Rashtreeya Sikshana Samithi Trust

R. V. COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belgaum)
R.V Vidyaniketan Post, Mysore Road
Bangalore-560 059

Scheme & Syllabus
V & VI Semester B.E
Information Science and Engineering

(2012 Scheme)

R. V. College of Engineering, Bangalore-560059

(Autonomous Institution Affiliated to VTU, Belgaum)

Department of Information Science & Engineering

SCHEME OF TEACHING & EXAMINATION

SEMESTER: V

Sl. No.	Course Code	Course Title	BoS	Credit Allocation*				No. of Credits
				L	T	P	S	

1	12HSI51	Intellectual Property Rights and Entrepreneurship	HSS	3	0	0	0	3
2	12IS52	System Software	ISE	3	0	1	1	5
3	12IS53	Microprocessors and Multicore Programming	ISE	3	0	1	1	5
4	12IS54	Computer Networks	ISE	3	1	0	1	5
5	12IS5AX	Elective – A	ISE	3	0	0	1	4
6	12IS5BX	Elective – B	ISE	3	0	0	0	3
Total Hours				**18**	**2**	**4**	**16**	**40**
Total Credits								**25**

*** L – Lecture, T – Theory, P – Practical, S – Self Study**

Elective – A		Elective – B	
Course Code	**Course Title**	**Course Code**	**Course Title**
12IS5A1	Advanced Algorithms	12IS5B1	Graph Theory and Applications
12IS5A2	Soft Computing	12IS5B2	Information Coding Theory
12IS5A3	Compiler Design	12IS5B3	Advanced Concepts in Operating System
12IS5A4	File Structures	12IS5B4	Network Programming
12IS5A5	Management Information Systems	12IS5B5	Java & J2EE
12IS5A6	Computer Graphics	12IS5B6	Natural Language Processing with Python

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Department of Information Science & Engineering

SCHEME OF TEACHING & EXAMINATION

SEMESTER: VI

*** L – Lecture, T – Theory, P – Practical, S – Self Study**

Sl. No.	Course Code	Course Title	BoS	Credit Allocation*				No. of Credits
				L	T	P	S	
1	12HSM61	Management and Organizational Behavior	HSS	3	0	0	0	3
2	12IS62	Software Engineering	ISE	3	0	0	1	4
3	12IS63	Computer Networks and Security	ISE	3	0	1	1	5
4	12IS64	Database Management Systems	ISE	3	0	1	1	5
5	12IS65	Emerging Technologies	ISE	2	0	0	0	2
6	12IS6CX	Elective – C	ISE	3	1	0	0	4
7	12IS6DX	Elective – D	ISE	3	0	0	0	3
Total Hours				**20**	**2**	**4**	**12**	**38**
Total Credits								**26**

Elective – C		Elective –D	
Course Code	**Course Title**	**Course Code**	**Course Title**

12IS6C1	Information Security	12IS6D1	Information Storage and Management
12IS6C2	Computer System Performance & Analysis	12IS6D2	Network Management
12IS6C3	High Performance Computing	12IS6D3	Pattern Recognition
12IS6C4	Image Processing and Computer Vision	12IS6D4	Mobile Application Development
12IS6C5	Software Architecture	12IS6D5	Enterprise Information Systems

Emerging Technologies	
Course Code	**Course Title**
12IS65	Recent Advances in Natural Language Processing

INTELLECTUAL PROPERTY RIGHTS AND ENTREPRENEURSHIP

Course Code	**12HSI51**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**2 Hrs**

Unit-I

Introduction:

Types of Intellectual Property, International Scenario in IPR: WIPO, WTO, TRIPS.

Patents:

Introduction, Object of patent; Scope and salient features of patent; patentable inventions, inventions are not patentable, Patent Procedure-Overview, Rights and obligations of patentee; Transfer of Patent Rights; Government use of inventions; Biotechnology patents, protection of traditional knowledge, Infringement of patents and remedy, Case study

8Hrs

Trade Secrets:

Definition, Significance,

Course Code	**12IS52**	**CIE Marks**	**150**
L:T:P:S	**3:0:1:1**	**SEE Marks**	**150**
Credits	**5**	**SEE Duration**	**3 + 3 Hrs**

Unit-I

Compiler Fundamentals and Tools - Lex and Yacc

Compilers – Introduction, Grammars, structure of a compiler.Lexical analysis, Modeling scanners or lexical analyzers as finite automata **8Hrs**

LEX – Lexical analyser generator

Syntax Analysis –The role of the parser, Writing a grammar, Top-Down parsing

Unit-II

Bottom-Up Parsing – LR(0) Items, Simple LR, LR(1) Items, Canonical LR, LALR parsers(RB-2). YACC – LALR parser generator (RB-4)

Machine Architecture **8Hrs**

Introduction, System software and machine architecture, Simplified instructionalComputer (SIC) Machine Architecture, SIC/XE Machine Architecture, SIC programming examples

Unit-III

Assemblers

Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation. **7 Hrs**

Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Implementation examples - MASM Assembler.

Unit-IV

Loaders And Linkers

Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader **6 Hrs**

Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker

Unit-V

Macro Processor

Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels **6Hrs**

Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.

System Software Lab

PART – A

1. Write a LEX program to count the number of vowels and consonants in a given string.
2. Write a LEX program to count number of words, lines, and characters
3. Write a LEX program to count the number of comment lines in a given C program. Also eliminate them and copy that program into a separate file
4. Write a LEX program to count the number of 'scanf' and 'printf' statements in a C program. Replace them with 'readf' and 'writef' statements respectively
5. Write a YACC program to test the validity of an arithmetic expression
6. Write a YACC program to evaluate an arithmetic expression involving operators +, -, * and /
7. Write a YACC program to recognize strings of the form $a^n b^{n+m} c^m$, n,m>=0
8. Write a YACC program to recognize a nested FOR loop statement for C language
9. Write a YACC program to recognize a nested WHILE loop statement for C language
10. Write a YACC program to recognize nested IF control statements(C language) and display the number of levels of nesting

PART - B

Groups of at least TWO (but not more than THREE) students are formed and Each group is assigned by the lab-incharge, a project that implement any of the system softwares or its module that is complex enough. A list that is suggestive but not exhaustive is given below.

1) Implement a 2-pass Assembler for the working model of 8086. (Students **must** use LEX and YACC tools).
2) Implement a Text Editor.
3) Implement a simple Lexical Analyzer for C or C++.
4) Implement a Single pass assembler.
5) Implement a simple Parser for C.
6) Implement a macroprocessor
7) Implement a shell

Note:
A report of about 25 – 30 pages on the package developed in Part B, duly certified by the department must be submitted during examination.Students must give complete code in their report

Course Outcome

1 Define the differences between system software and application software
2 Describe working of different system softwares and identify the different data structures needed
3 Produce the machine understandable code from the high-level or user understandable code
4 Analyze and subdivide the system software development into sub tasks or phases
5 Develop a system software like assembler, macro processor, linker and loader etc. using the lex, yacc and other tools.
6 Assess the software developed basd on the functionalities provided and efficiency

Reference Books

1 Leland. L. Beck, System Software, Third Edition, Addison-Wesley, ISBN: 978-8-13176-281-3, 1997.

2 Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, ISBN: 978-1-56592-000-2, 2007.

3 M. E. Lesk and E. Schmidt , Lex: A Lexical Analyzer Generator, A technical report, Available Online

4 Stephen C. Johnson,Yacc: Yet Another Compiler-Compiler, A technical report, Available Online

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 40 marks (15 marks for Quiz + 25 marks for descriptive) out of which best two will be considered. In addition 20 marks to be earned through self study on emerging topics.

Scheme of Continuous Internal Evaluation for Practicals

CIE is for 50 marks. 20 marks should be earned from continuous evaluation of programs and project (Schedule for project will be given by the lab-incharge). Remaining 30 marks is for Internal Test (Execution of program + Project demonstration)

Scheme of Semester End Evaluation for Theory

Question No. 1 consisting of objective type /short type questions covering the entire syllabus. It is compulsory and carries 20 marks. There are five units. Each unit will have two questions of 16 marks each, students have to answer one question from each unit.

Scheme of Semester End Evaluation for Practicals

In the examination, student has to execute ONE program from Part-A (selected by him from the lot) for a total of 15 marks. Change of program is allowed (ONCE ONLY), in which case 20% marks (3 marks) will be reduced and Part-A will be evaluated for 12 marks.
The package developed under Part-B has to be evaluated for a total of 35 marks.

MICROPROCESSORS AND MULTICORE PROGRAMMING

Course Code	**12IS53**	**CIE Marks**	**150**
L:T:P:S	**3:0:1:1**	**SEE Marks**	**150**
Credits	**05**	**SEE Duration**	**3 + 3 Hrs**

Unit-I

Introduction to Microprocessors –
General Architecture of a Microcomputer System, Evolution of Intel Microprocessor Architecture

Software Architecture of 8088 and 8086 Microprocessors - Microarchitecture of 8086, Software Model, Memory Address Space and Data Organization, Data Types, Segment registers and Memory Segmentation, Dedicated, reserved and general use memory, instruction pointer, Data Registers, Pointer and index registers, status register, Generating Memory Address **7 Hrs**

The 8088 and 8086 Microprocessors and their Memory and I/O Interfaces
The 8088 and 8086 Microprocessors, Minimum and Maximum mode systems, Minimum mode and Maximum mode Interface Signals

Unit-II

Assembly language Programming
Software: The microcomputer Program, Assembly language programming development on the PC, The Instruction Set, The MOV Instruction, Addressing modes

8088/8086 Programming - Integer instruction and Computation
Data transfer instruction, Arithmetic instruction, Logic instruction, Shift instruction, Rotate instruction- Control flow Instructions and Program Structures - Flag-Control instruction, Compare instruction, Control Flow and Jump Instruction, Subroutine and subroutine handling instruction, loops and loop handling instruction, Strings and String Handling instructions **7 Hrs**

Assembly Language Program Development with MASM
Statement Syntax for a source program, Assembler directives, Creating a source file with an editor, Assembling and Linking programs, Loading and Executing a Run module

I/O Interface Circuits and LSI Peripheral Devices
82C55A Programmable peripheral Interface, 82C55A Implementation of parallel I/O ports

Unit-III

Introduction to Multicore Architecture
Motivation for Concurrency in Software, Parallel Computing Platforms, Understanding Performance,

System Overview of threading **7 Hrs**
Defining Threads, System view of threads, What happens when a thread is created , Application programming models and Threading , Virtual Environment : VMs and Platforms

Unit-IV

Parallel Programming **7 Hrs**
Fundamental concepts – Designing for Threads , Parallel Programming Patterns , A Motivation Problem: Error Diffusion, Threading and parallel programming constructs – Synchronization, Critical sections, Deadlock, Synchronization

Primitives

Unit-V

OpenMP Programming

OpenMP – Challenges in Threading a loop ,Minimizing Threading overheads, Performance Oriented programming, Open MP Library functions, Open MP Environment Variables. **7 Hrs**

Solutions to parallel programming problems – Data races, deadlocks and livelocks, Non-blocking algorithms , Memory issues and cache related issues.

Microprocessors and Multicore Programming lab

Part – A : Assembly level programming

Tool to be used : MASM on Windows XP

1a) Write an ALP Search a key element in a list of 'n' 16-bit numbers using linear, binary search algorithm.

b) Write an ALP Reverse a given string and check whether it is a palindrome or not.

2 Write two ALP modules stored in two different files : One module is to read a character from the keyboard and the other one is to display a character. Use the above two modules to read a string of characters from the keyboard terminated by the carriage return and print the string on the display in the next line.

3 Write an ALP to read the status of eight input bits from the Logic Controller Interface and display 'FF' if it is the parity of the input read is even; otherwise display 00.

4 Write an ALP to display messages FIRE and HELP alternately with flickering effects on a 7-segment display interface for a suitable period of time. Ensure a flashing rate that makes it easy to read both the messages (Examiner does not specify these delay values nor is it necessary for the student to compute these values).

5 Write an ALP to scan a 4 x 4 keypad for key closure and to store the code of the key pressed in a memory location or display on screen. Also display row and column numbers of the key pressed.

