Protocol Operation – Connection Establishment – The Need for Flow and Error Control – Link Control Mechanisms – ARQ Performance – TCP Flow Control – TCP Congestion Control – Performance of TCP Over ATM – Integrated Services Architecture – Queuing Discipline – Random Early Detection – Differentiated Services. Resource

#### UNIT – IV

RSVP – Multi protocol Label Switching – Real Time Transport Protocol. Introduction to SONET – Layers – Frames – STS multiplexing – SONET networks – Virtual tributaries - Payload mappings – Packet over SONET – Generic Framing Procedure – Transport services – SONET over WDM – Traffic Grooming.

#### UNIT – V

Introduction to Optical Networks – Wavelength Division Multiplexing (WDM) – Introduction to broadcast and select networks – switch architectures – channel accessing – Wavelength routed networks – switch architectures – Routing and wavelength assignment – Virtual topology design – IP over ATM over WDM – IP over WDM.

#### TOTAL PERIODS: 60

##### Text Books:

1. William Stallings, “High Speed Networks and Internets”, Pearson Education, Second edition, 2002.
2. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design and Algorithms”, Prentice-Hall of India, 2002.

##### Reference Books:

1. Behrouz A Forouzan, “Data Communications and Networking”, Tata McGraw- Hill, Fourth edition, 2006.
2. Behrouz A. Forouzan and Sophia Chung Fegan, “Local Area Networks”, Tata McGraw-Hill, 2001.
3. Uless Black, “Optical Networks - Third Generation Transport Systems”, Pearson Education, 2002.

##### Websites:

1. <http://www.cse.wustl.edu/~jain>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E77	NETWORK PROTOCOLS	3	1	-

#### UNIT – I

**Network Architectures:** Introduction – OSI Model – TCP/IP Model – ATM Model.

**Application Layer Protocols:** BOOTP – DHCP – DNS – FTP – HTTP – SMTP – NNTP – Telnet – RMON – SNMP.

#### UNIT – II

**Presentation Layer Protocol:** LPP. **Session Layer protocols:** RPC, SDP. **Transport Layer protocols:** TCP, UDP, RDP, and RUDP.

#### UNIT – III

**Network Layer Protocols:** IP, IPv6, ICMP, ICMPv6, MobileIP, OSPF, RIP, Multicasting protocols – BGMP, DVMRP, IGMP, and MPLS protocols.

#### UNIT – IV

**Data Link Layer Protocols:** ARP, IPCP, RARP, SLIP, IEEE 802.3, IEEE 802.5, IEEE 802.11, FDDI, ISDN, PPP, LCP, HDLC – SONET/SDH Protocols.

#### UNIT – V

**Network Security Protocols:** SSH, RADIUS SSL/TLS, Kerberos, IPsec, Voice over IP

#### TOTAL PERIODS: 60

##### Text Books:

1. Douglas Comer, “Internetworking with TCP/IP Vol. I: Principles, Protocols and Architecture, Prentice Hall, Fourth edition, 2000.
2. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, Tata McGraw-Hill, Second edition, 2004

##### Reference Books:

1. A. Leon-Garcia and Indra Widjaja, “Communication Networks”, Tata McGraw-Hill, 2000.
2. Charles M. Kozierok, “The TCP/IP Guide: A Comprehensive, Illustrated Internet Protocols Reference”, No Starch Press, 2005.

##### Website:

1. <http://www.cse.wustl.edu/~jain>

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E78	MODELING AND SIMULATION	3	1	-

#### UNIT – I

**Introduction to Simulation:** Need for Simulation – System and its terminologies – Types of simulation – Advantages and Limitations of Simulation – Discrete event simulation – Monte Carlo Simulation – Areas of Application – Components of System – System and its Environment – Models of a System – Continuous Systems – Discrete Systems – Modeling approaches.

#### UNIT - II

**Random Numbers:** Desirable attributes of Random Numbers – Random Number generation – Mid-square Method – Congruential Methods - Recursive generator – Testing Randomness – Chi- square test – Kolmogorov Smirnov test – Bartels Ratio test – Runs up and down test – Run test.

**Probability distributions and Random Variates:** Probability distributions – Discrete and Continuous distributions – Uniform distribution – Exponential distribution – Poisson distribution – Normal distribution – Gamma distribution – Erlang distribution – Inverse Transform Technique – Weibull distribution – Empirical continuous distribution – Generating approximate normal variates – Discrete uniform distribution – Geometric distribution – Acceptance Technique for Poisson distribution – Rejection Technique for Poisson distribution.

**Queueing Theory:** Terminologies of Queueing system – Empirical Queueing Models.

#### UNIT – III

**Simulation Languages and Simulation Models:** Simulation language requirements – Evolution of Simulation languages – General Activity Simulation Programme – Single server Queueing system with single, two queues – Multiple server Queueing system – Balking – Reneging – Bulk arrivals – simple simulation problems.

#### UNIT - IV

**General Purpose Simulation System Language:** GPSS blocks for creation, queue, print, transfer, conditional transfer, Priority, Select, Table, Test, Tabulate Loop, Logic, Gate, etc – Standard Numerical Attributes in GPSS – Transaction parameter – Equivalence declaration – Transaction times – single and matrix Variables in GPSS – Programming in GPSS for simple simulation problems.

#### UNIT – V

**Other Simulation Languages: SIMULA Language** – SIMULA language structures – file operations – Object oriented concepts in SIMULA – array structures in SIMULA.

**SIMSCRIPT** – SIMSCRIPT language notations – SIMSCRIPT language structures – Object oriented Programming and simulation in SIMSCRIPT.

