

B. E. SYLLABUS

**INFORMATION SCIENCE
& ENGINEERING**

VII & VIII SEMESTER

**With
Scheme of Teaching
& Examination**

DEPARTMENT : INFORMATION SCIENCE & ENGINEERING

| Sl. No. | Name | Qualification | Designation |
|----------------|----------------------------|----------------------|--------------------------------------|
| 1 | Dr. B. Neelima | Ph. D. | Prof. & Head |
| 2 | Dr. Balasubramani R. | Ph. D. | Professor/ Chief Project Leader, EDC |
| 3 | Mr. Karthik Pai B. H. | M. Tech. (Ph. D.) | Assoc. Prof. |
| 4 | Ms. Ashwini B. | M. Tech. (Ph. D.) | Assoc. Prof. |
| 5 | Mr. Vasudeva Pai | M. Tech. | Asst. Prof. Gd. II |
| 6 | Mr. Pranesh | M. Tech. (Ph. D.) | Asst. Prof. Gd. II |
| 7 | Ms. Deepa J Shetty | M. Tech. (Ph. D.) | Asst. Prof. Gd. II |
| 8 | Mr. Devidas | M. Tech. (Ph. D.) | Asst. Prof. Gd. II |
| 9 | Ms. Rashmi Naveen | M. Tech. (Ph. D.) | Asst. Prof. Gd. II |
| 10 | Mr. Jason Elroy Martis | M. Tech. (Ph. D.) | Asst. Prof. Gd. II |
| 11 | Ms. Chinmai Shetty | M. Tech. | Asst. Prof. Gd. II |
| 12 | Mr. Abhishek Rao | M. Tech. | Asst. Prof. Gd. II |
| 13 | Mr. Abhir Bhandary | M. Tech. (Ph. D.) | Asst. Prof. Gd. I |
| 14 | Mr. Srikanth Bhat. K. | M. Tech. | Asst. Prof. Gd. I |
| 15 | Ms. Akshaya Devadiga | M. Tech. | Asst. Prof. Gd. I |
| 16 | Ms. Prathyakshini Devadiga | M. Tech. | Asst. Prof. Gd. I |
| 17 | Ms. Anusha Nayak | M. Tech. | Asst. Prof. Gd. I |

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

VISION :

To uniquely position the Department as a leader in innovation and excellence in information science and engineering through education, research and scholarship in a professional framework by addressing evolving global needs. Also the Department aims at creating top quality successful and sustainable programs and curricula for the students to address the emerging educational challenges and market demands.

MISSION :

- To provide outstanding education and research training to the students for their productive careers in industry, academia and government.
- To provide a learning environment that promotes excellence and innovation, ethical practice and responsibility towards society.
- To prepare the students to practice their professions competently to meet the ever- changing needs of society and to continue learning their discipline, allowing them to move into other related fields.
- To promote active learning, critical thinking, and engineering judgment coupled with business and entrepreneurial skills.

Programme Educational Objectives (PEOs):

- Graduates must gain both theoretical and practical knowledge to identify, formulate & solve challenges in Information Science & Engineering problems.
- Graduates must work productively as Information Science Engineers, including supportive and leadership roles on multidisciplinary teams.
- Graduates must communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavors, and practice their profession with high regard to legal and ethical responsibilities.
- Graduates must engage in life-long learning, such as graduate study, to remain current in their profession and be leaders in our technological society.

Programme Outcomes (POs):

After successful completion of the program students will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals and Information Science & Engineering principles to the solution of complex engineering problems.
2. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
4. Design solutions to the problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline.
5. Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequence responsibilities relevant to the professional engineering practice.
7. Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Recognise the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcome – (PSO)

1. An ability to strengthen the knowledge and understanding in computer networking and related areas.
2. An ability to strengthen the knowledge and understanding in software development and related areas.

Graduate Attributes :

| Sl. No. | Graduate Attributes |
|---------|--|
| a | Engineering Knowledge |
| b | Problem Analysis |
| c | Design / development of solutions |
| d | Conduct investigations of complex problems |
| e | Modern tool usage |
| f | The engineer and society |
| g | Environment and sustainability |
| h | Ethics |
| i | Individual and team work |
| j | Communication |
| k | Project management and finance |
| l | Life-long learning |

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

VII SEMESTER B.E.

27 Hours / Week

| Sl. No. | Sub. Code | Subject | Theory/Tuto./Prac./ Self Study | Total Hrs./Week | C.I.E | S.E.E | Credits |
|--------------|-----------|--------------------------------|--------------------------------|-----------------|------------|------------|-----------|
| 1 | 14HU701 | Engineering Management | 3+0+0+0 | 3 | 50 | 50 | 3 |
| 2 | 14IS702 | Information & Network Security | 4+0+0+0 | 4 | 50 | 50 | 4 |
| 3 | 14IS703 | Compiler Design | 4+0+0+0 | 4 | 50 | 50 | 4 |
| 4 | 14IS704 | Advanced Computer Architecture | 4+0+0+0 | 4 | 50 | 50 | 4 |
| 5 | 14IS71X | Elective –IV | 3+0+0+0 | 3 | 50 | 50 | 3 |
| 6 | 14IS72X | Elective-V | 3+0+0+0 | 3 | 50 | 50 | 3 |
| 7 | 14IS705 | Project Work - Phase – I ** | 0+0+2+0 | 2 | 50 | 0 | 1 |
| 8 | 14IS706 | Seminar | 0+2+0+0 | 2 | 50 | 50 | 1 |
| 9 | 14IS707 | Compiler Design Lab | 0+0+2+0 | 2 | 50 | 50 | 1 |
| TOTAL | | | 27 | 27 | 450 | 400 | 24 |

DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING
SCHEME OF TEACHING AND EXAMINATION

VIII SEMESTER B.E.

33 Hours / Week

| Sl. No. | Sub. Code | Subject | Theory/Tuto./Prac./ Self Study | Total Hrs./Week | C.I.E | S.E.E | Credits |
|--------------|-----------|-----------------------------|--------------------------------|-----------------|------------|------------|-----------|
| 1 | 14IS801 | Big Data and Analytics | 4+0+0+S | 4 | 50 | 50 | 4 |
| 2 | 14IS81X | Elective-VI | 3+0+0+0 | 3 | 50 | 50 | 3 |
| 3 | 14IS82X | Elective-VII | 3+0+0+0 | 3 | 50 | 50 | 3 |
| 4 | 14IS8XY | Open Elective | 3+0+0+0 | 3 | 50 | 50 | 3 |
| 5 | 14IS802 | Major Project Work Phase II | 0+0+20+0 | 20 | 50 | 50 | 10 |
| TOTAL | | | 33 | 33 | 250 | 250 | 23 |

ELECTIVE - IV

| | Sl. No. | Sub. Code | Subject |
|---------|---------|-----------|------------------------------------|
| 14IS71X | 1 | 14IS711 | Cloud Infrastructure and Services |
| | 2 | 14IS712 | Adhoc Networks |
| | 3 | 14IS713 | Microcontroller & its Applications |
| | 4 | 14IS714 | Human Computer Interaction |

ELECTIVE - V

| | Sl. No. | Sub. Code | Subject |
|---------|---------|-----------|--|
| 14IS72Y | 1 | 14IS724 | Software Defined Networks |
| | 2 | 14IS725 | Business Intelligence and its Applications |
| | 3 | 14IS727 | Machine Learning |

ELECTIVE - VI

| | Sl. No. | Sub. Code | Subject |
|---------|---------|-----------|--|
| 14IS81X | 1 | 14IS811 | Building Enterprise Applications (Infosys) |
| | 2 | 14IS812 | Embedded and Real Time Systems |
| | 3 | 14IS813 | Game Theory |
| | 4 | 14IS814 | Operations Research |
| | 5 | 14IS815 | Cyber Security And Cyber Laws |

ELECTIVE - VII

| | Sl. No. | Sub. Code | Subject |
|---------|---------|-----------|--|
| 14IS82Y | 1 | 14IS821 | Management Information Systems |
| | 2 | 14IS822 | Supply Chain Management & Enterprise Resource Planning |
| | 3 | 14IS823 | Decision Support Systems |
| | 4 | 14IS825 | Intrusion Detection System |

ENGINEERING MANAGEMENT
(Institution Level Core Paper)

Sub Code : 14HU701
Hrs/Week : 3+0+0+0

Credits : 03
Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Develop basic management knowledge essential to make a managerial career in professional life.
2. Impart some of the crucial and basic skills required to work in teams such as – communication skill, leadership traits, motivation techniques, personal and personnel management skills
3. Gain basic knowledge about production management, marketing strategies, consumer requirements and behaviour, marketing activities,
4. Understand the basics of accounting and finance and financial markets, managing engineering technology, project evaluation and selection
5. Create awareness among the engineering students about their social responsibilities and obligations.

UNIT – I

MANAGEMENT:Meaning – Functions of Management

PLANNING – NATURE AND IMPORTANCE OF PLANNING, Types of Plans, Planning Process, Planning Premises and Planning Horizon.

OBJECTIVES – Meaning, Characteristics/Qualities of Sound Objective.

FORECASTING – Meaning, Methods of Forecasting (Qualitative methods and Quantitative methods – simple moving average method, weighted moving average method, exponential smoothing method, simple regression model)

6 Hours

UNIT – II

ORGANIZING: Meaning, Legal Forms of Organization – Sole Proprietorship, Partnership, Corporation/Company, Co-operatives – Meaning and Features only)

DELEGATION OF AUTHORITY AND SPAN OF CONTROL– Meaning, Factors Determining the Span of Control.

HUMAN ASPECTS OF MANAGEMENT - Manpower Planning, Employing People (Recruitment, Selection Process, Making Job Offer, the Induction Process, Cost of Employing New Staff, Termination of Employment), Training and Development – Conducting Training and Methods of Training.

PERFORMANCE APPRAISAL– aims and formal schemes/methods of performance appraisal, 360 degree performance appraisal.