6 Write an ALP to drive a Stepper Motor interface to rotate the motor in specified direction (clockwise or counter-clockwise) by N steps (Direction and N are specified by the examiner). Introduce suitable delay between successive steps. (Any arbitrary value for the delay may be assumed by the student).

7 Write an ALP to generate a Fully Rectified Sine waveform using the DAC interface. (The output of the DAC is to be displayed on the CRO).

8 Write an ALP to drive an elevator interface in the following way:

i. Initially the elevator should be in the ground floor, with all requests in OFF state.

ii. When a request is made from a floor, the elevator should move to that floor, wait there for a couple of seconds (approximately), and then come down to ground floor and stop. If some requests occur during going up or coming down they should be ignored.

Part – B : Parallel Programming (OpenMP)

Tool to be used : Intel cluster studio on windows / linux OS

Write parallel program for the following

1 Write parallel program using OpenMP : The master thread forks a parallel region. All threads in the team obtain their unique thread number and print it. The master thread only prints the total number of threads.

2a) Write parallel program using OpenMP to sort n element using merge sort

b) Write parallel program using OpenMP to find the maximum in the given array of n elements

3 Write parallel program using OpenMP SECTION directive to assign different array operations to each thread that executes a SECTION.

4 Write parallel program using OpenMP to get Environment Information - The master thread queries and prints selected environment information.

5 Write parallel program using OpenMP for Loop Work-sharing - The iterations of a loop are scheduled dynamically across the team of threads. A thread will perform CHUNK

iterations at a time before being scheduled for the next CHUNK of work.

6 Write parallel program using OpenMP for Matrix Multiplication - Demonstrate a matrix multiply using OpenMP. Threads share row iterations according to a predefined chunk size.

7 Write parallel program using OpenMP for Parallel region with an orphaned directive - Demonstrates a dot product being performed by an orphaned loop reduction construct. Scoping of the reduction variable is critical.

8 Write parallel program using OpenMP for Combined Parallel Loop Reduction - Demonstrates a sum reduction within a combined parallel loop construct. Default data element scoping is assumed – there are no clauses specifying shared or private variables. OpenMP will automatically make loop index variables private within team threads, and global variables shared

Course Outcome

1 Demonstrate fundamental understanding on the operation between the Microprocessor and its interfacing devices.

2 Apply the programming techniques in developing the assembly language programfor microprocessor application

3 Analyze the time complexity of a parallel program and function of the problem size and number of processors.

4 Implement a parallel program using MPI

Reference Books

1 Walter A. Triebel, AvtarSingh,**"**The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications",4th edition**,** Pearson Education India, 2007. ISBN : 9788177584813

2 Shameem Akhter and Jason Roberts;Multi-core Programming; Intel Press; 2006;ISBN:0-9764832-4-6

3 Douglas V.Hall;Microprocessors and Interfacing Programming and Hardware; Tata McGraw Hill; 2nd Edition; 2008;ISBN:9780071126366

4 Michael J Quinn; Parallel programming in C with MPI and OpenMP; Tata McGraw Hill; 2007;ISBN:9780070582019

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 40 marks (15 marks for Quiz + 25 marks for descriptive) out of which best two will be considered. In addition 20 marks to be earned through self study on emerging topics.

Scheme of Continuous Internal Evaluation for Practicals

CIE consists of 50 marks out of which 30 marks for writing records, execution, documentation and 20 marks for internal test. Students should execute one program from each of Part-A and Part-B.

Scheme of Semester End Evaluation for Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Semester End Evaluation for Practicals

Students need to pick one program from the choices given. Students should execute one program from each of Part-A and Part-B. Modification in the program may be asked by the examiner. SEE is evaluated for 50 marks which include writing correct .program, execution and viva. A change of experiment is allowed and in such cases 20% of the marks is reduced and the experiment is evaluated for remaining 80%.

COMPUTER NETWORKS

Course Code	**12IS54**	**CIE Marks**	**100**
L:T:P:S	**3:1:0:1**	**SEE Marks**	**100**
Credits	**5**	**SEE Duration**	**3 Hrs**

Unit-I

Network Models

Networks, Switching, Layered tasks: Sender, Receiver, and Carrier, Hierarchy, The OSI Model: Layered Architecture, Peer-to-Peer Processes, Encapsulation, Layers in the OSI Model, TCP/IP Protocol suite, Addressing, The Internet, Accessing the Internet. **9Hrs**

Physical Layer and Media

Data and Signals: Analog and Digital, Digital Signals, Transmission Impairments, Data Rate Limits, Performance, Digital Transmission, Bandwidth Utilization: Multiplexing and Spreading.

Unit-II

Data Link Layer

Data Link Control: Framing, Flow and Error Control, Error Detection and Correction, Two DLC Protocols. Multiple Access protocols: Random access, Controlled access and Channelization. **8Hrs**

Unit-III

Network Layer

Network layer Services, Packet switching, Structure of a router, Network Layer Protocols: IPV4 Datagram format, IPV4 addresses, Forwarding IP packets, ICMPV4, Unicast Routing: Routing Algorithms, Unicast Routing Protocols, Multicast Routing: Intra-domain Routing protocols, Inter-domain Routing Protocols, IPV6 addressing, Transition from IPV4 to IPV6. **9 Hrs**

Unit-IV

Transport Layer

Introduction, Transport Layer Protocols: Simple Protocol, Stop and Wait protocol, Go-Back-N Protocol (GBN), Selective Repeat Protocol, Piggybacking, UDP: User Datagrams, UDP services, UDP applications, TCP: TCP Services, TCP Features, A TCP Connection, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, **9 Hrs**

Unit-V

Application Layer

Principles of application Layer protocols; The Web and HTTP; File Transfer: FTP; Electronic Mail in the Internet; DNS-The Internets Directory Service; Socket Programming with TCP; Socket programming with UDP.

Multimedia Networking **9 Hrs**

Streaming Stored Audio and Video; Protocols for Real-Time Interactive applications-RTP, RTCP, SIP.

Course Outcome

1 Identify the relationship between OSI layers of the computer networks.

2 Understanding the transport layer services, principles and congestion control.

3 Apply the protocols and services prescribed for the physical, data link, network and transport layers to implement as real experiments.

4 Compare the applied concepts for experimentation results and improve upon it.

5 Evaluate the physical, data link and network layer issues and routing algorithms using protocols, the IP protocol and how to handle internet connections, multicast routing and mobility in network layer.

6 Create and design simple network applications using the knowledge acquired about the services of application layer and multimedia networking.

Reference Books

1 Behrouz A. Forouzan - Computer Networks, A Top Down Approach, Special Indian Edition, Tata McGraw Hill, 2012, *ISBN-13: 978-1-25-900156-7*.

2 James F. Kurose, Keith W. Ross - Computer Networking, A Top-Down Approach Featuring the Internet, 6th Edition, Pearson Education, 2012, *ISBN: 0132856204, 9780132856201*.

3 Behrouz A. Forouzan - Data Communications and Networking, 5thEdition, Tata McGraw-Hill, 2009, *ISBN: 0-07-063414-9*.

4 William Stallings - Data and Computer Communication, 10th Edition, Pearson Education, 2010, ISBN-10: 0131392050.

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 40 marks (15 marks for Quiz + 25 marks for descriptive) out of which best two will be considered. In addition 20 marks to be earned through self study on emerging topics.

Scheme of Semester End Evaluation for Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily

ADVANCED ALGORITHMS

Course Code	**12IS5A1**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:1**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3 Hrs**

Unit-I

Analysis Techniques

Insertion sort, Analyzing algorithms, Designing Algorithms,Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods. **8 Hrs**

Unit-II

Graph Algorithms

Representations of graphs, Bellman - Ford Algorithm; Single source shortest paths in a DAG; Dijkstra's algorithm, Johnson's Algorithm for sparse graphs; Flow networks and Ford- Fulkerson method; Maximum bipartite matching. **7 Hrs**

Unit-III

Heaps: Binary Heap, Binomial Heaps, Fibonacci heaps, Skew heap

Number -Theoretic Algorithms **7 Hrs**

Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem;

Unit-IV

String-Matching Algorithms

Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm, Boyer-Moore algorithm. **7 Hrs**

Computational Geometry

Line segment properties, determining whether any pair of segments intersects, Finding the convex hull, finding the closet pair of points

Unit-V

NP-Completeness

Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-completeness proofs, NP-complete problems. **7 Hrs**

Approximation Algorithms

The vertex-cover problem; The traveling-sales-person problem; The set covering problem; Randomization and linear programming, The subset-sum problem.

Course Outcome

1 Analyze the different notions of asymptotic complexity. Determine the asymptotic complexity of algorithms including the solving of recurrence relations

2 Efficient implementation of both basic as well as advanced data structures including heaps, binomial heaps.

3 Ability to apply and implement learned algorithm design techniques and data structures to solve problems

4 Synthesize efficient algorithms in common engineering design situations.

5 Able to evaluate algorithmic solutions and to justify their correctness and complexity.

6 Compare between different data structures. Pick an appropriate data structure for a design situation.

Reference Books

1 Cormen, Thomas H., Leiserson, Charles E., Rivest, Ronald L. and Clifford Stein – Introduction to algorithms, 3rd Edition, MIT Press, 2009.

2 A.A.Puntambekar- Advanced Data Structures and Algorithms, Technical Publications, 2008, ISBN 8184314787, 9788184314786

3 Ellis Horowitz, SartajSahni, S.Rajasekharan –Fundamentals of Computer Algorithms, University Press, 2007.

4 Levitin, Introduction To Design And Analysis Of Algorithms, 2nd Edition, Pearson Education India

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best two will be considered. In addition 10 marks to be earned through assignment or seminar on emerging topics.

Scheme of Semester End Evaluation—Theory

1. Question No. 1 consisting of objective type/short type questions, it is compulsory and it carries 20 marks, covering the entire syllabus.
2. There are five units. Each unit will have two questions of 16 marks each, students have to answer one question from each unit.

SOFT COMPUTING

Course Code	**12IS5A2**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:1**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3 Hrs**

Unit-I

Neural Networks **6 Hrs**

History, overview of biological Neuro-system, Mathematical Models of Neurons,

ANN architecture

Unit-II

Learning Processes

Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks. **7 Hrs**

Unit-III

Fuzzy Logic

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. **6 Hrs**

Unit-IV

Operations on Fuzzy Sets, Fuzzy Arithmetic, Fuzzy Logic, Uncertainty based Information

Complement, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Information & Uncertainty, Non specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets. **7 Hrs**

Unit-V

Introduction of Neuro-Fuzzy Systems

Architecture of Neuro Fuzzy Networks, Applications of Fuzzy Logic: Medicine, Economics etc. **7 Hrs**

Genetic Algorithms

An Overview, Genetic Algorithms in problem solving, Implementation of Genetic Algorithms

Course Outcome

1	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
2	Analyze genetic algorithms to combinatorial optimization problems
3	Develop neural networks to pattern classification and regression problems
4	Effectively use existing software tools to solve real problems using a soft computing approach
5	Evaluate and compare solutions by various soft computing approaches for a given problem.

Reference Books

1	Anderson, James a., An Introduction to Neural Networks, ISBN: 978-81-203-1351-4,phi, 2008
2	Hertz J. Krogh, R.G. Palmer - Introduction to the Theory of Neural Computation, Addison-Wesley, 1991.ISBN 9780201515602
3	G.J. Klir& B. Yuan - Fuzzy Sets & Fuzzy Logic, PHI, 2006, ISBN: 978-81-203-1136-7
4	Melanie Mitchell - An Introduction to Genetic Algorithm, PHI, 2006

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best two will be considered. In addition 10 marks to be earned through

assignment or seminar on emerging topics.

Scheme of Semester End Evaluation—Theory

3. Question No. 1 consisting of objective type/short type questions, it is compulsory and it carries 20 marks, covering the entire syllabus.
4. There are five units. Each unit will have two questions of 16 marks each, students have to answer one question from each unit.