**NS3** - Events and Simulator- Callbacks - Implementation details- Object model in NS3 – Examples – Attributes

**MATLAB** - MATLAB Constructs - Variables - Arithmetic Operations - mathematical and Graphical Functions - Structures - Cell Arrays - MATLAB Programming - MATLAB Editor and Debugger - Projects - Simple Menu - Files - Sorting - Sub-image - Multiple Images

**TOTAL PERIODS: 60**

#### TEXT BOOKS:

1. R. Panneerselvam and P. Senthilkumar, “System Simulation, Modelling and Languages”, PHI Learning Private Limited, 2013

#### Reference Books:

1. Averill M Law, “Simulation Modeling and Analysis”, Fourth Edition, McGraw-Hill Education, 2008.
2. Jerry Banks, John Carson, Barry L. Nelson and David Nicol, “Discrete - Event System Simulation”, Prentice Hall, Fourth edition, 2005.
3. NarasingDeo, “System Simulation with Digital Computer”, Prentice-Hall of India, 2004.
4. Averill. M. Law and W. David Kelton, “Simulation Modeling and Analysis”, McGraw-Hill Inc., 2000

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E79	BUSINESS PROCESS DOMAINS	3	1	-

### UNIT – I

**Telecommunications:** The Future - Organizations Involved in Telecommunications - Terminals and Codes - Systems that use Data Transmission - Human-Computer Dialog - Telecommunications Standards - Communications Network Architectures - The Structure of Telecommunications Networks.

**Media:** Print Media – Electronic Media(Radio and Television) – Film Media – Advt.

**Technology:** Engineering and Management - Functions of Technology Management - Managing Technology through the Product Life Cycle

### UNIT – II

**Financial Services:** Financial System – E-Banking: Transactions(Inter and Intra Banking, Electronic payments) – Securities in E-banking(SSL, digital signatures) – Services provided(ATM, Smart card, ECS) – Insurance - Capital Market Services - Mutual Funds - Leasing and Hire Purchase

### UNIT - III

**Health and Public Services:** Information Technology in Healthcare and Telemedicine - Professional Health Service Organisations - Organisational& Professional Commitment & its Influence on Health Service Management – Biometric Technologies(RFID, Retina scanning, Facial recognition, Finger print scanning, Hand geometry, Working principles of DNA).

### UNIT – IV

**Manufacturing:** Manufacturing Operations - Manufacturing Models and Metrics - Introduction to Automation - Industrial Control Systems - Hardware Components for Automation and Process Control - Industrial Robotics - Product Design and CAD/CAM in the Production System

### UNIT – V

**Energy and Utilities:** Introduction to Global Energy Scenario - Technology and Considerations for Electrical and Fuel Energy - Energy Analysis of Real Industrial Systems: Factories - Principles and Objectives of Energy Management - Procedures for Energy Analysis and Audit.

### TOTAL PERIODS: 60

#### Text Books:

1. Telecommunications and the Computer by Martin, James, PHI, Third Edition, ISBN:978-81-203-0771-2.
2. Media Law And Ethics by Neelamalar M, PHI, 2010, ISBN:978-81-203-3974-3
3. Managing Engineering and Technology by Morse, Lucy C., Babcock, Daniel L. PHI, Fourth Edition, PHI, ISBN:978-81-203-3825-8
4. Financial Services by Sandeep Kumar Goel, PHI learning, 2011, ISBN: 978-81- 203-4445-7
5. E-COMMERCE : AN INDIAN PERSPECTIVE by S. J. JOSEPH, P. T., PHI

- learning, Fourth Edition, 2012, ISBN:978-81-203-4505-8
6. Information Technology: Principles And Applications by Ajoy K. RayTinkuAcharyaPHI, 2004, ISBN:978-81-203-2184-7
  7. Health Service Management: Culture, Consensus & The Middle Manager by Carney, Marie PHI, ISBN: 978-81-203-3176-1.
  8. Biometric Technologies and Verification Systems by John R.Vacca Butterworth-Heinemann/Elsevier,978-0-7506-7967-1
  9. Automation, Production Systems, And Computer-Integrated Manufacturing by Groover, Mikell P. PHI, Third Edition, 2007, ISBN:978-81-203-3418-
  10. Energy Engineering And Management by Chakrabarti, Amlan, PHI, 2011, ISBN:978-81-203-4233-0

**Reference Books:**

1. Essentials of E-Commerce Technology by Rajaraman, V PHI learning,ISBN:978-81-203-3937-8
2. Effective Public Relations and Media Strategy by Reddi, C.V. Narasimha P, PHI, 2010, ISBN:978-81-203-3646-9
3. Bringing New Technology To Market by Allen Kathleen R. PHI,ISBN:81-203-2209-6
4. Financial Services Tripathy, NaliniPrava PHI,ISBN:978-81-203-3245-4
5. IT Services Business Management : Concepts, Processes And Practices Dubey, Sanjiva Shankar, PHI, ISBN:978-81-203-4531-7.

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS E710</b>	<b>SOFTWARE PROJECT MANAGEMENT</b>	3	1	-

#### **UNIT – I**

Conventional Software Management: The Waterfall Model, Conventional software Management Performance. Evolution of Software Economics: Software Economics, Pragmatic Software Cost Estimation. Improving Software Economics: Reducing Software Product Size, Improving software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

#### **UNIT – II**

Conventional and Modern Software Management: Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an Iterative Process. Life Cycle Phases: Engineering and Production Stages, Inception. Elaboration, Construction, Transition Phases. Artifacts of the Process: The Artifact Sets. Management Artifacts, Engineering Artifacts, Programmatic Artifacts. Model Based Software Architectures: A Management Perspective and Technical Perspective.

#### **UNIT – III**

Flows of The Process: Software Process Workflows. Inter Trans Workflows. Checkpoints of the Process : Major Mile Stones, Minor Milestones, Periodic Status Assessments. Interactive Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating. Interaction Planning Process. Pragmatic Planning.

#### **UNIT – IV**

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, and Evolution of Organizations. Process Automation: Automation Building Blocks, The Project Environment.

#### **UNIT – V**

Project Control and Process Instrumentation: Server Care Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations Pragmatic Software Metrics, Metrics Automation. Tailoring the process: Process Discriminates, Example. Modern Project Profiles Next Generation Software economics, Modern Process Transitions. Case Study: The Command Center Processing and Display System –Replacement (CCPDS-R)

#### **TOTAL PERIODS: 60**

##### **Text Books:**

1. Software Project Management, Walker Rayce, 2010,PEA.
2. Bob Hughes and Mike Cotterell , “Software Project Management”, Tata McGraw- Hill, Third Edition,2004.