7 Hours

UNIT – III

MOTIVATION– Meaning, Theories of motivation (the Carrot and the Stick, Maslow’s Need Hierarchy theory, Herzberg’s Motivation-Hygiene theory, McClelland’s Trio of Needs, Self-Motivation, General Motivational Techniques).

LEADERSHIP – Meaning, Ingredients/Traits of leadership, styles of leadership. **6 Hours**

UNIT – IV

CONTROLLING– Meaning, Controlling Process, Three Perspectives on the Timing of Control, Types of Control, Characteristics of Effective Control System.

PROJECT EVALUATION TECHNIQUES: Interest Rate Calculations, Simple Interest, Compound Interest, Effective Rate of Interest, Payback Time, Present Worth, Future Worth, Annual Worth Calculations. **12 Hours**

UNIT –V

PROJECT PLANNING TOOLS– Gantt (Bar) Charts, Network Analysis – PERT and CPM - Crashing the Project completion duration using network analysis.

DEPRECIATION – Types and Causes, Computing Depreciation (using straight line method only) – Estimation of Sunk Cost. **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom’s Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C701.1 | Demonstrate the basic management skills required for a professional | L5 |
| C701.2 | Apply team work, communication skill, leadership traits, motivation techniques | L4 |
| C701.3 | Practice of personal management, production management, financial management, accounting, marketing ,etc. in personal and professional life. | L4 |
| C701.4 | Demonstrate the management of engineering technology, project evaluation and selection. | L5 |
| C701.5 | Practice social responsibilities in real life. | L5 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C701.1 | | | H | M | | H | H | M | L | | | | | |
| C701.2 | | | H | H | | H | H | H | M | | | | | |
| C701.3 | | L | M | H | M | H | | H | L | L | | | | |
| C701.4 | | L | H | M | M | M | | H | M | H | M | | | |
| C701.5 | | | H | | | H | L | H | H | | | | | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS :

1. “Managing Engineering and Technology”, 3rd Edition,- Daniel L. Babcock, Lucy C Morse.
2. “Management in Engineering – Principles and Practice”, Second Edition, - Gail Freeman Bell, James Balkwill; Prentice Hall of India Pvt. Ltd., New Delhi – 110001.
3. “Essentials of Management”, Fifth Edition, - Harold Koontz, Heinz Wehrich; Tata MacGraw Hill Edition, New Delhi.
4. “Engineering Economics”, 4th Edition, - Ames L. Riggs, David D. Bedworth, Sabah U. Randhawa; Tata McGraw Hill Edition.
5. “Industrial and Business Management”, Martand T Telsang; Sulthan Chand & Company Ltd., New Delhi – 110055.

REFERENCE BOOKS :

1. “Fundamentals of Financial Management”, - Prasanna Chandra; Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. “Operation Research”, - S. D. Sharma.
3. “Operation Research – An Introduction”, - Hamdy A Taha; Pearson Prentice Hall.
4. “Organizational Behaviour”, - Stephen P Robbins; Prentice Hall, India.
5. “Organizational Behaviour”, Fred Luthans; McGraw Hill International Edition.
6. “Financial Management – Text, Problems & Cases”, - M Y Khan, P K Jain; Tata McGraw Hill.

INFORMATION & NETWORK SECURITY

Sub Code : 14IS702

Credits : 04

Hrs/Week : 4+0+0+0

Total Hours : 52

Prerequisite: Computer Network

Course Learning Objectives:

This Course will enable students to

1. To understand the fundamentals of Cryptography
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across data networks
5. To design security applications in the field of Information technology

UNIT – I

CLASSICAL ENCRYPTION TECHNIQUES

Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad.

BLOCK CIPHERS AND THE DATA ENCRYPTION STANDARD

Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.,AES algorithm introduction.

12 Hours

UNIT- II

PUBLIC-KEY CRYPTOGRAPHY AND RSA

Principles of Public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **OTHER**

PUBLIC-KEY CRYPTOSYSTEMS

Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Z_p , elliptic curves over $GF(2^m)$, Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption,

security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA. **10 Hours**

UNIT - III

KEY MANAGEMENT AND DISTRIBUTION

Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure .

USER AUTHENTICATION

Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification. **10 Hours**

UNIT – IV

WIRELESS NETWORK SECURITY

Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, . **WEB**

SECURITY CONSIDERATIONS

Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer: SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. Transport Layer Security: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell (SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol. **10 Hours**

UNIT – V

ELECTRONIC MAIL SECURITY

Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate

processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow.

IP SECURITY

IP Security overview, applications of IPSec, benefits of IPSec, Routing applications, IPSec documents, IPSec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.

10 Hours

Course outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C702.1 | Comprehend the cryptography techniques. | L2 |
| C702.2 | Apply the Knowledge of number theory in Public Key Crypto Systems | L3 |
| C702.3 | Identify the Key management issues and resolve it. | L1 |
| C702.4 | Analyze the security issues in the network and solution for it. | L4 |
| C702.5 | Evaluate security mechanisms using rigorous approaches, including theoretical | L5 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C702.1 | | L | | | L | | | M | | M | | H | | |
| C702.2 | M | | M | | M | L | | | H | | H | | | |
| C702.3 | H | M | M | H | | | H | H | | H | | H | | |
| C702.4 | | H | | L | H | M | M | | M | | H | | | M |
| C702.5 | | H | H | | | H | | | M | | | H | M | L |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition. 2013

REFERENCE BOOK:

1. V k Pachghare: Cryptography and Information Security, PHE, 2013.

COMPILER DESIGN

Sub Code : 14IS703

Credits : 04

Hrs/Week : 4+0+0+0

Total Hours : 52

Course Learning Objectives:

This course will enable student to

1. Introduce the major concept areas of language translation and compiler design.
2. Differentiate Scanner and Parser phases of compiler
3. Extend the knowledge of parser by parsing LL parser and LR parser.
4. Provide practical programming skills necessary for constructing a compiler.
5. Explore the knowledge in various phases of compiler and its use, code optimization techniques, machine code generation, and use of symbol table.

UNIT – I

INTRODUCTION TO COMPILING

Compilers, Analysis of Source Program, The Phases of a Compiler, Cousins of the Compiler, The Grouping of Phases, Compiler- Construction tools.

LEXICAL ANALYSIS

The Role of Lexical Analyzer, Input Buffering, Specifications of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzer. Design of Lexical Analyzer Generator.-
LEX programming. **12 Hours**

UNIT – II

SYNTAX ANALYSIS

The Role of the Parser, Context-free Grammars, Writing a Grammar, Top-down Parsing, Bottom-up Parsing, Operator-Precedence Parsing. **10 Hours**

UNIT – III

SYNTAX ANALYSIS

LR Parsers –Simple LR (SLR), Canonical LR (CLR), Look Ahead LR (LALR) Parsers, Parser Generators-YACC programming **10 Hours**

UNIT – IV

SYNTAX-DIRECTED TRANSLATION

Syntax-Directed definitions, Constructions of Syntax Trees, Bottom-up Evaluation of S-attributed definitions, L-attributed definitions.

INTERMEDIATE CODE GENERATION

Intermediate Languages, Declarations, Assignments, Boolean Expressions, Case statements.

10 Hours

UNIT – V**CODE GENERATION**

Issues in the design of Code Generator, The Target Machine, Run-time Storage Management, Basic blocks and Flow graphs, Next-use information, A Simple Code Generator, Register Allocation and Assignment, The DAG representation of Basic Blocks.

CODE OPTIMIZATION

Introduction, The Principle of Optimization, Optimization of Basic Blocks, Loops in flow graphs.

10 Hours**Course Outcomes:**

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C703.1 | Comprehend the major concept areas of language translation and compiler design | L2 |
| C703.2 | Differentiate Lexical and Syntax Analysis phases of compiler | L4 |
| C703.3 | Analyze the basics of parsing including LL and LR Parser | L3 |
| C703.4 | Apply different methods of Intermediate code generation | L5 |
| C703.5 | Design code optimization techniques, machine code generation, and use of symbol table and provide practical programming skills necessary for constructing a compiler. | L6 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C703.1 | H | H | L | L | | | | | M | | L | | | |
| C703.2 | | H | L | | | | | | | | M | | | |
| C703.3 | H | M | M | M | | | | L | | | | | | |
| C703.4 | M | H | | L | | | | | | | | | | |
| C703.5 | H | | H | H | | | | | M | | H | H | L | L |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Alfred W Aho, Ravi Sethi, Jeffrey D Ullman, Compilers- Principles, Techniques and Tools, Pearson, 2nd Edition
2. John R Levine, Tony Mason & Doug Brown, UNIX Programming Tools- lex and yacc, O'Reilly Publication

REFERENCE BOOKS:

1. Andrew W Apple, Modern Compiler Implementation in C, Cambridge University Press
2. Kenneth C Louden, Compiler Construction Principles & Practice, Thomson Education

E-RESOURCES:

1. <http://nptel.ac.in/courses/106108052/>
2. <http://nptel.ac.in/courses/106104072/>

ADVANCED COMPUTER ARCHITECTURE

Sub Code : 14IS704
Hrs/Week : 4+0+0+0

Credits : 04
Total Hours : 52

Prerequisite:

The students should have general idea of Computer Organization. In addition, a familiarity with Memory organization, Computational models is required.

Course Learning Objectives:

This Course will enable students to

1. Learn principles of program and network properties.
2. Understand hardware technologies.
3. Understand the concept of pipelining and super scalar techniques.
4. Summarize the Cache Coherence and Synchronization Mechanisms.
5. Compare the working of various parallel computer models and their performance issues.

UNIT – I

PROGRAM AND NETWORK PROPERTIES

Flynn's classification, system attributes to performance, Parallel computer models- multiprocessors and multicomputer, multi-vector and SIMD Computers. Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Control flow, data flow and Demand driven mechanisms. Static interconnection networks, Dynamic interconnection Networks: Bus Systems, Crossbar Switch, Multiport Memory, Multistage and Combining networks

12 Hours

UNIT – II**PROCESSORS AND MEMORY HIERARCHY**

Instruction set architecture, CISC Scalar Processors , RISC Scalar Processors, VLIW architecture, Memory Hierarchy, Inclusion, Coherence and Locality, Memory capacity planning. Interleaved memory organization- memory interleaving, pipelined memory access, Bandwidth and Fault Tolerance. Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt.