COMPILER DESIGN

Course Code	**12IS5A3**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:1**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3 Hrs**

Unit-I

Introduction and Syntax-Directed Translation **8Hrs**

Language processors; The structure of a Compiler; Syntax-directed definitions; Evaluation orders for SDDs; Applications of syntax-directed translation; Syntax-directed translation schemes; Implementing L-attributed SDD's

Unit-II

Intermediate Code Generation : Variants of syntax trees; Three-address code; Types and declarationsTranslation of expressions; Control flow; Back patching; Switch statements, Intermediate code for procedures. **8Hrs**

Unit-III

Run-Time Environments: Storage Organization; Stack allocation of space, Access to non-local data on the stack, Introduction to Trace-Based Collection, Short-Pause Garbage Collection **7 Hrs**

Unit-IV

Machine Independent Optimizations **7 Hrs**

Leaders, Basic blocks and flow graphs, Principle sources of optimization; Introduction to data-flow analysis; Partial redundancy elimination; Loops in flow

graphs.

Unit-V

Code Generation

Issues in the design of Code Generator; The Target Language; Addresses in the target code;A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Instruction selection by tree rewriting **6Hrs**

Course Outcome

1 Describe working of each phase in the development of a compiler
2 Apply syntax directed translation rules to generated intermediate code
3 Design a compiler for a simple customized high level language
4 Generation of basic block and flow graphs for intermediate code
5 Apply different optimization methods on intermediate code to generate optimized code

Reference Books

1 Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, ISBN: 978-8-13172-101-8, 2007
2 Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, *ISBN*-10: 0534939724 | *ISBN*-13: 978-0534939724,1997
3 Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education,*ISBN*-13: 978-0805321661 *ISBN*-10: 0805321667,1991
4 Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, *ISBN* 0-521-60765-5,1997

Scheme of Continuous Internal Evaluation for Theory

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FILE STRUCTURES

Course Code	**12IS5A4**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:1**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3Hrs**

Unit-I

Introduction

File Structures: Definition of file structures, Overview of file structure design, Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters. Review of Unix Directory Structure: Physical devices and Logical Files, File-related Header Files, Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape. CD-ROM: Introduction, Physical Organization, Strengths and Weaknesses; **7Hrs**

Fundamental File Structure Concepts, Managing Files of Records

Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files, Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization

Unit-II

Organization of Files and Indexing

Over view of Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Key sorting.

Indexing: What is an Index? A Simple Index for Entry-Sequenced File, Using Template Classes in C++ for Object I/O, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, binding. **7Hrs**

Co sequential Processing and Sorting of Large files

Co sequential Processing: A Model for Implementing Co sequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Multiway Merging, Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk.

Unit – III

Multi-Level Indexing and B-Trees **7Hrs**

Introduction: The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a B-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging

and Redistribution, Redistribution during insertion; B* Trees, Buffering of pages; Virtual B-Trees; Variable-length Records and keys.

Unit-IV

Indexed Sequential File Access and Prefix B + Trees

Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of key. The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective. **7Hrs**

Unit-V

Hashing

Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access. **8Hrs**

Extendible Hashing

How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.

Programming Exercises

- Implement a primary index for a set of student data records
- Implement an inverted list for retrieving a record from a set of student records
- Implement a system to retrieve a set of student records using combination of secondary keys
- Demonstrate heapsort for a set of primary keys (USN) on student records
- Implement a Journal-Ledger transaction process using any two data sets
- Demonstrate K-way merge for a set of library records
- Implement a B-tree index using alphanumeric characters
- Implement a Simple Prefix B+Tree index for a set of student records
- Implement a hashing technique to store a set of student records. Use Progressive overflow to resolve collision
- Demonstrate extendible hashing technique for a set of student records

Course Outcome

1 Explore the design and implementation of Indexing, Co-Sequential Processing, Multilevel Indexing, Hashing

2 Expert in knowing the salient features of backup storage devices

3 Implement the basic file -Handling process.

4 Develop and employ the skills in designing and executing any File structures

Reference Books

1 Michael J. Folk, Bill Zoellick, Greg Riccardi; File Structures-An Object Oriented Approach with C++; Addison-Wesley; 3rd Edition ; Reprint 2011;*ISBN*: 0201874016

2 K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj;File Structures Using C++; Tata McGraw-Hill;, 2009; ISBN-13 : 978-0-07-066877-5/ISBN-10 : 0-07-066877-9

3 Raghu Ramakrishnan and Johannes Gehrke; Database Management Systems; 3rd Edition; McGraw ***;****ISBN*: 0072465638

4 Stanley B. Lippman, JoséeLajoie, Barbara E. Moo ; C++ Primer;4thEdition;*ISBN* 0-201-72148-1

Scheme of Continuous Internal Evaluation for Theory

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Scheme of Semester End Evaluation—Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

MANAGEMENT INFORMATION SYSTEMS

Course Code	**12IS5A5**	**CIE Marks**	100
L:T:P:S	**3:0:0:1**	**SEE Marks**	100
Credits	**4**	**SEE Duration**	3 Hrs

Unit-I

Foundation Concepts: Information Systems in Business : The Real World of Information Systems , The Fundamental Roles of IS in Business, Trends in Information Systems, The Role of e-Business in Business, Types of Information Systems, Managerial Challenges of Information Technology **03** Hrs

Foundation Concepts: The Components of Information Systems : System Concepts: A Foundation, Components of Information Systems, Information System Resources, Information System Activities, Recognizing Information Systems

Fundamentals of Strategic Advantage : Strategic IT, Competitive Strategy Concepts, Strategic Uses of Information Technology, Building a Customer-Focused Business, The Value Chain and Strategic IS **04** Hrs

Using Information Technology for Strategic Advantage : Strategic Uses of IT,

Reengineering Business Processes, Becoming an Agile Company, Creating a Virtual Company, Building a Knowledge-Creating Company, Knowledge Management Systems

Unit-II

e-Business Systems : Introduction, Cross-Functional Enterprise Applications, Enterprise Application Integration, Transaction Processing Systems, Enterprise Collaboration Systems **03 Hrs**

Functional Business Systems : Introduction, Marketing Systems, Manufacturing Systems, Human Resource Systems, Accounting Systems, Financial Management Systems

Getting All the Geese Lined Up : Managing at the Enterprise Level, Customer Relationship Management: The Business Focus, Introduction, What Is CRM? The Three Phases of CRM, Benefits and Challenges of CRM, Trends in CRM, **04 Hrs**

Enterprise Resource Planning: The Business Backbone : Introduction, What Is ERP ? Benefits and Challenges of ERP, Trends in ERP

Supply Chain Management: The Business Network, Introduction, What Is SCM? The Role of SCM, Benefits and Challenges of SCM, Trends in SCM

Unit-III

e-Commerce Fundamentals : Introduction to e-Commerce, The Scope of e-Commerce, Essential e-Commerce Processes, Electronic Payment Processes. **03 Hrs**

e-Commerce Applications and Issues : Business-to-Consumer e-Commerce, Web Store Requirements, Business-to-Business e-Commerce, e-Commerce Marketplaces, Clicks and Bricks in e-Commerce

Decision Support in Business : Introduction, Decision Support Trends, Decision Support Systems, Management Information Systems, Online Analytical Processing, Using Decision Support Systems, Executive Information Systems, Enterprise Portals and Decision Support, Knowledge Management Systems. **05 Hrs**

Artificial Intelligence Technologies in Business, Business and AI, An Overview of Artificial Intelligence, Expert Systems, Developing Expert Systems, Neural Networks, Fuzzy Logic Systems, Genetic Algorithms, Virtual Reality, Intelligent Agents.

Unit-IV

Developing Business/It Strategies : Planning Fundamentals, Introduction, Organizational Planning, The Scenario Approach, Planning for Competitive Advantage, Business Models and Planning, Business/IT Architecture Planning, Identifying Business/IT Strategies, Business Application Planning **03 Hrs**

Implementation Challenges : Implementation, Implementing Information Technology, End-User Resistance and Involvement, Change Management

Developing Business/It Solutions: Developing Business Systems : IS Development, The Systems Approach, Systems Analysis and Design, The Systems Development Life Cycle, Starting the Systems Development Process, Systems Analysis, Systems Design, End-User Development, Technical Note: Overview of Object-Oriented Analysis and Design **04 Hrs**

Implementing Business Systems : Implementation, Implementing New Systems, Project Management, Evaluating Hardware, Software, and Services, Other Implementation Activities

Unit-V

Security, Ethical, and Societal Challenges of IT : Introduction, Ethical Responsibility of Business Professionals, Computer Crime, Privacy Issues, The Current State of Cyber Law, Other Challenges, Health Issues, Societal Solutions, **04 Hrs**

Security Management of Information Technology : Introduction, Tools of Security Management, Inter-Networked Security Defenses, Viral Defenses, Other Security Measures, System Controls and Audits

Enterprise and Global Management of Information Technology: Managing Information Technology : Business and IT , Managing Information Technology, Managing the IT Function, Organizing IT, Outsourcing and Off shoring IT and IS, Failures in IT Management **03**

Managing Global IT : The International Dimension, Global IT Management, Cultural, Political, and Geoeconomic Challenges, Global Business/IT Strategies, Global Business/IT Applications, Global IT Platforms, Global Data Access Issues, Global Systems Development Hrs

Course Outcome

1 Define terminology and concepts in the major areas of business like Information Technology, Marketing, Management, Economics, Accounting, and Finance.

2 Assess the impact of the Internet and Internet technology on business-electronic commerce and electronic business.

3 Identify the major management challenges to building and using information systems and evolve appropriate solutions to those challenges.

4 Plan projects, work in team setting, and deliver project outcomes on time.

Reference Books

1 James A. O' Brien, George M. Marakas: Management Information Systems, Global Edition, 10 Ed, McGraw Hill, 2011. (Case Studies are included in Assignment / Self Study Topics for Continuous INTERNAL Evaluation Only)

2 Kenneth C. Laudon and Jane P. Laudon: Management Information System, Managing the Digital Firm,Prentice Hall PTR, 2011.

3 Steven Alter: Information Systems The Foundation of E-Business, 4th Edition, Pearson Education, 2002.

4 W.S. Jawadekar: Management Information Systems, Tata McGraw Hill 2006.

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COMPUTER GRAPHICS

Course Code	**12IS5A6**	**CIE Marks**	100
L:T:P:S	**3:0:0:1**	**SEE Marks**	100
Credits	**04**	**SEE Duration**	3 Hrs

Unit-I

Introduction

Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model.

The programmer's interface; Graphics architectures; Programmable pipelines; Performance characteristics. Graphics Programming: The Sierpinski gasket; Programming two dimensional applications. 6 Hrs

Unit-II

The OpenGL

The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three dimensional gasket; Adding interaction;Menus

Input and Interaction Interaction; 7 Hrs

Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; A simple CAD program; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations.

Unit-III

Geometric Objects and Transformations

Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. 7 Hrs

Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three dimensional applications; Quaternions.

Unit-IV

Viewing Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden surface removal; Interactive mesh displays 6 Hrs

Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

Unit-V

Implementation

Basic implementation strategies; The major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions. 7 Hrs

Rasterization; Bresenham's algorithm; Polygon rasterization; Hidden-surface removal; Antialiasing; Display considerations.

Course Outcome

1 Describe the general software architecture of programs that use 2D and 3D computer graphics.

2 Compare various algorithm design and implementation skills and also gain practical experience in graphics programming with OpenGL.

3 Analyze the applications of computer graphics concepts in the development of computer

games, information visualization, and business applications.

4 Design and implement models of surfaces, lights, sounds, and textures (with texture transformations) using a 3D graphics API.

Reference Books

1 Edward Angel; Interactive Computer Graphics: A Top-Down Approach with OpenGL; Pearson Education; 6th Edition; 2012;ISBN 10: 0-13-254523-3
ISBN 13: 978-0-13-254523-5.

