SCHEME OF TEACHING
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
SEVENTH SEMESTER – B.E

Sl. No	Subject Code	Course Title	Category	Teaching Dept	Contact Hours / Week				Credits
					L	T	P	Total	
1	IS0419	Management and Entrepreneurship Development	GC	IS & E	3	2	0	5	4
2	IS0422	Advanced Computer Architecture	GC	IS & E	4	0	0	4	4
3	IS0433	Cryptography and Network Security	GC	IS & E	3	2	0	5	4
4	IS0434	Cloud Computing	GC	IS & E	4	0	0	4	4
5	IS0204	Minor Project	GC	IS & E	0	0	4	4	2
6	IS03xx	**Foundation Elective**	FE	IS & E	3	0	0	3	3
7	IS03xx	Elective – III	GE	IS & E	3	0	0	3	3
8	IS03xx	Elective – IV	GE	IS & E	3	0	0	3	3
				TOTAL	**23**	**4**	**4**	**31**	**27**

GC:GeneralCore
GE:GeneralElective
FE:FoundationElective

FoundationElective:
Client Server Programming(IS0324)
Recommender Systems(IS0323)

Elective – III
IS0311 - System Simulation and Modeling
IS0315 - Wireless Communication and Networks
IS0316 - Object Oriented Analysis and Design

ELECTIVE – IV
IS0317 - Parallel Programming
IS0319 - Computer Forensics
IS0326 - Semantic Web

SCHEME OFTEACHING
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
EIGHT SEMESTER –B.E

Sl. No	Subject Code	Course Title	Category	Teaching Dept	Contact Hours / Week				Credits
					L	T	P	Total	
1	IS0304	Information Storage	GC	IS & E	3	0	0	3	3
2	IS0442	Artificial Intelligence	GC	IS & E	4	0	0	4	4
3	IS0602	Major Project	GC	IS & E	0	0	12	12	6
4	IS0118	Paper Presentation / Internship/ Industrial Visit	GC	IS & E	0	0	2	2	1
5	IS03xx	Elective – V	GE	IS & E	3	0	0	3	3
6	IS03xx	Elective – VI[$]	GE	IS & E	3	0	0	3	3
TOTAL (Regular)					**13**	**0**	**14**	**27**	**20**
TOTAL (Lateral Entry)					**10**	**0**	**14**	**24**	**17**

GC:GeneralCore **$ For regularstudents**
GE: GeneralElective

ELECTIVE – V
IS0320 - Cognitive Science
IS0327 - Wireless AdhocNetwork
IS0328 - Information Retrieval Systems

ELECTIVE – VI
IS0321 - Introduction to Machine Learning
IS0329 - Web Security
IS0330 - Network Management

VII SEMESTER

MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT (3:2:0)

Sub code	**: IS0419**	**CIE**	**: 50 Marks**
Hrs/week	**: 05**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Interpret broad knowledge of management.
2. Identify the objectives of planning and organization.
3. Explain the importance of directing and controllingfunctions.
4. Demonstratethe concepts of entrepreneurship. (For Tutorials also)
5. Create a business plan for a technologicalidea.
6. Interpret financial statements to exhibit technical proficiency.

MODULE1: **7 Hrs**

Management:

Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management – Management as a science, art or profession– Management and administration – Roles of management, Levels of management.

Self Learning Exercise: Development of management thought –modern managementapproaches

MODULE2: **7 Hrs**

Planning and Organizing:

Nature, importance and purpose of planning process – objectives - Types of plans- Decision making – Importance of planning – steps in planning, Planning premises. Nature and purpose of organization. Principles of organization.

Self Learning Exercise: Types of organization, Departmentation – Committees

MODULE3: **6 Hrs**

Directing and Controlling:

Meaning and nature of directing – Leadership styles and motivation theories, communication – Meaning and importance – Coordination, meaning and importance and Techniques of Coordination.

Self-LearningExercise: Meaning and steps in controlling – Essentials of a sound controlsystem**.**

MODULE4: **7 Hrs**

Entrepreneur:

Meaning of Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur – an emerging Class. Concept of Entrepreneurship – Evolution of Entrepreneurship, development of Entrepreneurship steps in entrepreneurial process, Role of entrepreneurs in Economic Development.