10 Hours**UNIT – III****PIPELINING AND SUPERSCALAR TECHNIQUES**

Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, pipeline hazards, Dynamic instruction scheduling - score boarding and Tomosulo's algorithm, Branch handling techniques, Arithmetic Pipeline Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines. Superscalar, pipeline design, Super pipeline processor design.

10 Hours**UNIT – IV****PARALLEL AND SCALABLE ARCHITECTURE**

Cache coherence, Snoopy protocols, Directory based protocols. Message routing schemes in multicomputer network, deadlock and virtual channel. Vector processing principles, Vector instruction types, Vector-access memory schemes. Vector supercomputer architecture, SIMD organization: distributed memory model and shared memory model. Principles of Multithreading: Multithreading Issues and Solutions, Multiple-Context processors.

10 Hours**UNIT – V****SOFTWARE FOR PARALLEL PROGRAMMING**

Parallel Programming Models, Shared-Variable Model, Message-Passing Model, Data-Parallel Model, Object-Oriented Model, Functional and Logic Models, Parallel Languages and Compilers, Language Features for Parallelism, Parallel Programming Environment, Software Tools and Environments.

10 Hours**Course Outcomes:**

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C704.1 | Learn about Parallel Computer Model. | L2 |
| C704.2 | Understand processor and memory hierarchy | L2 |
| C704.3 | Analyze about Scalar and super scalar processing | L4 |
| C704.4 | Analyze about cache coherence and synchronization. | L4 |

| | | |
|--------|---|----|
| C704.5 | Understand parallel programming software. | L2 |
|--------|---|----|

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C704.1 | | L | | | | | M | | | | | | H | |
| C704.2 | | | | | | | L | | | L | M | | H | |
| C704.3 | | L | | | | | | | M | M | | | H | |
| C704.4 | L | | | | | M | | | | | | L | H | |
| C704.5 | | L | | | | | | | M | M | | | H | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Kai Hwang, "Advanced computer architecture", TMH.
2. Advanced Computer Architectures – A design space approach, DezsoSima, Terence Fountain, Peter Karsuk, Pearson Education 1997.

REFERENCE BOOKS:

1. J.P.Hayes, "computer Architecture and organization"; MGH.
2. V.Rajaraman&C.S.R.Murthy, "Parallel computer"; PHI Learning.
3. Kain,"Advance Computer Architecture: - A System Design Approach", PHI Learning
4. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design"; Narosa Publishing.
5. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH.
6. David E. Callav&Jaswinder Pal Singh Marge Kaufmann Advance Computer Architecture, EIS India.
7. Sajjan G. Shiva, Taylor&Francis, "Advance Computer Architecture.

E-RESOURCE:

1. http://cs.hadassah.ac.il/staff/martin/Adv_Architecture/coursera.html

CLOUD INFRASTRUCTURE & SERVICES

Sub Code : 14IS711
Hrs/Week : 3+0+0+0

Credits : 03
Total Hours : 39

Prerequisites:

Student must have fundamental knowledge of Information Storage Management.

Course Learning Objectives:

This Course will enable students to

1. Introduce the broad perceptive of cloud architecture and model.
2. Understand the concept of Virtualization.
3. Be familiar with the lead players in cloud.
4. Understand the features of cloud simulator.
5. Apply different cloud programming model as per need.
6. Be able to set up a private cloud.
7. Understand the design of cloud Services.
8. Learn to design the trusted cloud Computing system

UNIT – I

CLOUD ARCHITECTURE AND MODEL

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

8 Hours

UNIT – II

VIRTUALIZATION

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

7 Hours

UNIT – III

CLOUD INFRASTRUCTURE

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

8 Hours

UNIT – IV**PROGRAMMING MODEL**

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative
 MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support -
 Google App Engine,
 Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack,
 Aneka, CloudSim. **8 Hours**

UNIT – V**SECURITY IN THE CLOUD**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security –
 Security Governance – Risk Management – Security Monitoring – Security Architecture
 Design – Data Security – Application Security – Virtual Machine Security - Identity
 Management and Access Control – Autonomic Security. **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C711.1 | To Compare the strengths and limitations of cloud computing. | L2 |
| C711.2 | To Apply suitable virtualization concept. | L3 |
| C711.3 | To Identify the architecture, infrastructure and delivery models of cloud computing. | L2 |
| C711.4 | To choose the appropriate cloud player and the appropriate Programming Models and approach. | L4 |
| C711.5 | To Design Cloud Services and Set a private cloud. | L5 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C711.1 | L | | M | | M | | | H | | | | | M | |
| C711.2 | L | | M | | H | M | | H | | | M | | | |
| C711.3 | L | | H | | M | | | | M | | M | L | H | |
| C711.4 | M | H | M | | M | L | | H | H | | M | | | L |
| C711.5 | L | M | M | | H | | L | M | | | | | | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

REFERENCE BOOKS:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.
4. Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011.
5. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O'Reilly
6. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, “Grid and Cloud Computing – A Business Perspective on Technology and Applications”, Springer.
8. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010.
9. RajkumarBuyya, Christian Vecchiola, S.TamaraiSelvi, ‘Mastering Cloud Computing’, TMGH,2013.
10. GautamShroff, Enterprise Cloud Computing, Cambridge University Press, 2011.
11. Michael Miller, Cloud Computing, Que Publishing,2008.
12. Nick Antonopoulos, Cloud computing, Springer Publications, 2010.

ADHOC NETWORKS

Sub Code : 14IS712

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Understand the MAC layer functionalities of wireless networks.
2. Understand the working of major MAC layer protocols for adhoc wireless networks
3. Classify and distinguish Network layer protocols for adhoc wireless networks.
4. Identify the issues with TCP/IP Transport layer protocols with wireless networks. Study few solutions provided by adhoc transport layer protocols.
5. Identify security and QoS issues and challenges with adhoc wireless networks.

UNIT – I

REVIEW OF WIRELESS NETWORKS

IEEE Wireless Standard, Basic 802.11 MAC layer mechanisms, CSMA/CA mechanisms and other MAC layer functionalities.

AD HOC NETWORKS

Introduction, Issues in Ad Hoc wireless networks, Ad hoc wireless internet.

MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Introduction, Issues in designing a MAC Protocol for Ad hoc wireless Networks, Design goals of a MAC protocol for Ad hoc wireless Networks. **8 Hours**

UNIT - II

CLASSIFICATION OF MAC PROTOCOLS. CONTENTION BASED PROTOCOLS

MACAW, FAMA busy tone protocols, **receiver initiated protocol: MARCH**. Contention based protocols with reservation mechanisms: DPRMA, HRMA, FPRP. Contention-based MAC protocols with scheduling mechanism: DPS&MA.

Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing Protocol for Ad hoc wireless Networks, Classification of routing Protocols. **8 Hours**

UNIT - III

TABLE DRIVE ROUTING PROTOCOL

DSDV, WRP, CGSR. On-demand routing protocol: DSR, AODV, LAR, FORP.

HYBRID ROUTING PROTOCOL

CEDAR, ZRP. Hierarchical routing protocols: FSR. Metrics used by power aware routing protocols. **8 Hours**

UNIT - IV

TRANSPORT LAYER PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Introduction, Issues in designing a transport layer Protocol for Ad hoc wireless Networks, Design goals of a transport layer protocol for Ad hoc wireless Networks, Classification of transport layer solutions, TCP over Ad hoc wireless Networks: TCP-F, TCP-BuS, ATCP, Split TCP. Other transport layer protocols for Ad hoc wireless Networks: ACTP, ATP. **8 Hours**

UNIT – V

SECURITY IN WIRELESS AD HOC WIRELESS NETWORKS

Network Security requirements, Issues & Challenges in security provisioning, Network security attacks, Key Management, Secure routing in Ad hoc wireless Networks: SAR, SEAD, Security-Aware AODV.

QUALITY OF SERVICE IN AD HOC WIRELESS NETWORKS

Introduction, Issues & challenges in providing QoS in Ad hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions. **7 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C712.1 | List and explain the issues in designing a MAC Protocol for Adhoc wireless Networks | L2 |
| C712.2 | Classify adhoc MAC protocols based on contention and scheduling mechanisms | L2 |
| C712.3 | Classify adhoc routing protocols based on the routing information storage and management | L4 |
| C712.4 | Compare the issues and implication of adhoc networks while using transport layer protocols designed for wired networks | L4 |
| C712.5 | Understand requirements, issues and solution for security and QoS for adhoc wireless networks | L4 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C712.1 | H | L | | | | | | | | | | | H | |
| C712.2 | M | M | M | L | | | | | | M | L | | H | |
| C712.3 | L | M | | | | | | | | | | | H | |
| C712.4 | H | H | L | L | | | | | | M | L | | H | |
| C712.5 | M | H | L | | | | L | | | | L | | H | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXTBOOK:

1. Ad Hoc Wireless Networks: Architectures and Protocols, 2nd edition, C. Siva Ram Murthy and B S Manoj, Pearson Education, 2005.

REFERENCE BOOKS:

1. Ad Hoc Networks: Technologies and Protocols, PrasantMohapatra and Srikanth Krishnamurthy, Springer Science, 2005.
2. Ad Hoc Mobile Wireless Networks: Principles, Protocols, and Applications, Subir Kumar Sarkar, T G Basavaraju and C Puttamadappa, Auerbach Publications, 2007.
3. Guide to Wireless Ad Hoc Networks, SudipMisra, Isaac Woungang, Subhas Chandra Misra, Springer-Verlag, 2009.