2 Donald Hearn, Pauline Baker; Computer Graphics with OpenGL; Pearson Education; 2nd Edition; 2009; ISBN: 8131727386.

3 F.S. Hill Jr.; Computer Graphics Using OpenGL; Pearson Education; 2nd Edition; 2007; ISBN: 2548568.

4 SumantaGuha; Computer Graphics Through OpenGL: From Theory to Experiments ;Taylor & Francis Group; 2011; ISBN:1439846200

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GRAPH THEORY AND APPLICATIONS

Course Code	**12IS5B1**	**CIE Marks**	**100**
L:T:P:S	**3:0: 0:0**	**SEE Marks**	**100**
Credits	**03**	**SEE Duration**	**3 Hrs**

Unit-I

Basic concepts, Paths and Circuits

Introduction, Applications of Graphs, Incidence and Degree, Isomorphism, Walks, paths and Circuits, Connected Graphs, Disconnected Graphs and Components. Euler Graphs, Hamiltonian Paths and Circuits. **7 Hrs**

Unit-II

Matrix representation of Graphs

Incidence Matrix, Submatrices of A(G), Circuit matrix, Fundamental circuit matrix and Rank of B, An application to a switching network. **7 Hrs**

Coloring,Covering and Partitioning

Chromatic number, Chromatic partitioning, Chromatic polynomial,The four color problem

Unit-III

Planar Graphs, Enumeration of Graphs

Planar Graphs, Kuratowski's Two Graphs, Different Representations of a Planar Graph, Detection of Planarity, Types of Enumeration, Counting labeled Trees, Counting Unlabeled Trees, Polya's Counting Theorem, Graph Enumeration With Polya's Theorem **7 Hrs**

Unit-IV

Vector Spaces of A Graph, Graphs in Switching and Coding Theory

Modular Arithmetic and Galois Fields, Vector Space Associated with a Graph, Basis Vectors of a Graph, Circuits and Cut-Set Subspaces, Orthogonal Vector Spaces,Contact Networks, Analysis of Contact Networks, Synthesis of Contact Networks, Unit Cube and Its Graph, Graphs in Coding Theory **7 Hrs**

Unit-V

Graph Theory in Operations Research

Transport Networks, Extensions of Max-Flow Min-Cut Theorem, Minimal Cost Flows, The Multicommodity Flow, Activity Networks in Project Planning, Analysis of Activity Network, Graphs in Game Theory, Signal-Flow Graphs, Graphs in Markov Processes,Graphs in Computer Programming, Graphs in Chemistry. **9 Hrs**

Course Outcome

1 Apply the abstract concepts of graph theory in modeling and solving non-trivial problems in different fields of study.

2 Design efficient algorithms for various optimizations on graphs

3 Develop the networking algorithms for maximal and minimal flows, transportation problem

4 Analyze complex problems and use graph theory in obtaining the solution

Reference Books

1 NarsinghDeo,'Graph Theory with applications to Engineering & Computer Science.', 3rd Edition, Prentice Hall, 2009. ISBN - 10 : 8120301455

2 Douglas B West, Introduction to Graph Theory, 2nd edition, Prentice Hall, India, 2005.ISBN - 8178088304

3 Frank Harary, 'Graph Theory', 1st Edition ,Narosa Publishing House,2001. ISBN – 0201410338

4 Ralph P. Grimaldi ,'Discrete and Combinatorial Mathematics' ,McGraw Hill, 5th Edition, 2004.ISBN - 0072424346

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INFORMATION CODING THEORY

Course Code	**12IS5B2**	**CIE Marks**	100
L:T:P:S	**3:0:0:0**	**SEE Marks**	100
Credits	3	**SEE Duration**	3 Hrs

Unit-I

Information theory 7 Hrs

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 memory less channels – BSC, BEC – Channel capacity, Shannon limit.

Unit-II

Source coding: text, audio

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding. 7 Hrs

Unit-III

Source coding: image and video

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard. 7 Hrs

Unit-IV

Error control coding: block codes

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC 7 Hrs

Unit-V

Error control coding: convolutional codes

Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding 7 Hrs

Course Outcome

1 Compare the generator matrix and parity check matrix for linear error correcting codes.
2 Analyze pulse, digital modulation techniques and transmission errors for linear error correcting codes.
3 Explore the Hamming distance of a code and also whether an error correcting code with predetermined properties exists.
4 Design the principal multiplexing techniques and analyze CDMA systems.

Reference Books

1 R Bose, "Information Theory, Coding and Cryptography", TMH 2007.**ISBN**-10: 0070482977
2 Fred Halsall, "Multimedia Communications: Applications, Networks, Protocols and Standards", Perason Education Asia, 2008(Reprint). **ISBN** 0201398184
3 K Sayood, "Introduction to Data Compression" 3/e, Elsevier 2006.**ISBN** 13: 978-0-12-620862-7
4 S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007. **ISBN**: 9780882753218.

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ADVANCED CONCEPTS IN OPERATING SYSTEM

Course Code	**12IS5B3**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3 Hrs**

Unit-I

INTRODUCTION

Overview, Functions of an Operating System, Design Approaches, Types of Advanced Operating System, Synchronization Mechanisms Concept of a Process, Concurrent Processes The Critical Section Problem, Other Synchronization Problems , Language Mechanisms for Synchronization, Axiomatic Verification of Parallel Programs, Process Deadlocks, Preliminaries Models of Deadlocks, Resources, System State, Necessary and Sufficient conditions for a Deadlock Systems with Single-Unit Requests, Consumable Resources, Reusable Resources. **6 Hrs**

Unit-II

DISTRIBUTED OPERATING SYSTEMS

Introduction, Issues Communication Primitives, Inherent Limitations,Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non-Token Based Algorithms:Lamport's Algorithm, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Distributed Deadlock Detection, IssuesCentralized Deadlock-Detection Algorithms, Distributed Deadlock, Detection Algorithms. Agreement Protocols, Classification Solutions Applications. **7 Hrs**

Unit-III

DISTRIBUTED RESOURCE MANAGEMENT **6 Hrs**

Distributed File systems Architecture, Mechanisms Design Issues, Distributed Shared MemoryArchitecture Algorithm, and Protocols Design Issues.Distributed

SchedulingIssuesComponents Algorithms.

Unit-IV

FAILURE RECOVERY AND FAULT TOLERANCE

Basic Concepts-Classification of Failures – Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and Nonblocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols; **7 Hrs**

Unit-V

MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS

Structures Design Issues, ThreadsProcess Synchronization, Processor Scheduling Memory Management Reliability / Fault Tolerance; Database Operating Systems: Introduction Concurrency Control, Distributed Database Systems, Concurrency Control Algorithms. **7 Hrs**

Course Outcome

1 To understand operating system concepts in parallel systems and distributed systems
2 Develop and analyze different components of fault tolerant systems
3 Apply to examples representative formal models relevant to operating systems, including models for resource allocation, scheduling, and clock synchronization
4 Analyze advanced features of distributed operating systems including communication, synchronization,

Reference Books

1 MukeshSinghal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw- Hill, 2001, ISBN: 9780070472686
2 Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating System Concepts", Eighth Edition, Addison Wesley Publishing Co., 2003, ISBN-13: 978-0470128725
3 Andrew S. Tanenbaum, "Modern Operating Systems", Third Edition, Addison Wesley, 2001, ISBN-13: 978-0-13-600663-3
4 William Stallings, Operating Systems: Internals & Design Principles, 5th Edition, Prentice Hall, ISBN : 0-13-147954-7

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Scheme of Semester End Evaluation—Theory

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NETWORK PROGRAMMING

Course Code	**12IS5B4**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3Hrs**

Unit-I

Introduction to Networking

Introduction to networking, TC/IP Protocol architecture, Classful internet addresses, subnets, supernetting, address resolution Protocol (RAP) and RARP, IP datagram format, UDP and TCP/data grams , ICMP its purpose , FINGER, NET STAT details &IPconfig, Ping, TRACERT, ROUTE. **6Hrs**

Unit-II

Socket Programming

Socket introduction, elementary TCP sockets, TCP client server, I/O functions, select and poll functions, socket options elementary UDP sockets, elementary node and address conversions, echo service (TCP and UDP). **7Hrs**

Unit-III

Server Programming

Algorithm and issues in server software design :iterative connectionless servers, (UDP), Iterative, connection oriented servers (TCP), single process, concurrent servers multiprotocol servers (TCP,UDP), multiservice servers (TCP,UDP). **7Hrs**

Unit-IV

Remote Procedure Call

Remote procedure call concept (RPC) :RPC models, analogy between RPC of client and server, remote programs and procedures, their multiple versions and mutual exclusion communication semantics, RPC retransmits, dynamic port mapping ,authentication. **6Hrs**

Unit-V

Network file system

Network file system concept of data link access, debugging techniques ,Routing sockets, broadcasting to mobile network. **7Hrs**

Course Outcome

1 Describe the key protocols that support the Internet.
2 Compare with several common programming interfaces for network communication.
3 Apply socket programming API with several packages.
4 Analyze Unix/Linux operating systems to build robust client and server software for this environment.

5 Implement Advanced programming techniques such as IPv6 Socket Programming, Broadcasting, Multicasting
6 Describe the key protocols that support the Internet.

Reference Books

1 W.Richard Stevens ; Unix Network programming; Prentice Hall; 3rd edition 2010;*ISBN*-10: 0139498761 | *ISBN*-13: 9780139498763
2 Douglas E.Comer, David L. Stevens; Internetworking with TCP/IP ;Vol. 3; Pearson 2ndEdition, Reprint 2009;*ISBN:* 013097627X (0-13-097627-X
3 Stephen A. Rago; Advanced Programming in the UNIX Environment; Second Edition ;Addison-Wesley Professional Computing Series 2010.;*ISBN*-10: 0321699424
4 W. Richard Stevens; TCP/IP Illustrated; Volumes 1, 2, and 3; Pearson, 2009; *ISBN*-10: 0321525949 | *ISBN*-13: 978-0321525949

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JAVA AND J2EE

Course Code	**12IS5B5**	**CIE Marks**	100
L:T:P:S	**3:0:0:0**	**SEE Marks**	100
Credits	3	**SEE Duration**	3 Hrs

Unit-I

Introduction: Java Buzzwords, Java programming structure, Type Conversion, Object Oriented Terminologies Constructors, Using objects as Parameters, Argument passing and returning objects, Understanding Static, Command Line arguments, Packages andInterfaces, Enumerations, Autoboxing,Annotations, Exception Handling. **7 Hrs**

Unit-II

Multithreaded Programming.Input/Output:ExploringJava.io:JavaInput/Output Classes and Interfaces, File, Stream Classes, the Byte Streams, the Character Streams. Introducing Swing, Exploring Swing. **7 Hrs**

Unit-III

Overview: J2EE and J2SE, Tomcat.

Java Database Connectivity: JDBC Introduction, Types of drivers, Basic Steps of JDBC, Creating and Executing SQL statement, The Result Set Object, Working with Databases. **7 Hrs**

Unit-IV

Servlets:

Introduction, Life cycle of Servlet, Handling GET and POST requests, Servlet Handling from data, Cookies and Session Tracking.

Java Server Pages: **7 Hrs**

Basics and Overview, JSP architecture, JSP tags and JSP expressions, Lifecycle of a JSP Model View Controller (MVC), JSP Objects, JSP Beans Tags, Working with Databases.

Unit-V

Struts:

Introduction to the Apache Struts, MVC Architecture, Struts Architecture, How Strutsworks? Introduction to the Struts Controller, Introduction to the Struts Action Class,Using Struts ActionForm Class, Using Struts HTML Tags, Introduction to Struts Validator Framework Client Side Address Validation in Struts, Developing Application with Struts. **7 Hrs**

Course Outcome

1 Comprehend the basic concepts of Java Standard Edition and the Enterprise Edition.
2 Use the Java SDK environment to create, debug and run Java standalone and applet programs.
3 Design and build robust and maintainable web applications by creating dynamic HTML content with Servlets and JavaServer Pages.
4 Create Rapid Applications using Struts.

Reference Books

1 Herbert Schildt, Java 7 The Complete Reference, McGraw-Hill Osborne Media,8th Edition, 2011, ISBN : 9780071606301.
2 Herbert Schildt, James Holmes,Complete Reference Struts, Tata Mcgraw Hill Publishing Co Ltd, 2nd Edition, 2012, ISBN: 9780070658455.
3 Jim Keogh, J2EE - The Complete Reference, Tata McGraw Hill, 1st Edition, 2002, ISBN: 9780070529120.
4 Bruce Eckel, Thinking in Java, Pearson Education, 4thEdition, 2006,ISBN: 0131872486.