Self Learning Exercise: Entrepreneurship in India and Barriers.

MODULE5: **6 Hrs**

Preparation of a project:

Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities: Market Feasibility Study; Technical Feasibility Study.

Self Learning Exercise: Financial Feasibility Study & Social Feasibility Study

MODULE6: **6 Hrs**

Basics of Financial Statements: Balance sheet, The Balance Sheet Equation, Glossary of Balance sheet terms, Income statement, Glossary of Income Statement terms, Ratio and Percentages.

Self Learning Exercise: Cash flow statement.

TEXTBOOKS:

1. **Management and Entrepreneurship,** N V R Naidu, T Krishna Rao, 4th Reprint2009.
2. **Understanding Financial Statements,** James O. Gill, Moira Chatton, First IndianEdition, 2004, Reprinted2005.

REFERENCE BOOKS:

1. **Principles of Management,** P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 2nd Edition, 2008.
2. **Entrepreneurship Development - Small Business Enterprises,** Poornima MCharantimath -

E-Content:

1. https://ecorner.stanford.edu/collection/elevating-ethics-in-entrepreneurship-education/
2. https://www.**mooc**-list.com/tags/**entrepreneurship**

ADVANCED COMPUTER ARCHITECTURE (4:0:0)

Sub code	**: IS0422**	**CIE**	**: 50 Marks**
Hrs/week	**: 04**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Explainthe pipeline design and scheduling techniques.
2. Identify the challenges in different levels ofparallelism.
3. Discuss the concepts of parallel processing and hardware-based speculation.
4. Explain the performance criteria for single and multicore processors.
5. Describe Data-level parallelism in Vector Architectures.
6. Explain various cache optimization techniques.

MODULE1: 9 Hrs

FUNDAMENTALS REVIEW

PIPELINING: Introduction: Pipeline scheduling, Implementation of an Instruction pipeline.

Self Learning Exercise: Arithmetic pipelines.

MODULE2: 9 Hrs

INSTRUCTION –LEVEL PARALLELISM – 1

Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling, Tomasulo's Algorithm.

Self Learning Exercise: Tomasulo's Algorithm Examples.

MODULE3: 8 hrs

INSTRUCTION –LEVEL PARALLELISM – 2

Hardware-based speculation, Exploiting ILP using multiple issue and static scheduling; Exploiting ILP using dynamic scheduling, multiple issue and speculation.

Self Learning Exercise: Studies of the limitations of ILP.

MODULE4: 9 Hrs

THREAD –LEVEL PARALLELISM:

Introduction; Centralized Shared-Memory Architectures; Distributed shared memory and directory-based coherence; Basics of synchronization.

Self Learning Exercise: Models of Memory Consistency: An introduction

MODULE5: 9 Hrs

DATA-LEVEL PARALLELISM IN VECTOR, SIMD, AND GPU ARCHITECTURES

Introduction, Vector Architecture, SIMD Instruction Set extensions for multimedia, Graphic Processing Units.

Self Learning Exercise: NVIDIA GPU Instruction Set Architecture

MODULE6: 8 Hrs

MEMORY HIERARCHY DESIGN:

Introduction, Basics of Memory Hierarchy, Cache Optimizations- First Optimization, Second Optimization, Third Optimization, Fourth Optimization, Fifth Optimization, Sixth Optimization, Seventh Optimization, Eighth Optimization, Ninth Optimization, Tenth Optimization.

Self Learning Exercise: Case-study: Performance of the Cortex-A8 Memory Hierarchy.

TEXTBOOKS:

1. **Computer Architecture, A Quantitative Approach –**John L. Hennessey and David A. Patterson: 5th Edition, Elsevier,2011.

REFERENCE BOOKS:

1. **Advanced Computer Architecture Parallelism, Scalability Programmability**– Kai Hwang: Tata McGraw- Hill, 2003
2. **B. Parhami,Introduction to Parallel Processing: Algorithms andArchitectures,** Plenum series, KLUWER ACADEMIC PUBLISHERS, 2008

E-B OOKS:

1. ABookonComputerArchitecture,availableat http://www.iuma.ulpgc.es/users/nunez/clases-micros-para-com/clases-mpc-slides-links/Copy%20of%20(Ebook%20Pdf)%20Computer%20Architecture%20A%20Quantitative%20App.pdf
2. MOOC's:
   Carnegie Mellon Computer Architecture lecture videos in YouTube.