4. The Handbook of Ad Hoc Wireless Networks, Editor Mohammad Ilyas, CRC Press, 2003.
5. Ad hoc Mobile Wireless Networks: Protocols & Systems, C. K. Toh, Prentice-Hall PTR, 2002.
6. https://onlinecourses.nptel.ac.in/noc17_cs07/preview

MICROCONTROLLERS AND ITS APPLICATIONS

Sub Code :14IS713
Hrs/Week : 3+0+0+0

Credits : 03
Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Explain the architecture of 8051 microcontroller.
2. Write assembly and C programming using 8051.
3. Interface external peripheral to microcontroller.
4. Differentiate various microcontrollers available in market.
5. Real time applications of 8051 microcontrollers.

UNIT – I

MICROPROCESSORS AND MICROCONTROLLERS

Introduction, A microprocessors survey. RISC and CISC CPU architecture, Harvard and Von-Neumann architecture

The 8051 Architecture: Introduction, Hardware, Input/output pins. Port and circuits, External memory, counters and timers, serial data input output, Interrupts **7 Hours**

UNIT – II

ADDRESSING MODES AND OPERATION

Introduction, Addressing modes, External data moves/ Indexed addressing modes, PUSH and POP instructions, Data exchanges, Byte level and Bit level logical operations, Rotate and swap operations, Example programs.

ARITHMETIC OPERATION:Flags, Incrementing and decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, programs. **8 Hours**

UNIT – III

JUMP AND CALL INSTRUCTIONS

The JUMP and CALL program ranges, Subroutines

INTERRUPTS: Interrupts and Returns, More detail on Interrupts, Example programs.

8 Hours

UNIT – IV**TIMER/COUNTER PROGRAMMING IN 8051**

Programming 8051 Timers, counter programming, Timer 0 and Timer 1 programming using 8051

SERIAL COMMUNICATION:8051 connection to RS232, 8051 serial communication programming. programming the second serial port, serial port programming in C

8 Hours**UNIT – V****INTERRUPT PROGRAMMING**

8051 Interrupts, Programming Timer Interrupts, Programming external hardware interrupts, Programming serial communication interrupts, Interrupt priority in 8051/8052, Interrupt programming in C

8051 INTERFACING AND APPLICATION

Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and PWM.

8 Hours**Course Outcomes:**

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C713.1 | Understand the architecture of 8051 microcontroller. | L2 |
| C713.2 | Analyze the addressing modes and some basic operations of 8051 microcontroller. | L3 |
| C713.3 | Differentiate the concepts of jump and call programming constructs. | L3 |
| C713.4 | Programming timer/counter and serial communication in 8051. | L4 |
| C713.5 | To know about the real time applications of the 8051 microcontroller. | L4 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|--------------|
| C713.1 | L | L | | L | L | | | M | | M | | H | L | |
| C713.2 | | | L | M | | L | | | H | | H | | | H |
| C713.3 | M | L | M | | M | | H | H | | H | | M | M | H |
| C713.4 | | | | L | H | M | M | | M | | M | | | |
| C713.5 | H | H | M | | | H | | | M | | | H | M | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Kenneth J. Ayala: "The 8051 Microcontroller Architecture, Programming & Applications" 2nd, Penram International, 1996/Thomson learning 2005
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; "The 8051 Microcontroller and Embedded systems using Assembly and C"-PHI, 2006/Pearson, 2006

REFERENCE BOOKS:

1. Ajay V.Deshmukh;" Microcontrollers theory and applications", TMH, 2005
2. Dr.RamaniKalpathi and Ganesh Raja; "Microcontroller and its applications", Sanguine Technical publishers, Bangalore-200

HUMAN COMPUTER INTERACTION

Sub Code : 14IS714

Credits : 03

Hrs/Week: 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Describe what interaction design is and how it relates to human computer interaction and other fields
2. Explain what cognition is and why it is important for interaction design
3. Outline the nature of user frustration and how to reduce it
4. Identify some of the common pitfalls in data analysis, interpretation, and presentation
5. Explain how to do usability testing through examples

UNIT – I

FOUNDATIONS OF HCI

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms **9 Hours**

UNIT – II

DESIGN & SOFTWARE PROCESS

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design **7 Hours**

UNIT – III**MODELS AND THEORIES**

Cognitive models –Socio-Organizational issues and stake holder requirements –
Communication and collaboration models-Hypertext, Multimedia and WWW. **7 Hours**

UNIT – IV**MOBILE HCI**

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications:
Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design:
Elements of Mobile Design, Tools. **8 Hours**

UNIT – V**WEB INTERFACE DESIGN**

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays,
Inlays and Virtual Pages, Process Flow. Case Studies **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C714.1 | Design effective dialog for HCI. | L2 |
| C714.2 | Design effective HCI for individuals and persons with disabilities. | L3 |
| C714.3 | Assess the importance of user feedback. | L2 |
| C714.4 | Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites. | L3 |
| C714.5 | Develop meaningful user interface | L4 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|----------|
| C714.1 | L | | | | | H | | L | | L | | H | | |
| C714.2 | | L | | H | | | M | | M | | H | | M | |
| C714.3 | H | H | | H | | H | | | | H | | H | | M |
| C714.4 | | H | L | | | M | | L | | | | H | | M |
| C714.5 | | | | H | | H | | M | | | M | | H | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I, II& III).
2. Brian Fling, “Mobile Design and Development”, First Edition , O’Reilly Media Inc., 2009 (UNIT –IV).
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly, 2009.(UNIT-V).

E-RESOURCE:

1. nptel.ac.in/courses/106103115/

SOFTWARE DEFINED NETWORKS

Sub Code : 14IS724

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Prerequisites: Computer Networks & Data Communications

Course Learning Objectives:

1. Appreciate the need for Software Defined Networks
2. Learn working of Software Defined Networking
3. Know the OpenFlow Specifications
4. Know the applications of Software Defined Networking in Data centers
5. Analyse the Future of Software Defined Networking

UNIT – I

INTRODUCTION

Basic Packet-Switching Terminology, The Modern Data Center, Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables, Can We Increase the Packet-Forwarding IQ? Open Source and Technological Shifts.

WHY SDN?

Evolution of Switches and Control Planes, Cost, SDN Implications for Research and Innovation, Data Center Innovation, Data Center Needs. **8 Hours**

UNIT - II

THE GENESIS OF SDN

The Evolution of Networking Technology, Forerunners of SDN, Software Defined Networking is Born, Sustaining SDN Interoperability, Open Source Contributions, Legacy Mechanisms Evolve Toward SDN, Network Virtualization.

HOW SDN WORKS

Fundamental Characteristics of SDN, SDN Operation, SDN Devices, SDN Controller, SDN Applications, Alternate SDN Methods. **8 Hours**

UNIT - III

THE OPENFLOW SPECIFICATION

OpenFlow Overview, OpenFlow 1.0 and OpenFlow Basics, OpenFlow 1.1 Additions, OpenFlow 1.2 Additions, OpenFlow 1.3 Additions, OpenFlow, Limitations.

ALTERNATIVE DEFINITIONS OF SDN

Potential Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening Up the Device, Network Functions Virtualization, Alternatives Overlap and Ranking. **8 Hours**

UNIT - IV

SDN IN THE DATA CENTER

Data Center Definition, Data Center Demands, Tunneling Technologies for the Data Center, Path Technologies in the Data Center, Ethernet Fabrics in the Data Center, SDN Use Cases in the Data Center, Open SDN versus Overlays in the Data Center, Real-World Data Center Implementations.

SDN IN OTHER ENVIRONMENTS

Consistent Policy Configuration, Global Network View, Wide Area Networks, Service Provider and Carrier Networks, Campus Networks, Hospitality Networks, Mobile Networks, In-Line Network Functions, Optical Networks, SDN vs. P2P/Overlay Networks. **8 Hours**

UNIT - V

SDN APPLICATIONS

Reactive versus Proactive Applications, Reactive SDN Applications, Proactive SDN Applications, Analyzing Simple SDN Applications, Creating Network Virtualization Tunnels, Offloading Flows in the Data Center, Access Control for the Campus, Traffic Engineering for Service Providers

SDN FUTURES

Potential Novel Applications of Open SDN, Applying Programming Techniques to Networks, Security Applications, Hiding IP Addresses, Segregating IPSec Traffic in Mobile Networks, Roaming in Mobile Networks, Traffic Engineering in Mobile Networks, Energy Savings, SDN-Enabled Switching Chips. **7 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|----------------|---|-------------------------------------|
| C724.1 | To comprehend need for Software Defined Networking | L2 |
| C724.2. | To learn working of Software Defined Networking | L2 |
| C724.3. | To introduce to various Software defined Networking Specification Standards | L2 |

| | | |
|---------|---|----|
| C724.4. | To appreciate the applications of Software Defined Networking in Data Center etc. | L4 |
| C724.5. | To understand future of Software Defined Networking | L2 |

Mapping of POs & COs:

| PO CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PS O 2 |
|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|--------------|
| C724.1 | M | | | | | | H | | | | M | H | | H |
| C724.2. | | | | | L | | | | | | M | | | H |
| C724.3. | M | M | H | H | | | | | | L | | | | H |
| C724.4. | | | | | H | | M | | L | | | | | H |
| C724.5. | | | M | | | M | | M | | | | H | | H |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Paul Goransson, Chuck Black: Software Defined Networks A Comprehensive Approach , Elsevier, 2014.(Chapters 1 to 8, 10 and 13)

REFERENCE BOOKS:

1. Thomas D.Nadeau & Ken Gray: SDN Software Defined Networks O'Reilly publishers, First edition, 2013.
2. <https://www.coursera.org/learn/sdn> or
<https://www.mooc-list.com/course/software-defined-networking-coursera>

BUSINESS INTELLIGENCE AND ITS APPLICATIONS

Sub Code : 14IS725

Credits : 03

Hrs/Week : 3+0+0

Total Hours : 39

Course Learning Objectives:**This Course will enable students to**

1. To discuss the need of BI for a business enterprise.
2. To implement the BI concepts to solve an organization business scenario.
3. To understand the need of data warehouse for a BI application.
4. To implement the steps involved in building a data warehouse and apply ETL.
5. To understand the measurement concept to evaluate business performance and build enterprise report.