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out

of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Evaluation—Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

NATURAL LANGUAGE PROCESSING WITH PYTHON

Course Code	**12IS5B6**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3 Hrs**

Unit-I

Introduction to Language Processing and Python

Computing with Language: Texts and Words, A Closer Look at Python: Texts as Lists of Words Computing with Language: Simple Statistics, Back to Python: Making Decisions and Taking Control, Automatic Natural Language Understanding **6 Hrs**

Accessing Text Corpora and Lexical Resources

Accessing Text Corpora, Conditional Frequency Distributions, More Python: Reusing Code, Lexical Resources, WordNet

Unit-II

Processing Raw Text **7 Hrs**

Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level

Text Processing with Unicode, Regular Expressions for Detecting Word Patterns,

Useful Applications of Regular Expressions, Normalizing Text ,Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings

Categorizing and Tagging Words
Using a Tagger, Tagged Corpora, Mapping Words to Properties Using Python Dictionaries Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, How to Determine the Category of a Word

Unit-III

Learning to Classify Text Supervised Classification, Further Examples of Supervised Classification, Evaluation, Decision Trees, Naive Bayes Classifiers, Maximum Entropy Classifier**s,** Modeling Linguistic Patterns

6 Hrs

Extracting Information from Text
Information Extraction, Chunking, Developing and Evaluating Chunkers, Recursion in Linguistic Structure ,Named Entity Recognition, Relation Extraction

Unit-IV

Analyzing Sentence Structure
Some Grammatical Dilemmas, What's the Use of Syntax?, Context-Free Grammar, Parsing with Context-Free Grammar, Dependencies and Dependency Grammar, Grammar Development

7 Hrs

Building Feature-Based Grammars
Grammatical Features, Processing Feature Structures, Extending a Feature-Based Grammar

Unit-V

Analyzing the Meaning of Sentences
Natural Language Understanding, Propositional Logic, First-Order Logic, The Semantics of English Sentences, Discourse Semantics

7 Hrs

Managing Linguistic Data
Corpus Structure: A Case Study, The Life Cycle of a Corpus ,Acquiring Data, Working with XML

Course Outcome

1 Define the terms used in NLP and scope of NLP
2 Explain the need and working of different components of a working NLP tools
3 Apply different techniques available in the development of the components in NLP
4 Analyze the behavior of each component based on the parameters
5 Develop the different components using appropriate structures and techniques

Reference Books

1 Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Relilly Publication, First Edition, ISBN 978-0-596-51649-9
2 James Allen – Natural Language Understanding, Pearson Education,2nd Edition, ISBN: 978-81-317-0895-8, 1995
3 Christopher D. Manning Foundations of Statistical Natural Language Processing, The MIT Press; 1st edition, ISBN: 0-262-13360-1, 1999
4 KaviNarayana Murthy - "Natural Language Processing - An Information Access Perspective", EssEss Publications, 1st Edition, ISBN: 81-7000-485-3, 2006

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best two will be considered. In addition 10 marks to be earned through assignment or seminar on emerging topics.

Scheme of Semester End Evaluation—Theory

Question No. 1 consisting of objective type/short type questions, it is compulsory and it carries 20 marks, covering the entire syllabus.

There are five units. Each unit will have two questions of 16 marks each, students have to answer one question from each unit.

MANAGEMENT& ORGANIZATIONAL BEHAVIOR

Course Code	**12HSM61**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3Hrs**

Unit-I

Introduction to Management:Management Functions, Roles & Skills, Management History – Classical Approach: Scientific Management & Administrative Theory, Quantitative Approach: Operations Research, Behavioral Approach: Hawthorne Studies, Contemporary Approach: Systems Theory, Overview of Social Responsibility & Managerial Ethics, Case Study. **6Hrs**

Unit-II

Foundations of Planning: Types of Goals &Plans, Approaches to Setting Goals & Plans, Strategic Management Process, Corporate & Competitive Strategies, Decision Making Process, Types of Decisions& Decision Making Conditions, Case Study. **4 Hrs**

Organizational Structure & Design: Designing Organizational Structure: Work Specialization, Departmentalization, Chain of Command, Span of Control, Centralization & Decentralization, Mechanistic &Organic Structures, Organizational Design: Traditional & Contemporary, Case Study. **4 Hrs**

Unit-III

Understanding Organizational Behavior: Attitudes, Job Satisfaction& Organizational Commitment, Cognitive Dissonance Theory, Personality: MBTI & Big Five Model, Emotional Intelligence, Perception & Factors Influencing Perception, Attribution Theory, Learning: Classical & Operant Conditioning, Social Learning & Shaping Behavior, Case Study. **6Hrs**

Unit-IV

Managing Teams: Groups & Stages of Group Development, Group Structure,Processes&Tasks,Work Team & Types of Work Teams, Case Study. **2Hrs**

Motivating Employees: Early Theories of Motivation: Maslow's Hierarchy of Needs Theory, McGregor's Theory X& Theory Y, Herzberg's Two Factor Theory& McClelland's Three Needs Theory, Contemporary Theories of Motivation: Adam's Equity Theory & Vroom's Expectancy Theory, Case Study. **4 Hrs**

Unit-V

Managers as Leaders: Early Leadership Theories: Trait Theories,Behavioral Theories: Ohio State Studies, University of Michigan Studies, Blake & Mouton's Managerial Grid, Contingency Theories of Leadership: The Fiedler Model, Hersey &Blanchard's Situational Leadership, Contemporary Views of Leadership: Transactional & Transformational Leadership, Case Study. **4Hrs**

Introduction to Controlling: The Control Process, Controlling for Organizational Performance & Tools for Measuring Organizational Performance, Case Study. **2 Hrs**

Course Outcome

1	Understand the principles of management theory & Recognize the characteristics of an organization.
2	Demonstrate the importance of key performance areas in strategic management & decision-making process
3	Design appropriate organizational structures and possess an ability to conceive organizational dynamics.
4	Evaluate leadership practices in organizations & Implement the right one that would enable systems orientation.

References

1 Stephen Robbins, Mary Coulter &NeharikaVohra,Management, Pearson Education Publications, 10th Edition, ISBN: 978-81-317-2720-1.

2 James Stoner, Edward Freeman & Daniel Gilbert Jr, Management, PHI, 6th Edition, ISBN: 81-203-0981-2.

3 Stephen Robbins, Timothy Judge&SeemaSanghi, Organizational Behavior, Pearson Education Publications, 13th Edition, ISBN: 978-81-317-2121-6.

Scheme of Continuous Internal Evaluation for Theory

CIE consists of three tests, each for 45 Marks, (15 Marks for Quiz + 30 Marks for Descriptive

– inclusive of case studies) out of which, the best two will be considered. In addition, there will be one seminar on emerging topics in Management and Organizational Behavior for 10 Marks.

Scheme of Semester End Evaluation for Theory

The question paper consists of Part A and Part B. Part A will be for 20 Marks covering the complete syllabus and is compulsory. Part B will be for 80 Marks and will consist of five questions, inclusive of case studies, carrying 16 Marks each. All five questions from Part B will have an internal choice and one of the two have to be answered compulsorily.

SEMESTER: VI
SOFTWARE ENGINEERING

Course Code	**12IS62**	**CIE Marks**	100
L:T:P:S	**3:0:0:1**	**SEE Marks**	100
Credits	4	**SEE Duration**	3 Hrs

Unit-I

Overview: Introduction: FAQ's about software engineering, Professional and ethical responsibility. **Socio-Technical systems**: Emergent system properties. Systems engineering. Organizations, people and computer systems. Legacy systems. **Software Evolution**: Program evolution dynamics. Software maintenance. Evolution processes. Legacy system evolution. **Software Processes**: Models, process iteration, Process activities. The Rational Unified Process. Computer Aided Software Engineering. **9 Hrs**

Unit-II

Requirements: Software Requirements: Functional and Non-functional requirements. User requirements. System requirements. Interface specification. The software requirements document. **Requirements Engineering Processes**: Feasibility studies. Requirements elicitation and analysis. Requirements validation. Requirements management. **Critical Systems:** A simple safety-critical system. System dependability. Availability and reliability. **9 Hrs**

Unit-III

Development: Rapid Software Development: Agile methods. Extreme programming. Rapid application development. **System Models**: Context models. Behavioral models. Data models. Object models. Structured methods. **Software Design**: Architectural Design: Architectural design decisions. System organization. Modular decomposition styles. Control styles. **Object-Oriented design**: Objects and Object Classes. An Object-Oriented design process. Design evolution. **9 Hrs**

Unit-IV

Verification and Validation: Verification and Validation: Planning. Software inspections. Automated static analysis. Verification and formal methods. **Software testing**: System testing. Component testing. Test case design. Test automation. 9 Hrs

Unit-V

Project Management: Management activities. Project planning. Project scheduling. Risk management. **Managing People**: Selecting staff. Motivating people. Managing people. The People Capability Maturity Model. **Software Cost Estimation**: Productivity. Estimation techniques. Algorithmic cost modeling, Project duration and staffing. **9 Hrs**

Course Outcome

1 Comprehend various software life cycle models and steps of software development process.
2 Apply concepts of Software Project Planning and software Design techniques.
3 Analyze capabilities of various tools to assist in the software development activities.
4 Develop correct and robust software design and software project plan from requirement gathering to implementation.

Reference Books

1 Ian Sommerville,“ Software Engineering”, 9th Edition, Pearson Education, 2013, ISBN: 9788131762165
2 Roger.S.Pressman,“ Software Engineering-A Practitioners Approach”, 7th Edition, Tata McGraw Hill, 2007, ISBN: 9780071267823
3 Pankaj Jalote,“ An Integrated Approach to Software Engineering”, 3rd Edition, Narosa Publishing House, 2013, ISBN: 9788173197024
4 Rajib Mall, Fundamentals of Software Engineering, 3rd Edition, Prentice-hall Of India Pvt Ltd., 2012, ISBN: 9788120348981.

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition, there will be one seminar on new topics/model presentation etc. for 10 marks.

Scheme of Semester End Evaluation—Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

COMPUTER NETWORKS AND SECURITY

Course Code	**12IS63**	**CIE Marks**	**150**
L:T:P:S	**3:0:1:1**	**SEE Marks**	**150**
Credits	**5**	**SEE Duration**	**3 Hrs+ 3Hrs**

Unit-I

Symmetric Ciphers

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms , A Model for Network Security, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography, Block Cipher Principles, The Data Encryption Standard (DES), A DES Example, The Strength of DES, AES Structure, AES Round Functions, AES Key Expansion, An AES Example, AES Implementation , Multiple Encryption and Triple DES, Electronic Codebook Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode,Stream ciphers, RC4. **9Hrs**

Unit-II

Asymmetric Ciphers

Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, Principles of Public-Key Cryptosystems,The RSA Algorithm, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography, Pseudo number generation based on an Asymmetric Cipher. **7Hrs**

Unit-III

Cryptographic Data Integrity Algorithms

Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA), Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, MACs Based on Block Ciphers: DAA and CMAC, Digital Signatures, ElGamal Digital Signature Scheme, Digital signature Standard (DSS). **9Hrs**

Unit-IV

Mutual Trust

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, Public Key Infrastructure, User Authentication Protocols: Remote User Authentication Principles, Remote User Authentication Using Symmetric Encryption, Kerberos, Remote User Authentication Using Asymmetric Encryption, Federated Identity Management,. **8 Hrs**

Unit-V

Network and Internet Security **9 Hrs**

Web Security Issues, Secure Sockets Layer (SSL), Transport Layer Security (TLS), HTTPS Secure Shell (SSH), IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security, Wireless Application Protocol Overview, Wireless Transport Layer Security, WAP End-to-End Security., E-mail and IP Security:
Pretty Good Privacy (PGP), S/MIME, DomainKeys Identified Mail (DKIM), IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange, Cryptographic Suites.