CRYPTOGRAPHY AND NETWORK SECURITY (3:2:0)

Sub code	**: IS0433**	**CIE**	**: 50 Marks**
Hrs/week	**: 05**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Explain the foundations of Cryptography and various mechanisms to protect data.
2. Demonstrate DES and AES. (For Tutorials also)
3. Apply the cryptographic techniques using public key algorithms. (For Tutorials also)
4. Verify the integrity of the messages transmitted via an insecure channel.
5. Distinguish the different key management techniques, authentication protocols andKerberos.
6. Explain the security aspects, protocols at various layers in the network and firewalls.

MODULE1: 7 Hrs

Introduction: Security Goals, Cryptographic Attacks, Services and mechanism, Techniques.
Traditional Symmetric-Key Ciphers: Introduction, Substitution Ciphers, Transposition Ciphers.
Self Learning Exercise: Mathematics of Cryptography.

MODULE2: 7 Hrs

Introduction to Modern Symmetric-Key Ciphers: Stream and Block Ciphers, Modern Block Ciphers.
Data Encryption Standard (DES): Introduction, DES Structure, Security of DES, Multiple DES-Conventional Encryption Algorithms
Advanced Encryption Standard (AES): Introduction, Transformations, Key expansion, The AES Ciphers, Analysis of AES.
Self Learning Exercise: Mathematics of Symmetric-Key Cryptography

MODULE3: 6 Hrs

Asymmetric-Key Cryptography: Introduction**,** RSA Cryptosystems, ElGamal Cryptosystem, Elliptic Curve Crypto systems.
Self Learning Exercise: Mathematics of Asymmetric-Key Cryptography.

MODULE4: **7 Hrs**

Message Integrity and Message Authentication

Message Integrity, Random Oracle Model, Message Authentication.

Digital Signature: Comparison, Process, Services, Attacks of Digital Signature, Digital Signature Schemes- RSA Digital Signature Scheme.

Self Learning Exercise: Variations and Applications.

MODULE5: **6 Hrs**

Entity Authentication: Introduction, Passwords, Challenge-Response.

Key Management: Symmetric-Key Distribution, Kerberos, Symmetric Key Agreement, Public-Key Distribution.

Self Learning Exercise: Biometrics, Hijacking.

MODULE6: **6 Hrs**

Security at the Application Layer: E-mail, PGP, S/MIME.

Security at the Transport Layer: SSL Architecture, SSL Message formats, Transport Layer Security.:

Security at Network Layer: Two modes, Two Security Protocols, Security Association and Policy.

System Security: Users, Trust and Trusted Systems, Malicious Programs, IDS, Firewalls.

Self Learning Exercise: Worms, Viruses.

TEXTBOOK:

1. **Cryptography and Network Security**, BehroozForouzan, SIE, 2nd Edition, McGraw-Hill

REFERENCE BOOKS:

1. Cryptography and Network Security: Principles and Practice; Fifth Edition,by William Stallings, PrenticeHall.
2. Cryptography and Network Security, Second Edition, AtulKahate.

EBOOKS:

1. http://www.uoitc.edu.iq/images/documents/informatics-institute/Competitive_exam/Cryptography_and_Network_Security.pdf

MOOCs:

1. http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html

CLOUD COMPUTING (4:0:0)

Subcode	**:IS0434**	**CIE**	**: 50Marks**
Hrs/week	**:04**	**SEE**	**: 50%Marks**
SEE Hrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Identify the open-source platforms for private clouds, service – level and Compliance – level agreements, and softwarelicensing.
2. Discuss applications of cloud
3. Describe cloud virtualization.
4. Compare different queuing and scheduling technique in cloud.
5. Discuss the security issues in cloud
6. Use different services provided by cloud application.

MODULE1: 9Hrs

Introduction: Network-centric computing and network-centric content, Peer-to-peer systems, Cloud computing – an old idea whose time has come, Cloud computing delivery models and services, Ethical issues in cloud computing, Cloud vulnerabilities, Major challenges faced by cloud computing.