##### **Reference Books:**

1. “A Guide to Distributed Development, Projects, and Outsourcing”, ChristofEbertNovember 2011,Paperback.
2. Software Engineering and Management, Shere K. D, 1998,PHI.
3. Software Project Management: A Concise Study, S. A. Kelkar,PHI.

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E711	NATURAL LANGUAGE PROCESSING	3	1	-

### UNIT - I

Introduction –Regular Expressions -Finite State Automata -Morphology –Finite state transducers- Probabilistic models - N-grams models.

### UNIT - II

Syntax analysis: Word classes and Part-of-Speech - Context Free Grammars for English – parsing with context free grammar- Syntax- Features and Unification- Lexicalized and Probabilistic Parsing- Language and Complexity.

### UNIT - III

Semantic Analysis: Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus - Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis -Semantic Attachments - Syntax-Driven Analyzer - Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval.

### UNIT - IV

Pragmatics: Discourse- Reference Resolution - Text Coherence -Discourse Structure - Dialog and Conversational Agents - Natural Language Generation- Machine Translation - Transfer Metaphor – Interlingua – Statistical Approaches.

### UNIT - V

Information Extraction: Entity recognition- relation detection- temporal expression analysis and template-filling. Question Answering and Summarization: Information retrieval-factoid question answering, single document summarization,- generic multiple document summarization- query-focused summarization.

### TOTAL PERIODS: 60

#### Text Books :

1. Daniel Jurafsky and James, H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition, 2nd edition Prentice-Hall, 2009.
2. Tanveer Siddiqui and U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.
3. James Allen “Natural Language Understanding”, Benjamin /Cummings Publishing Co., 1995.

#### Reference Books:

1. Gros, Jones and Webber, “Readings in Natural Language Processing”, Morgan Kaufmann publishers, 1986.
2. Popov, “talking with computers in Natural Language”- Springer – Verlag – 1986.
3. E.Reiter and Robert Date “Building Natural Language Generation Systems” Cambridge University Press, 2000.
4. Christopher Manning and Hinrich Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999

#### Website:

1. [www.cs.berkeley.edu/~klein/cs294-5/index.html](http://www.cs.berkeley.edu/~klein/cs294-5/index.html)
2. <http://www.cse.unt.edu/~rada/CSCE5290/>
3. <http://www.cl.cam.ac.uk/teaching/1213/L100/materials.html>



Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E712	OPTICAL NETWORKS	3	1	-

#### UNIT – I

Introduction to optical networks – Principles of optical transmission – Evolution of optical networks – Components and enabling technologies – Wavelength division multiplexing (WDM) – WDM network architectures, broadcast-and-select networks, linear lightwave networks, and wavelength routed networks – Issues in broadcast-and- select networks.

#### UNIT – II

Static traffic routing in wavelength routed networks – Virtual topology design – problem formulation and algorithms - design of multi-fiber networks – Virtual topology reconfiguration – problem formulation - reconfiguration due to traffic changes - reconfiguration for fault restoration – Network provisioning.

#### UNIT – III

Dynamic traffic routing in wavelength routed networks – Routing and wavelength assignment algorithms – Centralized and distributed control – Introduction to Wavelength convertible networks – Wave length rerouting.

#### UNIT – IV

Control and Management – Functions – Framework – Information Model – Protocols – Optical layer Services and Interfacing – Network Survivability – Protection in SONET / SDH – Protection in IP Networks – Optical Layer Protection – Schemes.

#### UNIT – V

Next generation optical Internets – burst switching – packet switching (IP-over-WDM) – Multicast traffic routing – source rooted trees - Access Networks – PON, FTTC, FTTH – Traffic Grooming – Optical Burst Switching.

#### TOTAL PERIODS: 60

##### Text Books:

1. C. Siva Ram Murthy and Mohan Gurusamy, “WDM Optical Networks: Concepts, Design, and Algorithms”, Prentice-Hall of India, 2002.
2. B. Mukherjee, “Optical WDM Networks”, Springer,2006.
3. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks: A Practical Perspective, Morgan Kaufmann (Elsevier Indian Edition), Second edition, 2004.

##### Reference Books:

1. Greg Bemstein, BalaRajagopalan and DebanjanSaha, “Optical Network Control – Architecture, Protocols and Standards”, Pearson Education,2004.
2. Uless Black, “Optical Networks - Third Generation Transport Systems”, Pearson Education,2002.

##### Website:

1. <http://www.cse.wustl.edu/~jain/cis788-99/ftp/dwdm.pdf>
2. [http://www.cse.buffalo.edu/~qiao/cse620/wdm\\_reconfig.ppt](http://www.cse.buffalo.edu/~qiao/cse620/wdm_reconfig.ppt)
3. <http://grail.cba.csuohio.edu/~arndt/optical%20network.ppt>
4. <http://sit.iitkgp.ernet.in/research/aut05vol/topic4.ppt>
5. [http://www.cambridge.org/resources/0521868009/5963\\_OSN\\_chapter9.ppt](http://www.cambridge.org/resources/0521868009/5963_OSN_chapter9.ppt)

## VIII SEMESTER

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS T82	ENGINEERING ECONOMICS AND MANAGEMENT	3	1	-

### UNIT – I

**Micro and Macro Economics and Its applications:** Nature and Scope of Economics Science; Micro economics, Macro economics; Concept of Equilibrium; Economic efficiency, Technical efficiency; Demand and Supply concepts, Elasticity of Demand and supply; Determinants of Demand; Fixed cost, variable cost, Average cost, marginal cost, opportunity cost; standard cost; concept of iso-quant; Price of products, Break Even Analysis, Nature and Functions of Money, National Income, GNP and Savings, Inflation and Deflation, Business Cycles. Types and principles of management, Elements of management; planning, organizing, staffing, co-ordinating etc, types of (ownership) of a firm.