Computer Networks and Security LAB

PART - A

1. Write a C/C++/Java program for error detecting code using CRC-CCITT (16bit).
2. Write a C/C++/Java program for distance vector algorithm to find suitable path for transmission.
3. Using TCP or IP sockets write a client/server program to make client send the name of afile and server to send back the contents of the requested file if present.
4. Write a program to create an echo service between client and server using UDP protocol.
5. Write a program to compare and analyze SSL and TLS protocols.
6. Write an algorithm to implement PGP protocol for email security.
7. Create a private Ethernet network with minimum of five systems and install a firewall and set up the configuration.
8. Write an algorithm to implement BER coding technique in ASN.1 notation.
9. Write a program in C/C++/Java to implement AES algorithm and compare it with DES.
10. Implement input S-box/P-box in S-DES algorithm.
11. Write a program for simple RSA algorithm to encrypt and decrypt the data.
12. Implement the Diffie-Hellman protocol and check what happens if x and y have the same value? That is, Alice and Bob have accidentally chosen the same number. Are the values of $R1$ and $R2$ the same? Are the values of the session keys calculated by Alice and Bob the same? Use an example to prove your claims.
13. Implement Kerberos algorithm using symmetric key and one-way hash.
14. Write an algorithm to create Ceaser and Play fair ciphers.

PART - B

Course Outcomes

1 Identify and investigate for new solutions of network security threats, focusing on cryptography and network security concepts.
2 Apply security principles to design and working of different computer applications and products.
3 Analyze and compare different cryptographic algorithms and network security

protocols.

4 Evaluate experiments for new network security solutions using cryptographic algorithms, protocols and IDS techniques to secure the network applications involving routing, switching and communication.

5 Create and design simple network applications using the knowledge acquired about the services of application layer and socket programming

Reference Books

1 William Stallings – Cryptography and Network Security, Principles and Practice, 5th Edition, Pearson Prentice Hall, 2010, *ISBN:978-0-13-609704-4*.

2 Menezes Bernard - Network Security and Cryptography, 1st Edition, Cengage Learning India, 2010, *ISBN: 9788131513491*.

3 Douglas Stinson- Cryptography Theory and Practice, 2nd Edition, Chapman & Hall/CRC, *ISBN: 978-1584885085*.

4 Behrouz A Forouzan - Data Communications and Networking, 5th Edition, Tata McGraw Hill, 2012, *ISBN: 0-07-063414-9*.

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 40 marks (15 marks for Quiz + 25 marks for descriptive) out of which best two will be considered. In addition 20 marks to be earned through self-study on emerging topics.

Scheme of Continuous Internal Evaluation for Practicals

CIE consists of 50 marks out of which 40 marks for maintaining record and 10 marks for internal test.

Scheme of Semester End Evaluation for Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Semester End Evaluation for Practicals

SEE is evaluated for 50 marks which include writing correct program, execution and viva.

1. In the examination, ONE program has to be asked from Part-A for a total of 15 marks.
2. The package developed under Part-B has to be evaluated for a total of 35 marks.

DATABASE MANAGEMENT SYSTEMS

Course Code	**12IS64**	**CIE Marks**	150
L:T:P:S	**3:0:1:1**	**SEE Marks**	150
Credits	**5**	**SEE Duration**	**3 + 3Hrs**

Unit-I

Introduction to Database Systems Databases and Database users: Introduction, An example, Characteristics of Database Approach, Actors on the scene, Workers behind the scene, Advantages of using the DBMS Approach, A brief history of Database applications, When not to use a DBMS. Database System—Concepts and Architecture: Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.

Entity-Relationship Model Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues, Enhanced Entity Relationship(EER) Modeling, An Example UNIVERSITY EER Schema and Formal Definitions for the EER Model. Subclasses, Superclasses, and Inheritance, Specialization and Generalization ,Constraints and Characteristics of Specialization and Generalization. Subclasses, Superclasses, and Inheritance, Specialization and Generalization, Constraints and Characteristics of Specialization and Generalization **7 Hrs**

Unit-II

Relational Model and Relational Algebra Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations : JOIN and DIVISION ;Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping, Mapping EER Model Constructs to Relations **7 Hrs**

Relational Database Design Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.

Unit-III

Sql-99: Schema Definition, Basic Constraints and Queries SQL Data Definition, Specifying Basic Constraints in SQL, Schema Change Statements in SQL; Basic Queries in SQL; More Complex SQL Queries; Insert, Delete and Update Statements in SQL; **7 Hrs**

Introduction to SQL programming Techniques Data base programming: Issues and Techniques, Embedded SQL, Dynamic SQL and SQLJ, Database programming with function calls: SQL/CLI and JDBC, database stored procedures and SQL/PSM.

Unit-IV

Overview of Transaction Management The ACID property, Transaction and schedules, Concurrent Execution of Transactions, Lock based Concurrency control, **7 Hrs**

performance of locking, Transaction support in SQL, Introduction to crash recovery.

Concurrency Control 2PL, Serializability, recoverability, Introduction to Lock management , Lock conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency control without Locking.

Crash Recovery Introduction to ARIES, the LOG, Other recovery related structures, The Write-Ahead Log protocol, checkpointing, Recovery from a system Crash, media recovery, other approaches and interaction with concurrency control.

Unit-V

Database Security and Authorization Introduction to Database Security Issues, Discretionary Access Control based on Granting and Revoking Privileges, Mandatory Access Control and Role-Based Access Control for Multilevel Security. **7 Hrs**

Enhanced Data model for advanced applications Active Database concepts and triggers, temporal database concepts, Spatial Database, Multimedia database.

Database Management System LAB

Contents

A Mini Project should be implemented and shall be carried out in a batch of two students. The students will finalize a topic in consultation with the faculty. The mini project must be carried out in the college only.

The Mini Project tasks would involve

- Understand the complete domain knowledge of application and derive the complete data requirement specification of the Mini Project
- Design of the project
- Normalization of the Relational design up to 3NF (Desirable 5NF).
- Appreciate the importance of security for database systems.
- Documentation and submission of report.

General Guidelines :

- Database for the project- MySQL, DB2, Oracle, SQL Server etc
- Front End for the project – Visual Basic, C++, C#, Web Interface (HTML, PhP)

Typical Mini Projects

- Placement management system.
- Result management & analysis system.
- RVCE Blog management system.
- Student Feedback system
- Library management

Course Outcome

After going through this course the student will be able to:

1 Design a Database for a given mini-world.

2 Apply the principles of the normalization for a given schema to implement database in the real world.

3 Appreciate the use of different algorithms for achieving transaction management,

concurrency control and recovery management.

4 Implement a database management system that satisfies relational theory and provides users with business queries, business forms, and business reports.

5 Implement database using querying mechanism and implement different level of security.

6 Work in teams and utilize effective group techniques to manage a complex project.

Reference Books

1 Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Addison- Wesley, 2007 ISBN-13: 9780321369574

2 Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003, ISBN: 9780071231510

3 Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006. ISBN: 9789332901384

4 C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems,8th Edition, Pearson education, 2006, ISBN: 9788177585568

Scheme of Continuous Internal Evaluation for Practicals

CIE consists of 50 marks out of which 30 marks for Project Demo and 20 marks for writing records, execution, documentation

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 20 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 20 marks.

Scheme of Semester End Evaluation for Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Semester End Evaluation for Practicals

Students will show the demo of the project. Modification in the project may be asked by the examiner. SEE is evaluated for 50 marks which include writing, Demo and viva.

EMERGING TECHNOLOGIES
RECENT ADVANCES IN NATURAL LANGUAGE PROCESSING

Course Code	**12IS65**	**CIE Marks**	**50**
L:T:P:S	**2:0:0:0**	**SEE Marks**	**---**
Credits	**2**	**SEE Duration**	**---**

Course Learning Objectives (CLO's)

1. Evaluating Natural Language processing applications
2. NLP applications to different domain

Unit – 1

Text summarization, Named Entity Recognition, Sentiment Analysis

Research papers

- A Semi-supervised Learning Approach to Named Entity Recognition
- Did I Really Mean That? Applying Automatic Summarization Techniques to Formative Feedback
- Sentiment Analysis of Reviews: Should we Analyze Writer Intentions or Reader Perceptions?
- Effective Spell Checking Methods Using Clustering Algorithms

Unit – 2

POS tagging, Word Sense Disambiguation, Parsing

Research papers

- Domain Adaptation for Parsing
- Using Parallel Corpora for Word Sense Disambiguation
- A New Approach to the POS Tagging Problem Using Evolutionary Computation
- Acronym Recognition and Processing for different languages

Course Outcomes:

1. Be able to identify suitable evaluation measures for the problem in natural language processing.
2. Develop an understanding of the practical problems in natural language processing

that can be solved using statistical techniques

3. Enhance their knowledge about statistical approaches to machine learning

Reference Books

[1] Proceedings of INTERNATIONAL CONFERENCE RECENT ADVANCES IN NATURAL LANGUAGE PROCESSING, ISSN 1313-8502 (http://lml.bas.bg/ranlp2013/docs/RANLP_main.pdf)

[2] James Allen, Natural Language Understanding, 2nd edition, Benjamin-Cummings Publishing Co. ISBN: 0-8053-0335-0

Scheme of Continuous Internal Evaluation (CIE)

CIE consists of 2 phases

Phase 1 : Test + Assignment = 20 + 5 =25

Phase 2 : Test + Assignment = 20 + 5 + 25

Total = 25+25 = 50 Marks.

Note: There is No SEE for this course.

Semester VI				
INFORMATION SECURITY				
Course Code	**12IS6C1**		**CIE Marks**	100
L:T:P:S	**3:1:0:0**		**SEE Marks**	100

Credits	4		**SEE Duration**	3 Hrs
Teaching Hours	36+6			

Unit-I	
Introduction to Security Fundamentals Meaning of "Secure", Attacks, Meaning of Computer Security, Computer Criminals, Methods of Defense.	**6 Hrs**
Unit-II	
Program Security: Secure programs, non malicious program errors, Viruses, malicious code, Trojans, Trap doors, Control against Program threats.	**7 Hrs**
Unit-III	
Protection in OS: Protected Objects and methods of protection, File protection mechanisms, User Authentications. **Database Security**: Security requirements, Reliability and Integrity, Sensitive data.	**7 Hrs**
Unit-IV	
Security in Networks: Website vulnerabilities, Denial of Service, Honey pots, Firewalls, IDS, Secure email **Administering Security:** Security Planning, Contents of a Security plan, Security planning team members, Assuring commitment to Security plan, Risk Analysis, Nature of risk, Steps of risk analysis	**8 Hrs**
Unit-V	
Privacy in Computing: Privacy on Web, Email Security, Impact on Emerging Technologies **Legal and Ethical Issues in Computer Security**: Protecting program and data, Information and Law, Redress for Software failure, Ethical issues in Computer security.	**8 Hrs**

Assignment

Instructions to the student:

- Groups of at least TWO students are formed and one of the Projects listed below is assigned to each group by the Teacher In-charge. Assignment will be such that all projects are distributed evenly.
- A report of about 20 – 25 pages on the package developed duly certified by the department must be submitted before the given deadline.

List of Topics:

- Developing a Network Monitoring System
- Demonstrate the NMAP Application to
    a. Scan a remote host in the network for open ports
    b. Identify the OS & version on a host in network
    c. Try various types of attacks (FIN attack, SYN Flood, Smurf, Fraggle etc
- Practical demo of vulnerabilities and how to overcome:
    - Buffer overflow
    - Integer overflow
    - File I/O

- Demonstrating the use of Wireshark to
  - Examine HTTP Request and Response Headers.
  - Capture, inspect and filter packets
  - Sniff HTTP Post passwords via Network
- Development of a Network packet sniffer

Course Outcomes	
1	Understand the concepts of information security, the need and issues related with it.
2	Analyze and design new security solutions for software development to secure networks, firewalls and intrusion detection systems.
3	Demonstrate and do computation of the secure technologies on to the networks, systems and deployment of security tools in real scenarios.
4	Evaluate the existing systems to handle security vulnerabilities.