Cloud Infrastructure: Cloud Computing at Amazon, Cloud Computing: The Google Perspective, *Microsoft Windows Azure* and Online Services, Open-Source Software Platforms for Private Clouds, Cloud Storage Diversity and Vendor Lock- in, Cloud Computing Interoperability: The Intercloud, Energy Use and Ecological Impact of Large-Scale Data Centers.

Self Learning Exercise: Responsibility Sharing Between User and Cloud Service Provider, User Experience, Software Licensing.

MODULE2: 8Hrs

Cloud Computing: Applications and Paradigms, Challenges for Cloud Computing, Existing Cloud Applications and New Application Opportunities, Architectural Styles for Cloud Applications, Workflows: Coordination of Multiple Activities, Coordination Based on a State Machine Model: The *ZooKeeper*, The *MapReduce* Programming Model, A Case Study: The *GrepTheWeb*Application, Clouds for Science and Engineering, High-Performance Computing on a Cloud, Cloud Computing for Biology Research.

Self Learning Exercise: Social Computing and Digital Content of Cloud Computing

MODULE3: 8Hrs

Cloud Resource Virtualization: Virtualization, Layering and Virtualization, Virtual Machine Monitors, Virtual Machines, Performance and Security Isolation, Full Virtualization and Paravirtualization, Hardware Support for Virtualization, Case Study: Xen, a VMM Based on Paravirtualization, Optimization of Network Virtualization in Xen 2.0, *vBlades*: Paravirtualization Targeting an x86-64 Itanium Processor, A Performance Comparison of Virtual Machines.

Self Learning Exercise: The Darker Side of Virtualization, Software Fault and Isolation.

MODULE4: 9 Hrs

Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two-Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds, Coordination of Specialized Autonomic Performance Managers, A Utility- Based Model for Cloud-Based Web Services, Resource Bundling: Combinatorial Auctions for Cloud Resources, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start-Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling *MapReduce* Applications Subject to Deadlines.

Self Learning Exercise: Resource Management and Dynamic Application Scaling

MODULE5: 9Hrs

Cloud Security: Cloud Security Risks, Security: The Top Concern for Cloud Users, Privacy and Privacy, Trust, Operating System Security, Virtual Machine Security, Security of Virtualization, Security Risks Posed by Shared Images, Security Risks Posed by a Management OS.

Self Learning Exercise: *Xoar:* Breaking the Monolithic Design of the TCB, A Trusted Virtual Machine Monitor

MODULE6: 9 Hrs

Cloud Application Development: *Amazon Web Services: EC2* Instances, Connecting Clients to Cloud Instances Through Firewalls, Security Rules for Application and Transport Layer Protocols in EC2, How to Launch an EC2 Linux Instance and Connect to it, How to Use S3 in Java, How to Manage SQS Services in C#, How to Install the Simple Notification Service on Ubuntu 10.04, How to Create an EC2 Placement Group and Use MPI, How to Install Hadoop on Eclipse on a Windows System, Cloud-Based Simulation of a Distributed Trust Algorithm, A Trust Management Service, A Cloud Service for Adaptive Data Streaming.

Self Learning Exercise: Cloud-Based Optimal FPGA Synthesis

TEXTBOOK:

1. **Cloud Computing: Theory and Practice,** Dan C. Marinescu, Morgan Kaufmann, 2013

REFERENCE BOOK:

1. **Cloud Computing Bible** by Barrie Sosinsky**,** WileyIndia
2. **Cloud Security** byRonald Krutz and Russell Dean Vines, Wiley-India.

E-B OOKS:

1. Book on cloud computing - https://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf

MOOC's:

1. https://www.coursera.org/learn/cloud-computing

MINOR PROJECT (0:0:4)

Subcode :IS0204 **Max. Marks:100**
Hrs/week 04

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Identify emerging areas of interest feasible to the project group.
2. Formulate a problem and perform theanalysis of the project.
3. Develop a method to solve the identified problem.

Note: A team consists of maximum four students.

FOUNDATION ELECTIVE

CLIENT-SERVER PROGRAMMING (3:0:0)

Sub code	**: IS0324**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On successful completion of the course, students will be able to:

1. Analyze the requirements of the client and server environment.
2. Explain socket programming ofclient server systems.
3. Demonstrate knowledge of current client/server system.
4. Develop client server applications.
5. Identify Algorithms and issues in server design.