### UNIT – II

**Production Management & Marketing Management:** Types of Production; process of planning, scheduling, Routing, material control; product concept concepts of productivity, Core concepts of Marketing- Needs, Wants, Demand- marketing's Selling- Products and Markets- Pricing and its related factors- Channels of Distribution- Promotion- Advertising- Market Research- Sales Forecasting.

### UNIT – III

**Financial Management:** Sources of finance, internal and external-preparation of balance sheet and profit and loss statements, Types of accounting and significance of each type, interest formulas and their applications.

### UNIT – IV

**Methods of Depreciation:** Straight line method of Depreciation- Declining Balance Method of Depreciation-Sum of the Years Digits Method of Depreciation-Sinking Fund Method of Depreciation-Service-output Method of Depreciation.

### UNIT – V

**Methods of Comparison of Alternatives :** Present worth method (Revenue and Cost Dominated Cash flow Diagram), Future Worth method (Revenue and Cost Dominated Cash Flow Diagram), Annual Equivalent Method (Revenue and Cost Dominated Cash Flow Diagram) Rate of Return Method (Revenue and Cost Dominated Cash flow Diagram) Examples in all methods.

**TOTAL PERIODS: 60**

#### Text Books:

1. O.P.Khanna,, „IndustrialEngineeringandManagement“, Dhanpat Rai and Sons, 1989.
2. R. Pannerselvam, „Engineering Economics“, Prentice Hall of India Pvt. Ltd, 2001.

#### Reference Books:

1. Mote Paul, Gupta, “Managerial Economics” Tata McGraw Hill, 1987.
2. Joseph Massie L “Essentials of Management” 3<sup>rd</sup> Edition PHI 1995.
3. Paul A Samuelson “Economics” Tata McGraw Hill 1987.

<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS T83</b>	<b>INFORMATION SECURITY</b>	3	1	-

#### **UNIT – I**

**FUNDAMENTALS:** Introduction to Information Security - Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing the Components - Balancing Security and Access - SDLC - Security SDLC.

#### **UNIT – II**

**SECURITY INVESTIGATION:** Need for Security - Business Needs - Threats - Attacks - Legal, Ethical and Professional Issues.

#### **UNIT – III**

**SECURITY ANALYSIS:** Risk Management: Identifying and Assessing Risk - Assessing and Controlling Risk - Trends in Information Risk Management - Managing Risk in an Intranet Environment.

#### **UNIT – IV**

**LOGICAL DESIGN:** Blueprint for Security - Information Security Policy - Standards and Practices - ISO 17799/BS 7799 - NIST Models - VISA International Security Model - Design of Security Architecture - Planning for Continuity.

#### **UNIT – V**

**PHYSICAL DESIGN:** Security Technology - IDS, Scanning and Analysis Tools - Cryptography - Access Control Devices - Physical Security - Security and Personnel issues.

#### **TOTAL PERIODS: 60**

##### **Text Books:**

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003.

##### **Reference Books:**

1. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw- Hill, 2003
2. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.

##### **Website:**

1. <http://www.cryptography.com/>
2. <https://www.schneier.com/cryptography.html>
3. <http://www.information-security-policies-and-standards.com/>
4. [www.jhuapl.edu/ourwork/nsa/](http://www.jhuapl.edu/ourwork/nsa/)

## Electives for Eighth Semester

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E81	<b>INTELLIGENT INFORMATION RETRIEVAL</b>	3	1	-

### UNIT – I

**Knowledge Representation:** Knowledge representation - Basics of Propositional logic – Predicate logic - reasoning using first order logic-unification - forward chaining - backward chaining –resolution - Production rules – frames - semantic networks - scripts.

### UNIT – II

**Ontology Development:** Description logic-taxonomies -Topic maps – Ontology - Definition expressing ontology logically - ontology representations – XML – RDF – RDFS – OWL – OIL –ontology development for specific domain - ontology engineering- Semantic web services.

### UNIT – III

**Information Retrieval Modeling:** Information retrieval – taxonomy-formal characterization – classic information retrieval - Set theoretic model - Algebraic model - Probabilistic model -structured text retrieval models - models for browsing -.retrieval performance evaluation –keyword based querying - pattern matching - structural queries-query operations.

### UNIT – IV

**Text and Multimedia Languages and Properties:** Introduction – metadata - markup languages – multimedia. **Text operations:** document preprocessing - document clustering text Compression –basic concepts - statistical methods. **Indexing and searching:** inverted files - suffix trees -signature files - boolean queries - sequential searching - pattern matching.

### UNIT – V

**Recent Trends in IR:** Parallel and distributed IR - multimedia IR - data modeling – query languages - A generic Multimedia indexing Approach - one dimensional time series – two Dimensional colour images - Automatic feature extraction. Web Searching - Characterizing the Web - Search Engines – Browsing – Meta searchers - Searching using hyperlinks.

**TOTAL PERIODS: 60**

#### **Text Books:**

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education, Second edition,2003.
2. Michael C. Daconta, Leo J. Obart and Kevin J. Smith,”Semantic Web – A Guide to the Future of XML, Web Services and Knowledge Management”, Wiley Publishers,2003.
3. Ricardo Baeza-Yates, BerthierRibeiro-Neto, “Modern Information Retrieval”, Addison Wesley,1999.

#### **Reference Books:**

1. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill, Third edition,2003.
2. Christopher D. Manning, PrabhakarRaghavan and Hinrich Schutze, “Introduction to Information Retrieval”, Cambridge University Press,2008.

#### **Website:**

1. <http://www.searchtools.com/info/info-retrieval.html>
2. <http://trec.nist.gov/>
3. <http://www-nlp.stanford.edu/IR-book/>
4. <http://www.csee.umbc.edu/csee/research/cadip/readings/IR.report.120600.book.pdf>
5. <http://www.obitko.com/tutorials/ontologies-semantic-web/resource-description-framework.html>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E82	SOFT COMPUTING	3	1	-

#### UNIT – I

Introduction: Introduction to Artificial Neural Networks, Fundamentals of biological neural networks, Basic principles of ANNs, The Perceptron, single layer and many layer perceptrons, Madaline.