References	
1	Charles P. Pfleeger, Shari Lawrence Pfleeger, Security in Computing,4th Edition, Pearson Education.
2	Charles P. Pfleeger, Shari Lawrence Pfleeger, Analyzing Computer Security, A Threat, Vulnerability Countermeasure Approach, Pearson Education.
3	William Stallings, Network Security Essentials, 4th Edition, Prentice Education Pearson, 2011.
4	Matt Bishop, Introduction to Computer Security, Addison-Wessley, Pearson Education

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered.
In addition the assignment part will carry 10 marks.

Scheme of Semester End Evaluation for Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

COMPUTER SYSTEM PERFORMANCE & ANALYSIS

Course Code	**12IS6C2**	**CIE Marks**	**100**
L:T:P:S	**3:1:0:0**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3 Hrs**

Unit-I

Introduction : Measuring performance, Common goals of performance analysis, Solution techniques **9 Hrs**

Metrics of performance: What is a performance metric?. Characteristics of a good performance metric, Processor and system performance metrics, Other types of performance metrics, Speedup and relative change, Means versus ends metrics.

Unit-II

Average performance and variability : Why mean values?, Indices of central tendency, Other types of means, Quantifying variability

Errors in experimental measurements : Accuracy, precision, and resolution, Sources of errors, A model of errors, Quantifying errors **9 Hrs**

Unit-III

Comparing alternatives : Comparing two alternatives, Comparing more than two alternatives

Measurement tools and techniques : Events and measurement strategies, Interval timers, Program proling, Event tracing, Indirect and ad hoc measurements, Perturbations due to measuring **9 Hrs**

Unit-IV

The design of experiments : Types of experiments**,** Terminology**,** Two-factor experiments

Generalized m-factor experiments, n2m experiments.

Simulation and random-number generation : Simulation-efficiency considerations, Types of simulations, Random-number generation, Verification and validation of simulations **9 Hrs**

Unit-V

Queueing analysis : Queueing-network models, Basic assumptions and notation, Operational analysis, Stochastic analysis **9 Hrs**

Course Outcome

1	Compare systems using sample data
2	Summarize and analyze experiment's outcomes
3	Apply Queuing theory to measure performances of systems
4	Model communication networks and I/O computer systems

Reference Books

1 David J. Lilja. : "Measuring Computer Performance: A Practitioner's Guide", Cambridge University Press, 2000 : 9780511036279

2 Raj Jain : "Art of Computer Systems Performance Analysis Techniques For Experimental DesignMeasurements Simulation And Modeling";Wiley Computer Publishing, ISBN: 0471503363

3 Neil J Gunter : "The Practical Performance Analyst"; McGraw-Hill Inc; 1998; ISBN: 0-07-912946-3

4 Paul J. Fortier, Howard Edgar Michel: "Computer Systems Performance Evaluation and Prediction";Digital Press, 2003;ISBN 1-55558-260-5

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 45 marks (15marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks

Scheme of Semester End Evaluation—Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the

complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

HIGH PERFORMANCE COMPUTING

Course Code	**12IS6C3**	**CIE Marks**	**100**
L:T:P:S	**3:1:0:0**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3 Hrs**

Unit-I **9 Hrs**

Introduction to Parallel Computing: Introduction to Parallel Computing - Need for Parallel Computing, Flynn's Taxonomy, Parallel Computer memory architectures- Multi-core architecture v/s many core architecture,

shared, distributed and Hybrid architectures.

Unit-II

Graphics Processing Unit (GPU): Introduction to GPU - GPUs as Parallel Computers, Architecture of a modern GPU, need for speed or Parallelism, Parallel Programming Languages and Models, Overarching goals.

9 Hrs

Unit-III

History of GPU Computing: History of GPU Computing - Evolution of Graphics Pipelines, the era of Fixed-Function Graphics Pipelines, Evolution of Programmable Real-Time Graphics, Unified Graphics and Computing Processors.

9 Hrs

General Purpose Computing on Graphics Processing Units (GPGPU): GPGPU - An

Intermediate step, scalable GPUs, Recent Developments, Future Trends, Introduction to C++ Accelerated Massive Parallelism (AMP).

Unit-IV

Open Computing Language (OpenCL): OpenCL Architecture - Platform model, Execution model, Memory Model, Programming Model, OpenCL supported Data types, Vector operations, Address Space Qualifiers, OpenCL Programming Exercises.

9 Hrs

Unit-V

Parallel Programming in Compute Unified Device Architecture (CUDA) C: Introduction to CUDA C - Parallel Programming in CUDA C, Thread Cooperation, Constant Memory and Events, Atomics, Streams.

9 Hrs

Advanced

Topics in Parallel Computing: Petascale Computing, Optics in Parallel Computing, Quantum computers, Recent developments in Nanotechnology and its impact on High Performance Computing (HPC).

Programming Exercise

1	Develop a CUDA C program to reverse the array elements.
2	Write a CUDA C program to increment the array elements.
3	Compute an N×N-element matrix C that is the outer product of two N-element vectors A and B, $C_{ij} = A_i B_j$, $0 \leq i \leq N-1$, $0 \leq j \leq N-1$. Implement using CUDA C.
4	Write a CUDA C program to multiply two NxN matrices.
5	Create an OpenCL program that takes as input a matrix (width × height) and determines the transposition of the input matrix.
6	Dot Product (scalar product) of set of input vector pairs. Implement in OpenCL for CUDA GPU's, with functional comparison against a simple C++ host CPU implementation.
7	Element by element addition of two 1-dimensional arrays. Implement in OpenCL for CUDA GPU's, with functional comparison against a simple C++ host CPU implementation.
8	Write an MPI program to show the use of probe and get_count to find the size of an incoming message.
9	Write an MPI program to show the use of MPI_Scatter and MPI_Gather. Each processor gets different data from the root processor by way of mpi_scatter. The data is summed and then sent back to the root processor using MPI_Gather. The root processor then prints the global sum.
10	Write an MPI program to show the use of MPI_Alltoall. Each processor send/rec a different random number to/from other processors.

Course Outcome

1	Identify different types of computational devices available for high-performance computing.
2	Describe the basics of GPU as Parallel Computers and its Architecture.
3	Apply the basic concepts of Open CL Architecture.
4	Analyze the Parallel Programming Models and the performance issues in

	parallel computing.
5	Discriminate various high-performance solutions to real-world computational problems.
6	Design and implement programs for GPU's using CUDA.

Reference Books

1	Benedict Gaster, David R. Kaeli, Lee Howes; Heterogeneous Computing with Open CL; Publisher: Morgan Kaufmann; First Edition; 2011; ISBN–10:0123877660.
2	David B. Kirk, Wen-mei W. Hwu; Programming Massively Parallel Processors, Publisher: Morgan Kaufmann; 2nd Edition; 2012; ISBN- 978-0-12-415992-1.
3	Jason Sanders, Edward Kandrot; CUDA by Example: An Introduction to General-Purpose GPU Programming**;** Publisher: Addison-Wesley Professional; 2010 Edition; ISBN-978-0-13-138768-3.
4	Aaftab Munshi, Khronos; The OpenCL Specification Publisher: OpenCL Working Group; First Edition; 2011; ISBN-13: 978-0321749642.

Scheme of Continuous Internal Evaluation for Theory

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Scheme of Semester End Evaluation—Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

Semester VI

IMAGE PROCESSING AND COMPUTER VISION

Course Code	**12IS6C4**	**CIE Marks**	**100**
L:T:P:S	**3:1:0:0**	**SEE Marks**	**100**
Credits	**4**	**SEE Duration**	**3 Hrs**

Unit-I

Image Formation **7Hrs**

Geometric Camera Models: Image Formation, Intrinsic and Extrinsic Parameters, Geometric Camera Calibration Light and Shading: Modelling Pixel Brightness, Inference from Shading, Modelling Inter-reflection, Shape from One Shaded Image color: Human color Perception, The physics of color, Representing color, A model of Image color, Inference from color

Unit-II

Image Enhancement **7Hrs**

Image Enhancement in Spatial domain, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Image

Enhancement in the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, and Homomorphic Filtering.

Unit-III

Image Restoration

A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations. **7Hrs**

Unit-IV

Image Segmentation

Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region Based Segmentation.

Morphological image processing **7Hrs**

Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation, Some Basic Morphological Algorithms

Unit-V

Image Compression

Fundamentals, Image compression models, Elements of information theory, Error free. **8Hrs**

Course Outcome

1 Describe the processes and hardware of image acquisition.
2 Apply pre-processing operations in image enhancement.
3 Compare various image segmentation and feature extraction operations.
4 Implement basic algorithms for image and video compression.

Reference Books

1 David A Forsyth, Jean Ponce; "Computer Vision: A Modern Approach"; Pearson Higher Education; 2nd Edition; 2012;
2 Rafael C. Gonzalez, Richard E. Woods; "Digital Image Processing"; Pearson Education; 3rd Edition; 2008;
3 S Jayaraman, S Esakkirajan, T Veerakumar; "Digital Image Processing"; Tata McGraw Hill; 2009;
4 Chanda, D. DuttaMajumdar; "Digital Image Processing and Analysis"; PHI; 2006;

Scheme of Continuous Internal Evaluation for Theory

CIE consists of Three Tests each for 40 marks (15 marks for Quiz + 25 marks for descriptive) out of which best two will be considered. In addition 20 marks to be earned through self study on emerging topics.

Scheme of Semester End Evaluation—Theory

Question No. 1 consisting of objective type /short type questions covering the entire syllabus. It is compulsory and carries 20 marks. There are five units. Each unit will have

two questions of 16 marks each; students have to answer one question from each unit.

SOFTWARE ARCHITECTURE

Course Code	**12IS6C5**	**CIE Marks**	100
L:T:P:S	**3:1:0:0**	**SEE Marks**	100
Credits	4	**SEE Duration**	3 Hrs

Unit-I

The Architecture Business Cycle: Where do architectures come from? Software processes and the architecture business cycle, What makes a "good" architecture? What software architecture is and what it is not, other points of view, Architectural patterns, reference models and reference architectures, Importance of software architecture, Architectural structures and views. **9 Hrs**

Architectural Styles: Architectural styles, Pipes and filters, Data abstraction and object-oriented organization, Event-based, implicit invocation, Layered systems, Repositories, Interpreters, Process control, Other familiar architectures, Heterogeneous architectures.

Unit-II

Case Study: A-7E Avionics System. **9 Hrs**

Quality: Functionality and architecture, Architecture and quality attributes, System quality attributes, Quality attribute scenarios in practice, Other system quality attributes, Business qualities, Architecture qualities.

Unit-III

Tactics: Introducing tactics, Availability tactics, Modifiability tactics, Performance tactics, Security tactics, Testability tactics, Usability tactics, Relationship of tactics to architectural patterns, Architectural patterns and styles. Air Traffic Control- A Case Study in Designing for High Availability. **9 Hrs**

Unit-IV

Designing the Architecture: Architecture in the Life Cycle, Designing the Architecture, Forming the team structure, Creating a skeletal system. Flight Simulation – Case Study in Architecture for Integrability. **9 Hrs**

Unit-V

Documenting Software Architectures: Uses of architectural documentation, Views, Choosing the relevant views, documenting a view, Documentation across views.
Reconstructing Software Architectures: Introduction, Information Extraction, Database Construction, View Fusion, Reconstruction, Example. **9 Hrs**

Course Outcome

1	Comprehend Software Architectural styles and patterns for specific Software Domains.
2	Apply essential techniques involved in Software Architectural Phase in Software Development Life Cycle.
3	Analyze Quality Attributes using Tactics.
4	Design and analyze the Software Architecture through real-time Case studies.

Reference Books

1 Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education Limited, 2013, ISBN: 9789332502307.

2 Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, 1st Edition, Pearson Education Limited, 2008, ISBN: 9788131722299.

3 Frank Buschmann, ReginеMeunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, 1st Edition, Wiley India Pvt.ltd, 2012, ISBN: 9788126516117.

4 E. Gamma, R. Helm, R. Johnson, J. Vlissides, "Design Patterns- Elements of Reusable Object-Oriented Software", 1st Edition, Pearson Education Limited, 2012, ISBN: 9788131700075.