MODULE1: 8 Hrs

The Client Server Model and Software Design, Concurrent Processing in Client-Server software: Introduction, Motivation, Terminology and Concepts, Introduction, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts, Anexample of Concurrent Process Creation, Executing New Code, Context Switching and Protocol SoftwareDesign,

Self Learning Exercise:Concurrency and Asynchronous I/O.

MODULE2: 8 Hrs

Program Interface to Protocols, The Socket Interface: Introduction, Loosely Spec ified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP, Introduction, Berkley Sockets, Specifying a Protocol Interface, The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program,

Self Learning Exercise: Symbolic Constants for Socket Call Parameters.

MODULE3: 9 Hrs

Algorithms and Issues in Client Software Design: Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a

Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server using UDP, Closing a Socket that usesUDP,

Self Learning Exercise:Partial Close for UDP, A Warning about UDP Unreliability.

MODULE4: 7 Hrs

Example Client Software: Introduction, The Importance of Small Examples, Hiding Details, An Example Procedure Library for Client Programs, Implementation of Connect TCP, Implementation of Connect UDP, A Procedure that Forms Connections, Using the Example Library, The DAYTIME Service, Implementation of a TCP Client for DAYTIME, Reading from a TCP Connection, The Time Service, Accessing the TIME Service, Accurate Times and Network Delays, A UDP Client for the TIME Service, The ECHO Service, A TCP Client for the ECHOService,

Self Learning Exercise:A UDP Client for the ECHO Service.

MODULE5: 7Hrs

Algorithms and Issues in Server Software Design: Introduction, The Conceptual Server Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure, Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address using INADDR_ ANY, Placing the Socket in Passive Mode, Accepting Connections and using them. An Iterative Connectionless Server Algorithm, Forming a Reply Address in a Connectionless Server, Concurrent Server Algorithms, Master and Slave Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrency using a Single Process, When to use each Server Types, The Important Problem of Server Deadlock

Self Learning Exercise: Alternative Implementations.

TEXTBOOK:

1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server Programming and Applications, PHI LEARNING PVT. LTD-NEW DELHI, 2nd Edition,2009.

REFERENCE BOOK:

1. W. Richard Stevens, "UNIX NETWORK PROGRAMMING", PHI LEARNING PVT. LTD-NEW DELHI 3RD Indian Reprint Edition,2009
2. W. Richard Stevens, "Unix Network Programming: Interprocess Communications", Volume – 2, Phi Learning Edition, 2nd Edition,2009

E-Books:

1. http://alandix.com/academic/tutorials/tcpip/TCP-IP-complete.pdf

MOOCs:

1. https://www.csd.uoc.gr/~hy556/material/tutorials/cs556-3rd-tutorial.pdf
2. http://ftp.sas.com/techsup/download/SASC/share5958-59/S5958v2.pdf

RECOMMENDER SYSTEMS (3:0:0)

Subcode	**:IS0323**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Distinguish between user-based and item-based recommendation.
2. Identify the need for content representation.
3. Analyze the knowledge representation.
4. Describe the techniques of hybrid design.
5. Evaluate the process of recommender system.

MODULE1: 8 Hrs

Introduction to basic concepts, Collaborative recommendation - User-based nearest neighbor recommendation, item-based nearest neighbor recommendation, about ratings, Further model-based and preprocessing-based approaches

Self Learning Exercise: Recent practical approaches and systems.

MODULE2: 8 Hrs

Content-based recommendation- Content representation and content similarity, Similarity-based retrieval.

Self Learning Exercise: Other text classification methods.

MODULE3: 8 Hrs

Knowledge-basedrecommendation- Introduction, Knowledge representation and reasoning, interacting with constraint-based recommenders, Interacting with case-based recommenders

Self-LearningExercise: Application examples.

MODULE4: 8 Hrs

Hybrid recommendation approaches - Opportunities for hybridization, Monolithic hybridization design

Self Learning Exercise: Parallelized hybridization design

MODULE5: 7 Hrs

Evaluating recommender systems - Introduction, General properties of evaluation research, Popular evaluation designs, Evaluation on historical datasets.

Self Learning Exercise: Alternate evaluation designs.