UNIT – I

BUSINESS VIEW OF INFORMATION TECHNOLOGY APPLICATIONS

Business Enterprise Organization, Its Functions, and Core Business Processes; Baldrige Business Excellence Framework; Key Purpose of Using IT in Business; The Connected World: Characteristics of Internet-ready IT Applications; Enterprise Applications (ERP/CRM, etc.) and Bespoke IT Applications; Information Users and Their Requirements; Case Study Briefs: GoodLife HealthCare Group, GoodFood Restaurants Inc., TenToTen Retail Stores

TYPES OF DIGITAL DATA

Introduction; Getting into “GoodLife” Database; Getting to Know Structured Data; Getting to Know Unstructured Data; Getting to Know Semi-Structured Data; Difference Between Semi-Structured and Structured Data. **7 Hours**

UNIT – II

INTRODUCTION TO OLTP AND OLAP

OLTP (On-Line Transaction Processing); OLAP (On-Line Analytical Processing); Different OLAP Architectures; OLTP and OLAP; Data Models for OLTP and OLAP; Role of OLAP Tools in the BI Architecture; Should OLAP be Performed Directly on Operational Databases? A Peek into the OLAP Operations on Multidimensional Data; Leveraging ERP Data Using Analytics

GETTING STARTED WITH BUSINESS INTELLIGENCE

Using Analytical Information for Decision Support; Information Sources Before Dawn of BI? Business Intelligence (BI) Defined; Evolution of BI and Role of DSS, EIS, MIS, and Digital Dashboards; Need for BI at Virtually all Levels; BI for Past, Present, and Future; The BI Value Chain; Introduction to Business Analytics **8 Hours**

UNIT – III

BI DEFINITIONS AND CONCEPTS

BI Component Framework; Who is BI for? BI Users; Business Intelligence Applications; BI Roles and Responsibilities; Best Practices in BI/DW; The Complete BI Professional; Popular BI Tools

BASICS OF DATA INTEGRATION

Need for Data Warehouse; Definition of Data Warehouse; What is a Data Mart? What is Then an ODS? Ralph Kimball’s Approach vs. W.H. Inmon’s Approach; Goals of a Data Warehouse; What Constitutes a Data Warehouse? Extract, Transform, Load; What is Data Integration? Data Integration Technologies; Data Quality; Data Profiling **8 Hours**

UNIT – IV

MULTIDIMENSIONAL DATA MODELING

Introduction; Data Modeling Basics; Types of Data Model; Data Modeling Techniques; Fact Table; Dimension Table; Typical Dimensional Models; Dimensional Modeling Life Cycle

MEASURES, METRICS, KPIS, AND PERFORMANCE MANAGEMENT

Understanding Measures and Performance; Measurement System Terminology; Navigating a Business Enterprise, Role of Metrics, and Metrics Supply Chain; “Fact-based Decision Making” and KPIs; KPI Usage in Companies; Where Do Business Metrics and KPIs Come From?
Connecting the Dots: Measures to Business Decisions and Beyond **8 Hours**

UNIT – V

BASICS OF ENTERPRISE REPORTING

Reporting Perspectives Common to All Levels of Enterprise; Report Standardization and Presentation Practices; Enterprise Reporting Characteristics in OLAP World; Balanced Scorecard; Dashboards; How Do You Create Dashboards? Scorecards vs. Dashboards; The Buzz Behind Analysis...

BI ROAD AHEAD

Understanding BI and Mobility; BI and Cloud Computing; Business Intelligence for ERP Systems; Social CRM and BI **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C725.1 | Understand the business view of information technology applications and different types of digital data | L2 |
| C725.2 | Differentiate On-Line Transaction Processing and On-Line Analytical Processing and define BI concepts | L4 |
| C725.3 | Analyze the basics of data integration including data quality and data profiling and implement various data integration approaches | L3 |
| C725.4 | Apply different methods of multi-dimensional modeling and evaluate Key Performance Indicators | L5 |
| C725.5 | Create Enterprise Reports and Understand the future of BI | L6 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| C725.1 | M | | | | | | H | | | | M | H | | H |
| C725.2 | | | | | L | | | | | | M | | | H |
| C725.3 | M | M | H | H | | | | | | L | | | | H |
| C725.4 | | | | | H | | M | | L | | | | | H |
| C725.5 | | | M | | | M | | M | | | | H | | H |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Prasad RN, Seema Acharya: Fundamentals of Business Analytics, First Edition, Wiley India Pvt. Ltd, 2012.
2. William H. Inmon: Building the Data Warehouse, 4th Edition, Wiley India Ed., Reprint 2012.
3. Infosys Reference Book on Business Intelligence

REFERENCE BOOKS:

1. David Loshin: Business Intelligence, First Edition, Elsevier Science, 2003.
2. Mike Biere: Business Intelligence for the Enterprise, First Edition, IBM Press, 2003
3. Larissa T. Moss and Shaku Atre: Business Intelligence Roadmap, Addison-Wesley Professional, 2003.

MACHINE LEARNING

Sub Code : 14IS727

Credits : 03

Hrs/Week: 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. To discuss the data definitions and analysis techniques
2. To understand descriptive statistics and basic analysis techniques
3. To understand data analysis techniques
4. To understand the classification concepts
5. To understand unsupervised learning and challenges

UNIT – I

DATA DEFINITIONS AND ANALYSIS TECHNIQUES

Elements, Variables, and Data categorization, Levels of Measurement, Data management and indexing, Introduction to statistical learning and R-Programming **8 Hours**

UNIT – II

DESCRIPTIVE STATISTICS

Measures of central tendency, Measures of location of dispersions

BASIC ANALYSIS TECHNIQUES

Statistical hypothesis generation and testing, Chi-Square test, t-Test, Practice and analysis with R **8 Hours**

UNIT – III**ANALYSIS TECHNIQUES CONTD..**

Analysis of variance, Correlation analysis, Maximum likelihood test, Data analysis techniques, Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis **8 Hours**

UNIT – IV

Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines, Ensemble Methods: Random Forest, Neural Networks, Deep learning, Practice and analysis with R **8 Hours**

UNIT – V

Unsupervised Learning and Challenges for Big Data Analytic, Clustering, Associative Rule Mining, Challenges for big data analytic **7 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C727.1 | Summarize data definitions and analyse techniques | L2 |
| C727.2 | Illustrate descriptive statistics using R | L3 |
| C727.3 | Analyze simple analysis techniques | L4 |
| C727.4 | Survey data analysis techniques using R | L3 |
| C727.5 | Analyze Unsupervised learning | L4 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C727.1 | H | M | | | | | | | | | | M | | |
| C727.2 | H | H | M | M | M | | M | | | | | M | | |
| C727.3 | H | M | M | M | | | M | | | | | M | | |
| C727.4 | H | M | | | M | | | | | | | M | | |
| C727.5 | H | M | M | M | | | M | | | | | M | | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

RESOURCES AND REFERENCES:

1. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.

2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten, T Hastie, and R. Tibshirani, Springer, 2013
4. Software for Data Analysis: Programming with R (Statistics and Computing), John M. Chambers, Springer
5. Mining Massive Data Sets, A. Rajaraman and J. Ullman, Cambridge University Press, 2012
6. Advances in Complex Data Modeling and Computational Methods in Statistics, Anna Maria Paganoni and PiercesareSecchi, Springer, 2013
7. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
8. Hadoop: The Definitive Guide (2nd Edn.) by Tom White, O'Reilly, 2014
9. MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems, Donald Miner, Adam Shook, O'Reilly, 2014
10. Beginning R: The Statistical Programming Language, Mark Gardener, Wiley, 2013

E-RESOURCE:

1. https://onlinecourses.nptel.ac.in/noc15_mg05

COMPILER DESIGN LAB

Sub Code :14IS707

Credits : 01

Hrs/Week :0+0+2+0

Total Hours : 26 (13 weeks)

Course Outcomes:

At the end of the course the student will be able to

1. The study about regular expressions
2. Implementation of simple LEX programs
3. The study about grammars
4. Implementation of simple YACC programs
5. The study about code generation, intermediate code generation, tokenizing

PART A

LEX PROGRAMS:

1. Program to count the number of vowels and consonants in a given string.
2. Program to count the number of characters, words, spaces and lines in a given inputFile.
3. Program to count no of:
 - a) +ve and -ve integers
 - b) +ve and -ve fractions
4. Program to count the no of comment line in a given C program. Also eliminate them and copy that program into separate file.
5. Program to count the no of 'scanf' and 'printf' statements in a C program. Replace them with 'readf' and 'writef' statements respectively.
6. Program to recognize a valid arithmetic expression and identify the identifiers and operators present. Print them separately.

7. Program to recognize whether a given sentence is simple or compound.
8. Program to recognize and count the number of identifiers in a given input file.

YACC PROGRAMS:

1. Program to test the validity of a simple expression involving operators +, -, * and /.
2. Program to check the syntax of a simple expression involving operators +, -, * and /.
3. Program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits
4. Program to evaluate an arithmetic expression involving operating +, -, * and /.
5. Program to recognize strings 'aaab', 'abbb', 'ab' and 'a' using grammar ($a^n b^n, n \geq 0$).
6. Program to recognize the grammar ($a^n b, n \geq 10$).

BIG DATA AND ANALYTICS

Sub Code :14IS801

Credits : 04

Hrs/Week : 4+0+0+S

Total Hours : 52

*** Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.**

Prerequisites:-

Student must have fundamental knowledge about Business Intelligence and Data Warehouse.