#### UNIT- II

Machine Learning Using Neural Network: Adaptive Networks – Feed forward Networks –Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures.

#### UNIT – III

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.

#### UNIT – IV

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms –Case studies.

#### UNIT – V

Genetic Algorithms, Survival of the fittest, initialization and selection, fitness computation, Cross over, Mutation, Rank Operations – Fitness Scaling – Inversion - Applications of Genetic Algorithms.

#### TOTAL PERIODS: 60

##### Text Books:

1. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Education,2003.
2. Timothy J Ross, “Fuzzy Logic: With Engineering Applications”, 2 Edition, Wiley India Private Ltd,2007.
3. Juan Ramon Rabunal, Julian Dorado, “Artificial Neural Networks in Real Life Application”, Idea Group Inc,2006.
4. J.S.R. Jang, C.T. Sun and E. Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2007.
5. David E Goldberg,” Genetic Algorithms in Search, Optimization and Machine Learning”, Pearson Education, India, 2013.

##### Reference Books:

1. S. Rajasekaran and G.A.V. Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice-Hall of India, 2003.
2. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer,2007.
3. S.N.Sivanandam · S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.
4. Randy L. Haupt, Sue Ellen Haupt, “Practical Genetic Algorithms”, 2 Edition, Wiley and Sons,2004

##### Website:

1. [www.csse.monash.edu.au/courseware/cse5301/2006/Lnts/LaD.pdf](http://www.csse.monash.edu.au/courseware/cse5301/2006/Lnts/LaD.pdf)
2. [www.lancet.mit.edu/mbwall/presentations/IntroToGAs](http://www.lancet.mit.edu/mbwall/presentations/IntroToGAs)
3. [www.iitk.ac.in/kangal/](http://www.iitk.ac.in/kangal/)

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E83	BIO- INSPIRED COMPUTING	3	1	-

#### UNIT – I

**Optimization Techniques:** Introduction to Optimization Problems – Single and Multi- objective Optimization – Classical Techniques – Overview of various Optimization methods – **Evolutionary Computing:** Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function – Reproduction – differences between GA and Traditional optimization methods – Applications – **Bio- inspired Computing (BIC):** Motivation – Overview of BIC – usage of BIC – merits and demerits of BIC.

#### UNIT – II

**Natural to Artificial Systems:** Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – Biological Inspirations in problem solving – **Behavior of Social Insects:** Foraging – Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting – Nest Building – Cooperative transport.

#### UNIT – III

**Swarm Intelligence:** Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – **Ant Colonies:** Ant Foraging Behavior – Towards Artificial Ants – Ant Colony Optimization (ACO) – S-ACO – Ant Colony Optimization Meta heuristic: Combinatorial Optimization – ACO Meta heuristic – Problem solving using ACO – Other Meta heuristics – Simulated annealing – Tabu Search – Local search methods – Scope of ACO algorithms.

#### UNIT – IV

**Swarm Robotics:** Foraging for food – Clustering of objects – Collective Prey retrieval – Scope of Swarm Robotics – **Social Adaptation of Knowledge:** Particle Swarm – Particle Swarm Optimization (PSO) – Particle Swarms for Dynamic Optimization Problems – Artificial Bee Colony (ABC) Optimization – **Other Swarm Intelligence algorithms:** Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering.

#### UNIT – V

**Case Studies:** ACO and PSO for NP-hard problems – Routing problems – Assignment problems – Scheduling problems – Subset problems – Machine Learning Problems – Travelling Salesman problem.

#### TOTAL PERIODS: 60

##### Text Books:

1. A. E. Elben and J. E. Smith, "Introduction to Evolutionary Computing", Springer, 2010.
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
3. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007

##### Reference Books:

1. Christian Blum, Daniel Merkle (Eds.), "Swarm Intelligence: Introduction and Applications", Springer Verlag, 2008.
2. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, "Swarm Intelligence: From Natural to Artificial Systems", Oxford University press, 2000.
3. Leandro N De Castro, Fernando J VonZuben, "Recent Developments in Biologically Inspired Computing", Idea Group Inc., 2005.

##### Website:

1. <http://www.isna3ha.com/books/english/AI/2008-Bioinspired%20Artificial%20Intelligence,%20Theories,%20Methods%20&%20Technologies.pdf>
2. <http://econ.ubbcluj.ro/~rodica.lung/taco/literatura/aco/Ant%20Colony%20Optimization%20Dorigo%20car te.pdf>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E84	Mobile Computing	3	1	-

#### UNIT I

**INTRODUCTION:** Wireless and Mobile Computing Architecture – Limitations of wireless and mobile communication – Wireless Telecommunication Networks: Digital cellular Systems, TDMA - CDMA – Wireless Networking Techniques – Mobility Bandwidth Tradeoffs – Portable Information Appliances.

#### UNIT II

**EMERGING WIRELESS NETWORK STANDARDS: 3 G** Wireless Networks – State of Industry – Mobility support Software – End User Client Application – Mobility Middleware –Middleware for Application Development - Adaptation and Agents - Service Discovery Middleware – Finding Needed Services - Interoperability and Standardization.

#### UNIT III

**MOBILE NETWORKING :** Virtual IP Protocols - Loose Source Routing Protocols - Mobile IP – CDPD – GPRS – UMTS Security and Authentication – Quality of Service – Mobile Access to the World Wide Web.

#### UNIT IV

**MOBILE DATA MANAGEMENT:** Mobile Transactions - Reporting and Co Transactions – Kangaroo Transaction Model – Clustering Model –Isolation only transaction – 2 Tier Transaction Model – Semantic based nomadic transaction processing.

#### UNIT V

**MOBILE COMPUTING MODELS:** Client Server model – Client/Proxy/Server Model – Disconnected Operation Model – Mobile Agent Model – Thin Client Model – Tools: Java, Brew, Windows CE, WAP, Sybian, and EPOC.