TEXTBOOK:

1. Recommender Systems – An Introduction, DIETMAR JANNACH, MARKUS ZANKER, ALEXANDER FELFERNIG, GERHARD FRIEDRICH, Cambridge university press, 2015

REFERENCE BOOKS:

1. Recommender Systems Handbook, Springer – 2011

2. Building Recommendation system with R - Suresh K. Gorakala, Michele Usuelli, 2015 Packet publishing

ELECTIVE – III

SYSTEM SIMULATION AND MODELING (3:0:0)

Sub code	**: IS0311**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Explain appropriate tool for simulation.
2. Discuss general principles ofsimulation.
3. Describe the Characteristics ofQueuing Systems.
4. Discuss random number and random variate generation.
5. Describe data collection and selection inputmodels.

MODULE1: 8 Hrs

Introduction to Simulation:When Simulation is the appropriate tool, When Simulation is not appropriate, Advantages and Disadvantages of Simulation, Areas of application, Systems and System Environment, Components of a System, Discrete and Continuous Systems, Model of a System, Types of Models, Discrete-Event System Simulation.

Self Learning Exercise: Simulation study.

MODULE2: 8 Hrs

Simulation Examples, General Principles and Simulation Software: Simulation of Queuing Systems, Simulation of Inventory Systems, Other Examples of Simulation. Concepts in Discrete-Event Simulation, List Processing. Selection of Simulation Software, An Example Simulation.

Self Learning Exercise: Simulation in GPSS.

MODULE3: 8 Hrs

Queuing Model: Characteristics of Queuing Systems, Queuing Notation

Self Learning Exercise: Long-Run Measures of performance of queueing Systems.

MODULE4: 8 Hrs

Random-Number Generation, Random-Variate Generation: Properties of Random Numbers, Generation of Pseudo-Random Numbers, Techniques for Generating Random Numbers, Tests for Random Numbers.Inverse-Transform Technique: Exponential,Uniform.

Self Learning Exercise: Discrete Distribution, Acceptance-Rejection Techniques.

MODULE5: 7 Hrs

Input Modeling: Data Collection, Identifying the Distribution with Data, Parameter Estimation, Goodness-of-Fit Tests, Fitting a Nonstationary Poisson Process.

Self Learning Exercise: Selecting Input Models without Data.

TEXTBOOK:

1. Discrete-Event System Simulation, Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, P. Shahabudeen, 4th Edition, Prentice Hall, 2009.

REFERENCE BOOK:

1.Simulation Modeling and Analysis, Averill M. Law, Mcgraw Higher Ed, 4th Edition, 2007.
2.System Simulation, Geoffrey Gordon, Phi Learning, 2nd Edition, 2002.

EBOOKS:

1.http://www.e-booksdirectory.com/listing.php?category=100

MOOCs:

1. http://www.nptel.ac.in/courses/103107096/
2.http://freevideolectures.com/Course/3364/Principles-of- Engineering-System-Design/27

WIRELESS COMMUNICATION AND NETWORKS (3:0:0)

Sub code	**: IS0315**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Describe advances in wireless technology and ubiquitous access to information.
2. Analyze the evolution of mobile radiocommunications.
3. Describe the basic cellular concepts.
4. Explain mobile radio propagation.
5. Discuss traffic routing in wireless networks and wireless data services.

MODULE 1: **8 Hrs**

Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communications, Mobile Radio Systems around the world, Examples of Wireless Communication Systems, Paging System, Cordless Telephone System, Cellular Telephone Systems, How a cellular call is made, Comparison of Common Wireless Communications Systems

Self Learning Exercise*:* Trends in cellular radio and personal communications.

MODULE 2: **8 Hrs**

Modern Wireless Communication Systems: Second generation (2G) Cellular Networks, Evolution of 2.5G, TDMA Standards, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL) and LMDS, Wireless Local Area Networks (WLANs).

Self Learning Exercise*:* Bluetooth and Personal Area Networks (PANS)

MODULE 3: **8 Hrs**

The Cellular Concept-System Design Fundamentals, Introduction, Frequency reuse, channel assignment strategies, handoff strategies – prioritizing handoffs, Practical Handoff considerations. Interference and system capacity, co-channel interference and system capacity, channel planning for wireless systems, adjacent channel interference.

Self Learning Exercise*:* Power control for reducing interference.