Course Learning Objectives:

This Course will enable students to

1. Understand the common Hadoop ecosystem components, Hadoop Architecture.
2. Learn various NoSQL systems and their features, To compare NoSQL systems with each other and relational systems
3. Understand concepts like design of Hadoop distributed file system
4. Understand MapReduce Applications.
5. Learn Pig, Understand Hive concepts, Understand Cassandra

UNIT – I

UNDERSTANDING BIG DATA

Chapter 1: What is big data – why big data –Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

12 Hours

UNIT – II**NOSQL DATA MANAGEMENT**

Chapter 2: Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding – version – Map reduce – partitioning and combining – composing map-reduce calculations **10 Hours**

UNIT – III**BASICS OF HADOOP**

Chapter 3: Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures **10 Hours**

UNIT – IV**MAPREDUCE APPLICATIONS**

Chapter 4: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats **10 Hours**

UNIT – V**HADOOP RELATED TOOLS**

Chapter 5: Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries. **10 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|----------------|---|-------------------------------------|
| C801.1 | Describe big data and use cases from selected business domains | L2 |
| C801.2 | Explain NoSQL big data management | L3 |
| C801.3 | Install, configure, and run Hadoop and HDFS | L6 |
| C801.4 | Perform map-reduce analytics using Hadoop | L5 |
| C801.5 | Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics | L5 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C801.1 | L | M | L | M | | | M | | | | | M | | L |
| C801.2 | | M | | | | L | | | | | | L | | M |
| C801.3 | L | | | | | | | | | | | L | | |
| C801.4 | | L | | M | | L | | | | | | L | | |
| C801.5 | | | L | H | | | M | | | | L | M | | M |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCE BOOKS:

1. VigneshPrajapati, Big data analytics with R and Hadoop, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

E-RESOURCE:

1. nptel.ac.in/courses/106106142/47

BUILDING ENTERPRISE APPLICATIONS

Sub Code : 14IS811
Hrs/Week : 3+0+0+0

Credits : 03
Total Hours : 39

Course Learning Objectives:**This Course will enable students to**

1. Comprehend the life cycle of raising an Enterprise Application.
2. Apply various techniques in incepting an Enterprise Application.
3. Design an Enterprise Architecture.
4. Implement various concepts of Software Construction Maps.
5. Apply various testing techniques in testing an Enterprise Application.

UNIT – I

Introduction to enterprise applications and their types, software engineering methodologies, life cycle of raising an enterprise application, introduction to skills required to build an enterprise application, key determinants of successful enterprise applications, and measuring the success of enterprise applications **8 Hours**

UNIT – II

Inception of enterprise applications, enterprise analysis, business modeling, requirements elicitation, use case modeling, prototyping, non functional requirements, requirements validation, planning and estimation **8 Hours**

UNIT - III

Concept of architecture, views and viewpoints, enterprise architecture, logical architecture, technical architecture - design, different technical layers, best practices, data architecture and design – relational, XML, and other structured data representations, Infrastructure architecture and design elements - Networking, Internetworking, and Communication Protocols, IT Hardware and Software, Middleware, Policies for Infrastructure Management, Deployment Strategy, Documentation of application architecture and design. **8 Hours**

UNIT – IV

Construction readiness of enterprise applications - defining a construction plan, defining a package structure, setting up a configuration management plan, setting up a development environment, introduction to the concept of Software Construction Maps, construction of technical solutions layers, methodologies of code review, static code analysis, build and testing, dynamic code analysis – code profiling and code coverage. **8 Hours**

UNIT – V

Types and methods of testing an enterprise application, testing levels and approaches, testing environments, integration testing, performance testing, penetration testing, usability testing, globalization testing and interface testing, user acceptance testing, rolling out an enterprise application **7 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|----------------|---|-------------------------------------|
| C811.1 | Have skills required to build an Enterprise Applications | L2 |
| C811.2 | Create a Business Modeling of an Enterprise Application | L4 |
| C811.3 | Design an Enterprise Architecture by incorporating various hardware and networking requirements | L3 |
| C811.4 | Construct the Technical Solution layers | L5 |

| | | |
|--------|--|----|
| C811.5 | Roll out an Enterprise Application after subjecting it to different types of testing | L3 |
|--------|--|----|

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C811.1 | L | | | | | | H | | | | M | H | | H |
| C811.2 | | | | | M | | | | | | L | | | H |
| C811.3 | M | M | H | H | | | | | | L | | | L | H |
| C811.4 | | | | | H | | M | | L | | | | | H |
| C811.5 | | | M | | | M | | M | | | | H | | H |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Raising Enterprise Applications – Published by John Wiley, authored by Anubhav Pradhan, Satheesha B. Nanjappa, Senthil K. Nallasamy, VeerakumarEsakimuthu
2. Building Java Enterprise Applications – Published by O'Reilly Media, authored by Brett McLaughlin

REFERENCE BOOKS:

1. Software Requirements: Styles & Techniques – published by Addison-Wesley Professional
2. Software Systems Requirements Engineering: In Practice – published by McGraw-Hill/Osborne Media
3. Managing Software Requirements: A Use Case Approach, 2/e – published by Pearson
4. Software Architecture: A Case Based Approach – published by Pearson
5. Designing Enterprise Applications with the J2EE Platform (PDF available at http://java.sun.com/blueprints/guidelines/designing_enterprise_applications_2e/)

EMBEDDED AND REAL TIME SYSTEMS

Sub Code : 14IS812

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:**This Course will enable students to**

1. Discuss the major components that constitute an embedded system.
2. Implement small programs to solve well-defined problems on an embedded platform.
3. Understand the importance of RTOS in an Embedded System.
4. Develop familiarity with tools used to develop in an embedded environment.
5. Know about the real time applications of embedded system.

UNIT – I

INTRODUCTION

Embedded system definition, characteristics, design metrics; Processor, IC and design technologies; ASIPs, Embedded system examples **8 Hours**

UNIT – II

INTERFACING EXTERNAL PERIPHERALS

Combinational and sequential building blocks, Timers, ADCs, Keypad controllers, LCD controllers, stepper motor and DC motor control **8 Hours**

UNIT – III

PROCESSOR DESIGN EXAMPLES

Custom Single Purpose processor design examples: GCD Generator, Network Bridge, 4 bit shift multiplier **8 Hours**

UNIT – IV

INTRODUCTION TO RTOS

The Scheduler, Objects, services, key characteristics of RTOS, Tasks :- Defining Tasks, Task States & Scheduling, Task Operations, Typical Task Structure, synchronization, Communication & Concurrency. **8 Hours**

UNIT – V

RTOS SERVICES

Semaphores Operations, Usage, Message Queues : Typical message QUE Operations, Usage, Other RTOS services. **7 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C812.1 | Understand what is a microcontroller, microcomputer, embedded system | L2 |
| C812.2 | Analyze key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices | L3 |
| C812.3 | Recognize the key features of embedded systems in terms of computer hardware and be able to discuss their functions. | L3 |
| C812.4 | Understand the basics of Real Time Operating System and real-time application of RTOS. | L2 |
| C812.5 | To know about the real-time applications of Message queues, synchronization and other services. | L2 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C812.1 | | L | M | | L | | L | M | | M | | M | L | |
| C812.2 | M | | | H | | L | | | H | | M | | M | |
| C812.3 | | M | L | M | M | | M | H | | H | | H | | H |
| C812.4 | | H | | L | H | M | H | | M | L | H | | M | M |
| C812.5 | H | | H | | | H | | L | | | | H | | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS :

1. Frank Vahid, Tony Givargis; Embedded System Design- a unified hardware/software introduction, John Wiley 2002
2. Qing Li and Carolyn Yao, Real Time Concepts for Embedded Systems, 2003 edition CMP Books.

REFERENCE BOOKS :

1. Rajkamal “Embedded Systems Architecture, Programming and Design”, Tata McGrawHill
2. Dr.K.V.K.K.Prasad, “Embedded/Real Time Systems: Concepts Design and Programming- The ultimate referencce”, Dreamtech Press
3. Philip Laplante-“Real time systems design and analysis – an Engineer’s Handbook”, PHI publications

GAME THEORY

Sub Code : 14IS813

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:**This Course will enable students to**

1. Analyze the usage of Game Theory
2. Know how the Strategic Games are Played and its Foundation
3. Understand the Layout of Extensive games
4. Know the Concepts of maximization and Minimization
5. Apply some of the principles of Game theory

UNIT – I**INTRODUCTION; STRATEGIC GAMES**

What is game theory? Four elements, Classification of games, The theory of rational choice; Interacting decision makers, Strategic games; Example: The prisoner’s dilemma; Nash equilibrium; Examples of Nash equilibrium; Best- response functions; Dominated actions;

Equilibrium in a single population: symmetric games and symmetric equilibria, Interpretation of Nash Equilibrium **8 Hours**

UNIT – II

MIXED STRATEGY EQUILIBRIUM

Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Finding mixed strategy by graphical method; Finding mixed strategy by analysing subset of all actions; Dominated actions; Pure equilibria when randomization is allowed, examples; The formation of players beliefs; Eliminating dominated actions, Median Voter theorem **8 Hours**

UNIT – III

EXTENSIVE GAMES

Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Subgame perfect equilibrium; Finding subgame perfect equilibria of finite horizon games. **8 Hours**

UNIT – IV

EXTENSIONS

Allowing for simultaneous moves, examples, Discussion: subgame perfect equilibrium and backward induction.