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Scheme of Semester End Evaluation—Theory

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INFORMATION STORAGE & MANAGEMENT

Course Code	**12IS6D1**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3Hrs**

Unit-I

Introduction

Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access **7Hrs**

Unit-II

Intelligent Disk Subsystems

Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems. **7Hrs**

I/O Techniques

The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage

Unit-III

Network Attached Storage

The NAS Architecture, The NAS hardware Architecture, The NAS Sotfware Architecture, Network connectivity, NAS as a storage system. **6Hrs**

File System and NAS

Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

Unit-IV

Storage Virtualization

Definition of Storage virtualization ; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network **7Hrs**

SAN Architecture and Hardware devices

Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective.

Unit-V

Software Components of SAN

The switch's Operating system; Device Drivers; Supporting the switch's components;

Configuration options for SANs. **6Hrs**

Management

Planning Business Continuity; Managing availability; Managing Serviceability; Capacity planning; Security considerations

Course Outcome

1 Compare various intelligent disk subsystems.
2 Apply different I/O techniques to retrieve and store data from storage medium.
3 Analyze storage area network and fiber channel network protocols.

4 Implement and design different Management applications on Storage Networks

Reference Books

1 Ulf Troppens, Rainer Erkens and Wolfgang Muller: "Storage Networks Explained", Wiley India, 2007,*ISBN* 13, : 9788126518326. *ISBN* 10, : 8126518324.

2 Robert Spalding: "**Storage Networks The Complete Reference"**, Tata McGraw-Hill, 2003.*ISBN*-13: 978-0-07-053292-2

3 Richard Barker and Paul Massiglia: "Storage A**rea Network Essentials A CompleteGuide to understanding and Implementing SANs"**, John Wiley India, 2002, *ISBN*-10: 1-934356-56-5, *ISBN*-13: 978-1-934356-56-2 .

4 Emc: "Information Storage and Management: Storing, Managing and Protecting Digital Information" Wiley India 2009,*ISBN*-13: 978-0470294215 *ISBN*-10: 0470294213

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Scheme of Semester End Evaluation—Theory

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NETWORK MANAGEMENT

Course Code	**12IS6D2**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3Hrs**

Unit-I

Introduction **7Hrs**

Analogy of Telephone Network Management, Data and Telecommunication Network

Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Communications Protocols and Standards-Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.

Unit-II

Basic Foundations: Standards, Models, and Language

Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model. **6Hrs**

Unit-III

SNMPv1 Network Management

Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMPMIB Group, Functional Model. **7Hrs**

Unit-IV

SNMP Management – RMON:

Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications; ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON. **6Hrs**

Unit-V

Network Management Applications:

Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model. **7Hrs**

Course Outcome

1 Compare various network management models.
2 Apply different remote monitoring mechanisms using different packages.
3 Analyze the security issues and attacks in Network Management applications and Explore abstract syntax notations.
4 Design SNMP Communication Model and Network Management Applications

Reference Books

1 Mani Subramanian: Network Management- Principles and Practice, Pearson, 2003.
2 J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.
3 Neal Allen: Network Maintenance and Troubleshooting Guide: Field Tested Solutions for Everyday Problems Addison-Wesley Educational Publishers Inc 2009
4 John Cowley: Communications and Networking Springer London Ltd. 2012

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Scheme of Semester End Evaluation—Theory

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions carrying 16 marks each. All five questions from Part B will have internal choice and one of the two have to be answered compulsorily.

PATTERN RECOGNITION

Course Code	**12IS6D3**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3 Hrs**

Unit-I

Introduction: Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces. **7Hrs**

Unit-II

Normal density: Univariate and multivariate density, discriminant functions for the normal densitydifferent cases.

Bayes decision theory – discrete features, compound Bayesian decision theory and context. **7Hrs**

Unit-III

Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case. **7 Hrs**

Un-supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures.

Unit-IV

Clustering: K-means clustering, Date description and clustering similarity measures, criteria function for clustering.

Component analyses: Principal component analysis, non-linear component analysis; Low dimensional representations and multi dimensional scaling. **7 Hrs**

Unit-V

Discrete Hidden MorkovModels: Introduction, Discrete–time markov process, extensions to hidden Markov models, three basic problems for HMMs.

Continuous hidden Markov models: Observation densities, training and testing with continuous HMMs, types of HMMs **7Hrs**

Course Outcome

1	Define the descriminant functions and classification
2	Describe different classifications based on different features
3	Apply different estimation techniques for parameter estimation
4	Analyze the similarity measures and use appropriate clustering technique
5	Develop a system based on hidden Markov Model

Reference Books

1 Pattern Classification, 2nd Edition, *Richard O. Duda, Peter E. Hart, David G. Stork*, A wiley - Interscience Publication, John Wiley and Sons, INC., *ISBN: 978-0-471-05669-0*, 2010

2 Pattern Recognition and Machine Learning, *Christopher M. Bishop*, Springer Science, First Edition, ISBN Number: *978-0-387-31073-2*, 2010

3 Pattern Recognition from Classical to modern approaches, *Sankar K. Pal, Amita Pal*, World scientific publishing co. Pvt. Ltd., First Edition, *ISBN: 978-9-810-24684-6*, 2009

4 Pattern Recognition and Image Analysis, *Gose, Earl, Johnsonbaugh, Richard , Jost, Steve,* PHI Publications, First Edition, ISBN: *978-81-203-1484-9*, 2010

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Scheme of Semester End Evaluation for Theory

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MOBILE APPLICATION DEVELOPMENT

Course Code	**12IS6D4**	**CIE Marks**	**100**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**100**
Credits	**3**	**SEE Duration**	**3 Hrs**

Unit-I

Introduction: Introduction to building Mobile Applications, Android Fundamentals, Advantages and Features of Android, Android SDK Installation, AVD Creation, Android Application Building Blocks.Architecture: Android Architecture **7 Hrs**

Unit-II

Android Application Lifecycle: Process and Threads, Activity, Widgets, Services, Intent and Intent Filter, Content Provider, Broadcast receivers, Security and Permissions. User Interfaces, Handling UI Events, Creating Menu, Notifications, Styles & Themes. **7 Hrs**

Unit-III

User Interfaces: Layouts, Views, Graphics, Building Custom components, Data and Storage, Multimedia, LBS, Sensors, Network Connection and Wi-Fi Connections, Messaging, Telephony, Web Control, Bluetooth, NFC. **7 Hrs**

Unit-IV

Design Concepts & Advance Topics: Application Design Concepts- Basic framework to build an app, Cross Compilation enablers, Signing Applications in Android, application Versioning, Home screen widgets. **7 Hrs**

Unit-V

Case-study – Study popular mobile applications. Reference to Android blogs for effective application programming using Android, Introduction to SDK, IDE, Rich graphics Interfaces, Debugging and Troubleshooting – How to get infer information from application call stack and generating logs. How to write complex applications debugging. Platform API's, Service API's, Introduction to App Stores. **8Hrs**

Course Outcome

1	Comprehend the basic features of Android Platform and the Application Development Process
2	Demonstrate the design concepts & advanced concepts of Android Application Development
3	Assess the basic framework and usage of SDK to build GUI and apply advanced technologies in developing mobile applications
4	Develop the skills in designing and building innovative, sophisticated mobile applications using android platform and design complex application debugging code

Reference Books

1	Mark Murphy; Beginning Android 3; Apress Springer India Pvt Ltd. ;1st Edition; 2011;ISBN13: 978-1-4302-3297-1
2	SayedHashimi , SatyaKomatineni, Dave MacLean; Pro Android 4; Apress Springer India Pvt Ltd; 1st Edition; 2012; ISBN: 978-1-4302-3930-7
3	Reto Meier; Professional Android 2 Application Development; Wiley India Pvt.ltd; 1st Edition; 2012; ISBN: 9788126525898
4	Tutorials available on http://innovator.samsungmobile.com

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Scheme of Semester End Evaluation for Theory

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ENTERPRISE INFORMATION SYSTEMS

Course Code	**12IS6D5**	**CIE Marks**	100
L:T:P:S	**3:0:0:0**	**SEE Marks**	100
Credits	3	**SEE Duration**	3 Hrs

Unit-I

Introduction to EIS : An Overview, Accommodating Variety, Integrated Management Information, Seamless Integration, Supply Chain Management, Resource Management, Integrated Data Model, Scope, Technology, Benefits of ERP, Evolution, ERP revisited, ERP and its Modern Enterprise. An Overview, What is Business Engineering? Significance, Principles, BRP, ERP and IT, Business Engineering with Information Technology, EIS and IT. Business Engineering with Information Technology, ERP and Management Concerns. **6 Hrs**

Unit-II

Business Modeling for ERP: An Overview, Building Business Model. An overview, Role of Consultants, Vendors and users, Customization, Precautions, ERP-Post Implementation Options, ERP-Implementation Methodology, Guidelines for Implementation. **7 Hrs**

ERP and the competitive advantages: ERP and the Competitive strategy. An Overview, MFG/PRO, IFS/Avalon- Industrial and Financial Systems, Baan IV, SAP, SAP R/3 Applications

Unit-III

Understanding the Supply Chain

What is Supply Chain? Historical perspective; Objective of Supply Chain; The Importance of supply Chain Decisions; Decisions Phases in a Supply Chain; Process Views of a Supply Chain; Examples of Supply Chains. (No numericals)

Supply Chain Performance: Achieving Strategic Fit and Scope

Competitive and supply Chain Strategies; Achieving Strategic Fit; Expanding Strategic Scope; Obstacles to Achieving Strategic Fit. **8 Hrs**

Supply Chain Drivers and Metrics - Impellers of Supply Chain; Drivers of Supply chain performance; A framework for structuring Drivers; Facilities; Inventory; Transportation; Information; Sourcing; Pricing; Obstacles to Achieving Strategic Fit. (No numericals)

Unit-IV

Information Technology in Supply Chain

The role of information Technology in a supply chain; The Supply Chain IT Framework; Customer Relationship Management; Internal Supply Chain Management; Supplier Relationship Management; The Transaction Management Foundation; The Future of IT in the Supply Chain; Risk Management in It; Supply Chain IT in Practice.

Coordination in a Supply Chain

Lack of supply chain coordination and the bullwhip effect; Effect of lack of coordination on performance; Obstacles to coordination in a supply chain; Managerial Levers to achieve coordination; Building strategic partnerships and trust within a supply chain; Continuous Replenishment and Vendor-Managed Inventories; Collaborative Planning, Forecasting, and Replenishment (CPFR); The Role of IT in Coordination; Achieving Coordination in Practice. **6 Hrs**

Unit-V

ERP Case studies : Market Dynamics and Competitive Strategy, Case Studies, **6 Hrs**

Mercedes-Benz, KeeHin Industries, Bull Electronics, Angers Plant Manufactureres, Twentieth Century Companies, Ameritech, Essar Steel, Jindal Iron and steel Company, Godrej Soaps and Associated Companies, Indian Renewable Energy Development Agency.

SCM Case studies

Kurlon Limited ; Vehicle Routing at Baroda Union ; PC International Division; Supply Chain Initiative at APR Limited; Managing Tendupatta Collection Operations; Supply Chain Management at Dalmia Cement Ltd; Power Equipments (India) Ltd; The Global Green Company; Marico Industries: my SAP™ Supply Chain Management; Subhiksha: Managing Store Operations

Course Outcome

1	Familiarize with concepts of Enterprise Resource Planning
2	Understand Business Modeling for Enterprise Resource Planning.
3	Identify various tools, technologies and products to assist in ERP related activities
4	Familiarize with concepts of Supply Chain Management
5	Understand Business Modeling for Supply Chain Management.
6	Identify various tools, technologies and products to assist in SCM related activities

Reference Books

1	'Enterprise Resource Planning- Concepts and Practice', Vinod Kumar Garg, N K, Venkatakrishnan, PHI, 1999.
2	'Enterprise Resource Planning', S Sadagopan, PHI,1999
3	Chopra & Meind, Supply Chain Management; Pearson Education – Addison Wesley Longman; 4th Edition 2010; ISBN: 9780-136080404
4	David Simchi Levi, Philip Kaminsky & Edith Simchi Levi: Designing and Managing the Supply Chain Concepts, Strategies and Case Studies ; Tata McGraw Hill; 3rd Edition; 2008; ISBN: 9780 – 073341521

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