#### TOTAL PERIODS: 60

##### Text Books:

1. Reza B Fat and Roy.T. Fielding, “Mobile Computing Principles”,Cambridge UniversityPress, 2005.
2. Abdelsalam A Helal, Richard Brice, Bert Haskel, Marek Rusinkiewicz, Jeffery LCaster and DarellWoelk, “Anytime, Anywhere Computing, Mobile Computing Conceptsand Technology”, Springer International Seriesin Engineering and Computer Science,2000.

##### Reference Books:

1. Golden Richard, Frank Adelstein, Sandeep KS Gupta, Golden Richard and Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional Publishing”,2005.
2. UweHansmann, LotharMerk, Martin S. Nicklons and ThomasStober, “Principlesof Mobile Computing”, Springer,2003.

##### Website:

1. <http://www.faadooengineers.com/threads/394-MOBILE-COMPUTING-E-bookpresentation-and-lecture-notes-covering-full-semester-syllabus>
2. <http://www.dsc.ufcg.edu.br/~sampaio/cursos/2005.1/BancoDeDados/Artigos/BDMoveis/MobileTransactions/an-overview-of-transaction.pdf>

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E85	GRID COMPUTING	3	1	-

### UNIT I INTRODUCTION

Parallel and Distributed Computing - Cluster Computing - Grid Computing Anatomy and Physiology of Grid - Web and Grid Services.

### UNIT II FRAMEWORK

Architecture – Implementation of Grid Architecture – Grid Services OGSI, OGSA, WSRF – Grid Resource and Service Management –Resource Management Framework – Service Negotiation and Acquisition Protocol – Layers of Grid Computing – Building Reliable Services - Grid Monitoring – Sensors and Sensor Management - Grid Security – WS Security –GSI.

### UNIT III DATA AND KNOWLEDGE GRID

Data Source – Collective Data Services - Data Management – Collective Data Management – Federation Services – Representing Knowledge – Processing Knowledge - Knowledge Oriented Grid.

### UNIT IV GRID MIDDLEWARE

List of Globally Available Toolkits – GT3 – Architecture Details – Grid Service Container – OGSI Implementation – Security Infrastructure - System Level Services – Hosting Environments- Programming Model.

### UNIT V APPLICATIONS

Scientific – Medical – Bioinformatics – Federated Computing – ERM – Multiplayer Games - Collaborative Science – Case Study.

### TOTAL PERIODS = 60

#### Text Books:

1. Ian Foster, Carl Kesselman, “The Grid 2: Blueprint for a New Computing Infrastructure”, Elsevier Series, Second edition, 2009.

#### Reference Books:

1. Srikumar Venugopal, Krishna Nadiminti, Hussein Gibbins and Rajkumar Buyya, “Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience”, Wiley Press, New York, USA, 2010.
2. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, “Grid Computing: Making the Global Infrastructure a Reality”, Wiley, 2010.
3. Maozhen Li, Mark Baker, “The Grid: Core Technologies”, Wiley, 2009.

#### Website:

1. <http://forge.gridforum.org/>
2. <http://gridgroup.tic.hefr.ch/>
3. <http://digitalcommons.unl.edu/cseconfwork/83>
4. <http://www.globus.org/>
5. <http://www.ggf.org/>
6. <http://www.unicore.org/>



Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E86	AGENT TECHNOLOGIES	3	1	-

#### UNIT – I

**Agents Overview:** Software Agent definition – Agents Vs objects – Intelligent Agent – Agent characteristics – Agent Types – Agent Applications – Agent Oriented Software Engineering (AOSE) - Aglets – Mobile agents – Agent frame works – Agent reasoning.

#### UNIT – II

**Agents Implementation:** Processes – Threads – Daemons – Components – Java Beans – ActiveX – Sockets, RPCs – Distributed computing – Aglets programming – JINI architecture – Actors and agents – Typed and proactive messages.

#### UNIT – III

**Multi Agent Systems:** Interaction between agents – Reactive agents – Cognitive agents – Interaction protocols – Agent coordination – agent negotiation – Agent cooperation – Agent organization – Self-interested agents in electronic commerce applications.

#### UNIT – IV

**Intelligent Software Agents:** Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications.

#### UNIT – V

**Agents and Security:** Agent Security Issues – Mobile Agents Security – Protecting Agents Malicious Hosts – Untrusted Agents – Black box Security – Authentication for Agents – Security issues for Aglets.

**TOTAL PERIODS: 60**

#### TEXT BOOKS

1. Joseph P. Bigus and Jennifer Bigus, “Constructing Intelligent Agents UsingJava: Professional Developer's Guide”, Wiley, Second edition,2001.
2. Bradshaw, “Software Agents”, MIT Press,2000

#### REFERENCES

1. Stuart Jonathan Russell, Peter Norvig, John F. Canny Contributor, PeterNorvig and John
2. F. Canny, “Artificial Intelligence: A Modern Approach”, Prentice Hall,Second edition,2003.
3. Richard Murch and Tony Johnson, “Intelligent Software Agents”,Prentice Hall,2000.

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E87	BIO INFORMATICS	3	1	-

#### UNIT- I

Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy

#### UNIT – II

Protein Information Resources -Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases -Genome Information Resources - DNA sequence databases, specialized genomic resources.

#### UNIT – III

DNA Sequence analysis - Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases

#### UNIT - IV

Pair wise alignment techniques - Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dot plot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching - Multiple sequence alignment, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

#### UNIT – V

Analysis packages -Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

#### TOTAL PERIODS: 60

##### Text Books:

1. T.K.Attwood&D.J.Parry-Smith, “Introduction to Bioinformatics”, Addison Wesley Longman,2007.
2. Jean Michel Claverie, Cedric Notre dame, “Bioinformatics- ABeginner’s Guide”, Wiley India Pvt. Ltd,2003.
3. Bryan Bergeron, “Bio Informatics Computing”, Pearson Education, Second edition,2003.