STRICTLY COMPETITIVE GAMES AND MAXIMIZATION

Maximization and Nash equilibrium; Strictly Competitive Games; Maximization and Nash equilibrium in strictly competitive games

RATIONALIZABILITY

Iterated elimination of strictly dominated actions; Iterated elimination of weakly dominated actions; Dominance solvability. **8 Hours**

UNIT – V

APPLICATIONS OF GAME THEORY

Assumptions and issues in Game theory, Mechanism design problem and examples, game theory and cryptography, game theory and wireless adhoc networks, game theory and network security, Pareto optimal, Selfish routing, Correlated equilibrium **7 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C813.1 | Know the Concepts of Theory | L2 |
| C813.2 | Understand the Architecture of Games | L6 |
| C813.3 | Analyze the Architecture of Game Playing | L5 |
| C813.4 | Apply the use of Equilibrium in Games | L4 |
| C813.5 | Apply the Concepts of Game Theory | L5 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C813.1 | L | | | | | | | | M | | | | L | |
| C813.2 | L | | | L | | L | | M | | M | | H | | M |
| C813.3 | | L | H | | L | | L | | | | M | | | |
| C813.4 | | H | | | | | | | | | L | | | |
| C813.5 | | L | H | M | H | M | | L | | | | | M | M |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Martin Osborne: An introduction to game theory, Oxford University Press, Indian Edition, 2004.
2. An Introduction to Game Theory: Strategy, Joel Watson, W W Norton and Company
3. Algorithmic Game Theory, Noam Nisan, Tim Roughgarden, Eva Tardos, Vijay V Vazirani, Cambridge University Press

REFERENCE BOOK:

1. Roger B Myerson: Game theory: Analysis of Conflict, Harvard University Press, 1997.

OPERATIONS RESEARCH

Sub Code : 14IS814

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:**This Course will enable students to**

1. To know the basics of OR, modelling and applications of OR.
2. Definition of linear programming model, formulation of linear programming model and application of linear programming model using different techniques.
3. To formulate the problem and solve the problem by using different techniques.
4. Describe mathematical formulation of an Assignment Problem and solve various scenarios by using different methods.
5. Understand and identify the project management techniques

UNIT - I

Introduction: Introduction to OR, nature and meaning, applications, modeling in OR, phases of OR study. Linear Programming: Introduction to Linear Programming through an example, graphical method, formulation of LP model from practical problems, assumptions and properties of linear programming, simplex method

7 Hours

UNIT – II

Revised simplex method, Big M method, 2 phase method, Duality theory, Primal and dual relationship, Dual simplex method **8 Hours**

UNIT – III

Transportation Problems: Special types of main programming, transportation problems, methods to find initial feasible solution and modification to obtain optimal solution (Degeneracy in transportation problems, unbalanced transportation problems **8 Hours**

UNIT - IV

Assignment problem Mathematical formulation of an assignment problem, unbalanced assignment problem, TSP, Hungarian method **8 Hours**

UNIT - V

CPM, PERT : Representation of a project by a network, activities and events, starting times, finishing times, floats, slacks, CPM, Idea of crashing probabilistic times and PERT analysis **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C814.1 | Comprehend OR basics, its modeling and applications | L2 |
| C814.2 | Analyze Linear Programming model | L4 |
| C814.3 | Apply Transportation Problem | L3 |
| C814.4 | Synthesize mathematical formulation of an Assignment Problem and solve various scenarios by using different methods. | L5 |
| C814.5 | Evaluate Project management techniques | L6 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C814.1 | H | L | | | | L | | | | | | | | |
| C814.2 | H | L | | | | | | | | | L | | | |
| C814.3 | M | | | | | | | | | | | | | |
| C814.4 | H | | | | M | | | | | | | | | |
| C814.5 | L | L | | | M | L | | | | | L | M | | L |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXTBOOKS:

1. Operations Research, S D Sharma, 15th edition
2. Operations Research – An introduction, Hamdy A Taha, PHI, 7 th edition

REFERENCE BOOKS:

1. Operation research, Kantiswaroop, Manmohan and Gupta
2. Introduction to operation research, a computer oriented algorithmic approach, Gillett B G, McGraw Hill, 1976

CYBER SECURITY AND CYBER LAWS

Sub Code : 14IS815

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This course will enable students to

1. Define the area of cybercrime and forensics.
2. Explain the motive and causes for cybercrime , detection and handling.
3. Investigate Areas affected by cybercrime.
4. Illustrate tools used in cyber forensic
5. Infer legal Perspectives in cyber security

UNIT – I

INTRODUCTION TO CYBERCRIME

Cybercrime- Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, A Global Perspective on Cybercrimes, Cybercrime Era:Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing **7 Hours**

UNIT - II

CYBERCRIME

Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops **8 Hours**

UNIT - III

TOOLS AND METHODS USED IN CYBERCRIME

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan-horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction to Phishing, Identity Theft (ID Theft). **8 Hours**

UNIT – IV

UNDERSTANDING COMPUTER FORENSICS

Introduction, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics. **8 Hours**

UNIT – V

INTRODUCTION TO SECURITY POLICIES AND CYBER LAWS

Need for An Information Security Policy, Information Security Standards – ISO, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property – Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License. **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C815.1 | Define cyber security, cyber law and their roles | L1 |
| C815.2 | Identify cyber security cybercrime and forensics | L2 |
| C815.3 | Apply tools and methods used in cyber crime | L3 |
| C815.4 | Integrate the tools and methods used in Cyber Forensics | L5 |
| C815.5 | Comprehend the Security Policies and Cyber Laws | L2 |

Mapping of POs & COs

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C815.1 | | L | | | | | | | | M | | | | |
| C815.2 | M | | M | | | L | | | H | | | | | |
| C815.3 | H | M | M | L | | | | | | | H | M | | L |
| C815.4 | | H | | L | | M | | | M | | H | | | |
| C815.5 | | H | | | | H | | | M | M | | H | L | L |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013
2. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI. "Introduction to information security and cyber laws". Dreamtech Press. ISBN: 9789351194736, 2015

REFERENCE BOOKS:

1. Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing, and
2. Investigating Intrusions", Copyright © 2014 by John Wiley & Sons, Inc, ISBN: 978 -1-118 -
3. 84965 -1
4. James Graham, Ryan Olson, Rick Howard, "Cyber Security Essentials", CRC Press, 15-Dec 2010
5. Anti
6. Anti- Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.

MANAGEMENT INFORMATION SYSTEMS

Sub Code : 14IS821

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Study the fundamentals of Information System
2. Identify the role of Information Technology.
3. Understand the Business systems
4. Use the fundamentals of e-Commerce and Decision Making for Business System.
5. Analyze Business Development Process and Security Management

UNIT – I

(Foundation Concept)

FOUNDATIONS OF INFORMATION SYSTEMS IN BUSINESS

Foundations concepts: Information systems in business, Foundations concepts: The Components of Information system

COMPETING WITH INFORMATION TECHNOLOGY

Fundamentals of Strategic Advantage, Using Information Technology for Strategic Advantage

8 Hours

UNIT - II

(Information Technologies)

COMPUTER HARDWARE

Computer System, Computer Peripherals

COMPUTER SOFTWARE

Application Software, System Software

DATA RESOURCE MANAGEMENT

Technical Foundations of Database Management, Managing Data Resources

TELECOMMUNICATION AND NETWORKS

The Networked Enterprise, Telecommunications Network Alternatives

8 Hours

UNIT - III

(Business Applications)

E-BUSINESS SYSTEMS

e-Business Systems, Functional Business Systems

ENTERPRISE BUSINESS SYSTEM

Customer Relationship Management, Enterprise Resource Planning, Supply Chain Management

8 Hours

UNIT - IV**(Business Applications)****E-COMMERCE SYSTEMS**

e-Commerce Fundamentals, e-Commerce Applications and Issues

SUPPORTING DECISION MAKING

Decision Support in Business, Artificial Intelligence Technologies in Business

7 Hours**UNIT - V****(Development Process and Security)****DEVELOPING BUSINESS/IT SOLUTIONS**

Developing Business Systems, Implementing Business Systems

SECURITY AND ETHICAL CHALLENGES

Security, Ethical and Societal Challenges of IT, Security Management of IT

ENTERPRISE AND GLOBAL MANAGEMENT OF IT

Managing IT, Managing Global IT

8 Hours**Course Outcomes:**

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C821.1 | Explain the concepts, components and classification of information system. | L5 |
| C821.2 | Identify the role of Information Technology. | L4 |
| C821.3 | Understand e-business and enterprise business system. | L2 |
| C821.4 | Analyze the fundamentals of e-commerce and decision support in business and study artificial intelligent technologies in business. | L4 |
| C821.5 | Apply the information system concept of strategies to the global management and study the implementation & development of IT solutions. | L3 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|--------------|--------------|
| C821.1 | L | M | H | | H | M | | M | | | H | M | | |
| C821.2 | H | H | H | | M | M | | M | M | L | L | L | | H |
| C821.3 | L | M | M | H | H | L | M | H | | | M | H | H | |
| C821.4 | M | L | H | | M | | | M | | | M | M | L | L |
| C821.5 | L | M | H | L | H | M | M | H | H | L | H | M | | L |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXTBOOK:

1. James A O' Brien, George M Marakas, Ramesh Behl: Management Information Systems (10th edition) Tata McGraw Hill.

REFERENCE BOOKS:

1. Laudon and Laudon: Management Information System: Organization and Technology. (4th edition) Pearson Education/ Prentice hall India 1999.
2. W.S. Jawadekar: Management Information Systems, Tata McGraw Hill 1998
3. Steven Alter: Information Systems, Addison Wesley 1999

E-RESOURCE:

1. NPTEL source - <http://nptel.ac.in/courses/122105022/>

**SUPPLY CHAIN MANAGEMENT AND ENTERPRISE
RESOURCE PLANNING**

Sub Code : 14IS822

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Outline the concepts of a supply chain with various case studies and explain the strategic framework to analyze supply chains and their management.
2. Illustrate the role of transportation and coordination in a supply chain with design and comparison of various transportation modes and coordination methodologies.
3. Analyze the role of pricing and revenue management in a supply chain with key factors ,tactics and Get the idea of role of IT in a supply chain
4. Understand and Analyze ERP
5. Apply ERP to the Supply Chain Management.

UNIT – I

UNDERSTANDING THE SUPPLY CHAIN

What is a supply chain?, The objective of a supply chain, Importance of supply chain decisions, Decision phases in a supply chain, process views of a supply chain, Examples of supply chains

LOGISTICS AND COMPETITIVE STRATEGY

Competitive advantage, gaining competitive advantage through logistics, the mission of logistic management, the supply chain and competitive performance, the changing the logistic environment.