##### Reference Book:

1. Arthur M.Lesk, “Introduction to Bioinformatics”, Oxford University Press, 2008.

##### Website:

1. <http://bioinformaticsweb.net/>
2. <http://www.med.nyu.edu/rcr/rcr/btr/complete.html>
3. [http://mybio.wikia.com/wiki/Tutorials\\_in\\_bioinformatics](http://mybio.wikia.com/wiki/Tutorials_in_bioinformatics)

Subject Code	Subject Name	Lectures (Periods)	Tutorials (Periods)	Practical (Periods)
CS E88	HIGH PERFORMANCE COMPUTING	3	1	-

### UNIT – I

**Introduction** : Need of high speed computing – increase the speed of computers – history of parallel computers and recent parallel computers; solving problems in parallel – temporal parallelism – data parallelism – comparison of temporal and data parallel processing – data parallel processing with specialized processors – inter-task dependency.

The need for parallel computers - models of computation - analyzing algorithms –expressing algorithms.

### UNIT – II

**Parallel Programming Platforms:** Trends in microprocessor architectures - limitations of memory system performance – parallel computing platforms – communication costs in parallel machines – routing mechanisms for interconnection networks.

**Principles of Parallel Algorithm Design:** Preliminaries – decomposition techniques – characteristics of tasks and interactions – mapping techniques for load balancing – methods for containing interaction overheads – parallel algorithm models.

**Basic Communication Operations:** One-to-all broadcast and all-to-one reduction – all-to-all broadcast reduction – all-reduce and prefix-sum operations – scatter and gather – all-to-all personalized communication – circular shift – improving the speed of some communication operations.

### UNIT – III

**Analytical Modeling of Parallel Programs:** Sources of overhead in parallel programs – performance metrics for parallel systems – scalability of parallel systems – minimum execution time and minimum cost-optimal execution time.

**Programming using the Message-Passing Paradigm:** principles of message-passing programming – the building blocks – MPI – topologies and embedding – overlapping communication with computation – collective communication and computation operations – groups and communicators.

**Programming Shared Address Space Platforms:** Thread basics – synchronization primitives in Pthreads – controlling thread and synchronization attributes – composite synchronization constructs – tips for designing asynchronous programs – OpenMP.

### UNIT – IV

**Dense Matrix Algorithms:** Matrix-vector multiplication – matrix-matrix multiplication – solving a system of linear equations – FFT.

**Sorting:** Issues in sorting on parallel computers – sorting networks – bubble sort and its variants – Quick sort – bucket and sample sort – other sorting algorithms.

**Graph Algorithms:** Definitions and representation – minimum spanning tree – single-source shortest paths – all-pairs shortest paths.

## UNIT – V

**Search Algorithms for Discrete for Discrete Optimization Problems:** Definitions and examples, sequential search algorithms, search overhead factor, parallel depth-first search, parallel best-first search, speedup anomalies in parallel search algorithms.

**Dynamic Programming:** Overview.

### TOTAL PERIODS: 60

#### Text Books:

1. V. Rajaraman and C. Siva Ram Murthy, “Parallel Computers – Architecture and Programming”, Prentice-Hall of India, 2003. (UNIT I)
2. AnanthGrama, Anshulgupta, George Karypis and Vipin Kumar, “Introduction to Parallel Computing”, Pearson Education, Second edition, 2004. (UNITs II to V)

#### Reference Books:

1. Selim G. Akl, “The Design and Analysis of Parallel Algorithms”, Prentice-Hall of India, 1999.
2. M.J. Quinn, “Parallel Computing – Theory and Practice”, McGraw-Hill, 1994.
3. Michael Jay Quinn, “Parallel Programming in C with MPI and OpenMP”, McGraw-Hill, 2003.
4. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
5. OpenMP Programmer’s Manual.
6. MPI Programmer’s Manual

#### Websites:

1. <http://www.openmp.org/>
2. <http://www.open-mpi/>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E89	WIRELESS COMMUNICATION NETWORKS	3	1	-

### UNIT – I

**Communication Systems:** Medium access control-Motivation for a specialized MAC-SDMA-FDMA –TDMA –CDMA -comparison of S/T/F/CDMA. Telecommunication Systems –GSM – DECT – TETRA - UMTS and IMT - 2000, Satellite Systems – GEO – LEO – MEO - Routing –Localization –Handover –Broadcast systems- Overview –Cyclic Repetition of Data. Digital Audio Broadcasting –Digital Video Broadcasting.

### UNIT – II

**Wireless Communication:** Wireless LAN-Infrared vs Radio transmission – Infrastructure and ad hoc networks –IEEE802.11-HIPERLAN –Bluetooth. Wireless ATM-Motivation for WATM –Wireless ATM working group –WATM Services- Reference Model-Functions-Radio Access Layer –Handover –Location Management – Addressing –Mobile quality of service – Access point control protocol.

### UNIT – III

**Mobile Network Layer:** Mobile IP-Dynamic host configuration protocol-Ad hoc networks. Mobile transport layer-Traditional TCP292-Indirect TCP Snooping TCP, Mobile TCP-Fast Retransmit/Fast recovery-transmission/Timeout Freezing ,Selective Retransmission – Transaction oriented TCPUP.

### UNIT – IV

**Support for Mobility:** File Systems-Consistency –World wide Web –Hyper Text mark up language –approaches that might help wireless access-System architecture –Wireless Application Protocol.

### UNIT – V

Infrastructure-Based/Cellular Networks Introduction to Mobile Networks, GSM System, GPRS, EDGE, and CDMA based standard, IMT-2000, WLL, Mobile Satellite Communication, 3G and 4G, Cognitive Radio Network (5G). Ad Hoc Network, WLAN and WMAN (10) Introduction, Bluetooth, Wi-Fi Standard, WiMAX Standard, Wireless Sensor Networks, IEEE 802.15.4 and Zigbee, Ultra-wideband(UWB), IEEE 802.20.

### TOTAL PERIODS: 60

#### Text Books:

1. Johchenschiller, Mobile Communication, Addison Wesley,2000
2. UpenaDalal, “Wireless Communication”, Oxford HigherEducation.