8 Hours

UNIT – II

TRANSPORTATION IN A SUPPLY CHAIN

Roles of transportation in a supply chain ,modes of transportation and their performance characteristics, transportation infrastructure and policies, design option for a transportation network, trade-offs in transportation design, tailored transportation, role of IT in transportation, risk management in transportation, Indian transportation system-in need of innovations to propel economic growth, making transportation decisions in practice.

COORDINATION IN A SUPPLY CHAIN

Lack of supply chain coordination and bullwhip effect,the effect on performance of lack of coordination, obstacles to coordination in supply chain, managerial levels to achieve coordination, building strategic partnerships and trusts within, continuous replenishment and vendor managed inventories, collaborative planning, forecasting and replenishment(CPFR), collaborative planning, forecasting and replenishment-Indian experiences, the role of IT in coordination.

8 Hours

UNIT – III

TOTAL DISTRIBUTION COST ANALYSIS

Total cost concept, principles of logistic costing, logistics and bottom line, logistics and shareholder value, customer profitability analysis, direct product profitability, cost drivers and activity based costing

IT ENABLED SUPPLY CHAIN

Introduction, changing role of IT,IT solution options, Electronic Data Interchange(EDI)

8 Hours

UNIT – IV

ERP OVERVIEW

Benefits, business engineering, ERP and management concerns, Business Modeling for ERP.ERP implementation, customization, post implementation options.

8 Hours

UNIT – V

ERP AND COMPETITIVE ADVANTAGE

marketing of ERP, ERP domain: SAP,BAAN, SAP r/3,MGF/PRO,IFS/Avalon

7 Hours

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C822.1 | Analyse various supply chains in the real world and apply the various methodologies for the supply chain profitability. | L2 |
| C822.2 | Describe the role of transportation and coordination in a supply | L2 |

| | | |
|--------|--|----|
| | chain and how it can be managed for the success of a supply chain. | |
| C822.3 | Design a good pricing and revenue management system for a successful supply chain. | L3 |
| C822.4 | Understand and Analyze ERP | L4 |
| C822.5 | Apply Information Technology and ERP in a supply chain. | L3 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C822.1 | H | | | | | | | H | | | H | | M | |
| C822.2 | H | | | | | | | H | | | H | | M | |
| C822.3 | L | | | | H | | | | | | H | | M | |
| C822.4 | L | | H | | | | | | | | H | | M | |
| C822.5 | | H | M | | | | | | | | H | M | M | |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOKS:

1. Martin Christopher, "Logistics and supply chain management
2. Sunil chopra, Peter Meindl, supply chain management strategy, planning, and operation, Pearson Education 2003
3. VinodkumarGarg,N.K. venkatakrishnan, "Enterprise Resource planning concepts and Practice", PHI 1999.

DECISION SUPPORT SYSTEMS

Sub Code : 14IS823

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. Describes the decision making process
2. Describes the architecture of a decision support system(DSS)
3. Presents the techniques most commonly employed in the construction of decision support systems, and in making decisions with the support of the system.
4. Presents the problems related to decision support systems that are not yet resolved satisfactorily at present and, therefore, are open research areas
5. Explain Group Decision making.

UNIT – I

MANAGEMENT SUPPORT SYSTEMS

An overview- Managers and Decision Making, Managerial Decision Making and Information Systems, Managers and Computerized Support, The need for Computerized Support technologies, a frame work for decision support, the concept of Decision Support systems

GROUP DECISION SUPPORT SYSTEMS

Executive systems and Information (support) Systems, Expert Systems, Artificial Neural Networks, and Hybrid Support Systems. **7 Hours**

UNIT - II

The Evolution and Attributes of Computerized Decision aids Introduction and Definitions, Systems, Models, The Modeling Process

DECISION MAKING:The Intelligent Phase, Decision Making: The Design Phase, Decision Making: The Choice Phase, Evaluation, Decision Making: Implementation Phase **7 Hours**

UNIT - III

DSS CONFIGURATION, WHAT IS DSS?

Characteristics, Capabilities, Components of DSS, The Data Management Sub System, The Model Management Subsystem, The Knowledge Based Management System

The User Interface, The User, DSS Hardware, Distinguishing DSS from Management Science and MIS, DSS Classification. **7 Hours**

UNIT - IV

INTRODUCTION TO DSS DEVELOPMENT

The Traditional System Development Life cycle, Alternate Development Methodologies, Prototyping: The DSS Development Methodology, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team-Developed DSS, End User-Developed DSS, Developing DSS: Putting the System Together, DSS Research Directions and the DSS of the future.

Group Decision Making, Communication and Collaboration, Communication Support, Collaboration Support: Computer- Supported Cooperative work, Group Support Systems, Group Support Systems Technologies, Group Systems, The GSS Meeting Process, Distance Learning, Creativity and Idea Generation, GSS and Collaborative Computing Issues and Research. **8 Hours**

UNIT - V

CONCEPTS AND DEFINITIONS OF ARTIFICIAL INTELLIGENCE

AI versus Natural Intelligence, The Artificial Intelligence field, Types of Knowledge-Based Decision Support systems, Basic Concepts, The Human Element in Expert System, How Expert System work? Problem areas addressed by ES, Benefits, Problems and Limitations of ES, ES Success Factors, Types of Expert Systems, ES and the Internet/ Intranet/ Web

Knowledge Engineering, Scope of Knowledge, Difficulties in Knowledge Acquisition, Methods of Knowledge Acquisition, Machine Learning, Intelligent Agents, Selecting an

appropriate Knowledge Acquisition Method, Knowledge Acquisition from Multiple Experts, Validation and Verification of Knowledge Base, Analyzing and Coding, Documenting and Diagramming, Numeric and Documented Knowledge Acquisition, Knowledge Acquisition and Internet/ Intranet, Induction and Table Example. **10 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcomes (CO) | Bloom's Taxonomy Level (BTL) |
|---------|---|------------------------------|
| C823.1 | Define a framework for decision support | L1 |
| C823.2 | Explain phases of decision making process | L2 |
| C823.3 | Describe the characteristics, capabilities and components of DSS. | L3 |
| C823.4 | Explain the DSS development methodology | L4 |
| C823.5 | Explain Group Decision making | L4 |

Mapping of POs & COs:

| POs COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| C823.1 | | L | | | L | | | M | | M | | H | | M |
| C823.2 | M | | M | | M | L | | | H | | H | | | M |
| C823.3 | H | M | M | H | | | H | H | | H | | H | | M |
| C823.4 | | H | | L | H | M | M | | M | | H | | | M |
| C823.5 | | H | H | | | H | | | M | | | H | | M |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Efraim Turban & Jay E. Aronson : 'Decision Support Systems and Intelligent Systems', Sixth Edition, Pearson Education Asia, 2001

REFERENCE BOOKS:

1. Giarratano & Riley: 'Expert Systems: Principles and Programming', Thomson Brooks / Cole, 2002.
2. Sprague R.H. Jr and H.J. Watson: 'Decision Support Systems', Fourth Edition, Prentice Hall, 1996.

INTRUSION DETECTION SYSTEM

Sub Code : 14IS825

Credits : 03

Hrs/Week : 3+0+0+0

Total Hours : 39

Course Learning Objectives:

This Course will enable students to

1. To become familiar with the basics of Intrusion Detection system
2. To learn concepts of network Intrusion Detection systems
3. To gain the knowledge of Snort rules and Procedures
4. To acquire knowledge of securing databases

UNIT - I

History of Intrusion detection, Audit, Concept and definition, Internal and external threats to data, attacks, need and types of IDS, Information sources, Host based information sources, Network based information sources **7 Hours**

UNIT - II

Intrusion Prevention Systems, Network IDs protocol based IDs ,Hybrid IDs, Analysis schemes, thinking about intrusion, A model for intrusion analysis , techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis, non credential analysis **8 Hours**

UNIT - III

Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options, Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes, Snort Alert Modes **8 Hours**

UNIT - IV

Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc Plugins, Preprocessors and Output Modules, Using Snort with MySQL Using ACID and SnortSnarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs, future needs **8 Hours**

UNIT - V

Securing database-to-database communications : Monitor and limit outbound communications ,Secure database links and watch for link-based elevated privileges, Protect link user names and passwords, Monitor usage of database links, Secure replication mechanisms, Map and secure all data sources and sinks Trojans : The four types of database Trojans, Baseline calls to stored procedures and take action on Divergence, Control creation of and changes to procedures and triggers **8 Hours**

Course Outcomes:

At the end of the course the student will be able to

| Sl. No. | Course Outcome (CO) | Bloom's Taxonomy Level (BTL) |
|---------|--|------------------------------|
| C825.1 | Define the basics of Intrusion Detection System | L1 |
| C825.2 | Analyze different types of intrusion detection systems | L4 |
| C825.3 | Comprehend Snort rules and procedures | L2 |
| C825.4 | Apply knowledge gained by attacking scenarios | L3 |
| C825.5 | Evaluate different types of database security | L6 |

Mapping of POs & COs:

| Pos COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O 1 | PS O 2 |
|---------|------|------|------|------|------|------|------|------|------|-------|-------|-------|--------|--------|
| C825.1 | M | | L | | | | | | | | M | | | |
| C825.2 | | H | | | | M | | | | | | L | | |
| C825.3 | | | | | | | | M | H | | | | | |
| C825.4 | H | | L | | | | | | | | M | | | |
| C825.5 | | | H | | | | | | H | | | | L | L |

(L = Low 30%-49%, M = Medium 50%-69%, H = High >70%)

TEXT BOOK:

1. Rebecca Gurley Base "Intrusion Detection" MacMillan Technology Series (MTP Series)
ISBN 1578701856, 9781578701858

REFERENCE BOOKS:

1. Rafeeq Rehman "Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID"
Prentice Hall PTR, 2003 ISBN 0-13-140733-3
2. RonBen Natan, Implementing Database Security and Auditing, Elsevier, Indian reprint,
ISBN: 9781555583347