#### Reference Books:

1. Willium C. Y. Lee, “Mobile communication Design andfundamentals”
2. D. R. KamiloFehar, “Wireless digitalcommunication”
3. Haykin S &Moher M. , “Modern wireless communication”, Pearson,2005.

4. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson  
**Website:**

1. [http://compnetworking.about.com/od/wireless/WiFi\\_Wireless\\_Networks\\_and\\_Technology.htm](http://compnetworking.about.com/od/wireless/WiFi_Wireless_Networks_and_Technology.htm)
2. <http://www.brunel.ac.uk/sed/ece/research/wnc>
3. <http://elsevier.com/Wireless-Communications-and-Networking>
4. <http://williamstallings.com>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E810	<b>BIG DATA MANAGEMENT</b>	3	1	-

#### UNIT – I

**Introduction to Big Data:** Big Data overview- convergence of key trends-industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading, big data technologies-introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

#### UNIT – II

**NOSQL Data management :** Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master- slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – mapreduce – partitioning and combining – composing map-reduce calculations.

#### UNIT – III

**Basic of Hadoop:** Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression.

#### UNIT – IV

**MapReduce Applications:** MapReduce workflows – unit tests with MR Unit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN.

#### UNIT – V

**Hadoop Related Tools:** Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

**TOTAL PERIODS: 60**

#### Text Books:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to theEmerging World of Polyglot Persistence", Addison-Wesley Professional,2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley,2012.

#### Reference Books:

1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive",O'Reilley, 2012.
2. Lars George, "HBase: The Definitive Guide", O'Reilley,2011.

#### Website:

1. [http://www.johndcook.com/R\\_language\\_for\\_programmers.html](http://www.johndcook.com/R_language_for_programmers.html)
2. <http://bigdatauniversity.com/>
3. <http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction>

Subject Code	Subject Name	Lectures (Periods)	Tutorial (Periods)	Practical (Periods)
CS E811	CLOUD COMPUTING	3	1	-

#### UNIT – I

**Introduction to Cloud Computing:** Overview, Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks, Assessing the role of Open Standards.

#### UNIT – II

**Cloud Architecture, Services and Applications:** Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, SaaS Vs. PaaS, Using PaaS Application Frameworks, Software as a Service, Identity as a Service, Compliance as a Service.

#### UNIT – III

**Abstraction and Virtualization:** Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context

#### UNIT – IV

**Managing & Securing the Cloud:** Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, Establishing Identity and Presence

#### UNIT – V

**Case-Studies:** Using Google Web Services, Using Amazon Web Services, Using Microsoft Cloud Services

**TOTAL PERIODS: 60**

#### Text Books:

1. Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, First Edition, John Wiley & Sons, 2011.
2. Sosinsky B., “Cloud Computing Bible”, First Edition, Wiley Edition, 2011.

#### Reference Books:

1. Miller Michael, “Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online”, Pearson Education India
2. Smooth S., Tan N., “Private Cloud Computing”, Morgan Kaufman, First Edition, 2011
3. Linthicum D., “Cloud Computing and SOA Convergence in Enterprise”, Pearson Education India.

#### Website:

1. [www.ibm.com/cloud-computing/](http://www.ibm.com/cloud-computing/)
2. [www.microsoft.com/enterprise/it-trends/cloud-computing/](http://www.microsoft.com/enterprise/it-trends/cloud-computing/)



<b>Subject Code</b>	<b>Subject Name</b>	<b>Lectures (Periods)</b>	<b>Tutorial (Periods)</b>	<b>Practical (Periods)</b>
<b>CS E812</b>	<b>MOBILE APPLICATION DEVELOPMENT</b>	3	1	-

#### **UNIT - I**

Introduction to Mobile Telephony – Mobile device – communication standards : GSM, CDMA, UMTS, Introduction to 1G/2G/3G/4G – LTE – Mobile applications – categories – Factors in Developing Mobile Applications - Mobile application development – software architecture – application models – Framework and tools - HTML 5 - Java script -AJAX

#### **UNIT – II**

Introduction to Android – Installation - Android Architecture - Application Fundamentals - SDK features – Development framework – Android Applications and Activities – creating user interfaces – layouts – views – resources – menu – graphics – animation – intents

#### **UNIT – III**

Android File management tool – database storage – working with SQLite – GPS functionality – location based API – creating map based activities - geocoding – location-based services – handling audio and video services - networking : using Bluetooth – managing connectivity – telephony – SMS

#### **UNIT – IV**

iOS programming – introduction to Objective C: class-objects-methods – interface – inheritance – Introduction to Foundation Framework Classes - File Handling - Property Lists, NSCopy, and Archiving - Selectors and Targets - Dynamic Typing and Dynamic Binding. Introduction to iPhone Architecture - Introduction to Development IDE - XCODE, Interface Builder - Creating and building simple applications - Handling Basic Interaction - Creating basic view controllers - Monitoring events and actions - Creating advanced view controllers

#### **UNIT – V**

Storyboarding Integration - Programmatic Interface creation - Integrating with core services – Email, Contacts - Data actions – preferences - files and addresses - Camera, WebKit - database with iPhone app - Core Data Integration - Advanced controllers – Navigation controller - Integrating with Core Services – Core Audio - Video - Even Handling - Gesture Recognition - Maps and location - Protocols and Categories - Communication with the Services - Using the Accelerometer - Bluetooth Programming.

#### **TOTAL PERIODS: 60**

#### **Text Books:**

1. Reto Meier, Professional Android 2 Application Development, Wiley publications,2011
2. J. F. DiMarzio , Android – A programmer’s Guide, McGraw Hill,2010
3. James A. Brannan, Blake Ward, iOS SDK Programming, Tata McGraw Hill, 2011

#### **Reference Books:**

1. Jeff McWherter, Scott Gowell , Professional Mobile Application Development, John Wiley & sons , Inc, 2012

#### **Website:**

1. [www.android.com](http://www.android.com)
2. [www.apple.com](http://www.apple.com)