MODULE 4: **8 Hrs**

Mobile Radio Propagation: Introduction to radio wave propagation, Free space propagation model, The three basic propagation mechanisms: Reflection, reflection from Dielectrics, Brewster Angle, Diffraction, Fresnel zone geometry, knife-edge diffraction model, multiple knife-edge diffraction, Scattering.

Self Learning Exercise*:* Radar Cross Section Model

MODULE 5: 7 Hrs

Wireless Networking: Introduction to wireless networks, Differences between wireless and fixed telephone networks, PSTN, Limitations in wireless networking, Merging wireless networks and the PSTN, Development of wireless networks, first generation, second generation, third generation, Fixed network transition hierarchy, Traffic routing in wireless networks, circuit switching, packet switching, The X.25 protocol, Wireless data services

Self Learning Exercise: Common channel signaling

TEXT BOOK:

1. Wireless Communications, Principles and Practice, second edition, Theodore S Rappaport, Publisher: New Delhi: Dorling Kindersley, 2009.

REFERENCE BOOKS:

1. Mobile Communications Engineering Theory and Applications, Second Edition, William C Y Lee McGraw Hill Telecommunications 1998.
2. Wireless Communications and Networks, William Stallings Pearson Education Asia, 2005.

E-BOOKS:

1. www.coursetalk.com›MIT, Principles of Wireless Communications online course.
2. https://onlinecourses.nptel.ac.in/noc15_ec05, Principles of Modern CDMA/ MIMO/ OFDM Wireless Communications

OBJECT ORIENTED ANALYSIS ANDDESIGN (3:0:0)

Sub code	**: IS0316**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Identify the functionalities of models.
2. Compare class model, State model and interaction model.
3. Analyze common architecturalstyles.
4. Explain class modelling and legacysystems.
5. Analyze various design patterncategories**.**

MODULE1: 8 Hrs

INTRODUCTION, MODELING CONCEPTS, CLASS MODELING:

What is Object Orientation? What is OO development? OO themes, Evidence for usefulness of OO development, OO modeling history. Modeling as Design Technique: Modeling, abstraction, the three models. **Class Modeling**: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model.

Self Learning Exercise: Navigation of class models.

MODULE2: 8 Hrs

PROCESS OVERVIEW, SYSTEM CONCEPTION, DOMAIN ANALYSIS: Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model;

Self Learning Exercise: Iterating the analysis of models.

MODULE3: 8 Hrs

APPLICATION ANALYSIS, SYSTEM DESIGN:

Application Analysis: Application interaction model; Application class model; Application state model; adding operations. Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles.

Self Learning Exercise: Architecture of the ATM system.

MODULE4: 8 Hrs

CLASS DESIGN, IMPLEMENTATION MODELING, LEGACY SYSTEMS: Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing Legacy Systems: Reverse engineering; Building the class models;
Self Learning Exercise: Building the interaction model.

MODULE5: 7Hrs

DESIGN PATTERNS:
What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber. Management Patterns: Command processor; View handler. Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms.
Self Learning Exercise: Counted Pointer example.

TEXTBOOKS:

1. **Object-Oriented Modeling and Design with UML** Michael Blaha, James Rumbaugh, 2nd Edition, Pearson Education,2005

2. **Pattern-Oriented Software Architecture: A System of Patterns - Volume 1** Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal, John Wiley and Sons,2006

REFERENCE BOOKS:

1. **Object Oriented Analysis and Design with the Unified Process** Satzinger, Jackson, Burd, 2004.
2. **Object-Oriented Analysis and Design with Applications** Grady Boochetal 3rd Edition, Pearson Education,2007.

EBOOKS:

1. https://bbooks.info/b/w/7af36048f41dc97899a26893101e734a5a14fbff/object-oriented-analysis-design-and-implementation-2nd-edition.pdf

MOOCs:

1. http://nptel.ac.in/courses/106105153/

ELECTIVE – IV

PARALLEL PROGRAMMING (3:0:0)

Subcode	**:IS0317**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Discuss parallel programmingconcepts.
2. Illustrate the concepts of OpenMP using programmingstyles.
3. Implement Matrix times and Vectoroperations.
4. Discuss features of OpenMPlanguage.
5. Explain the concepts of OpenMPsynchronization.

MODULE1: 8 Hrs

Introduction: Why Parallel Computers needed, Shared-Memory Parallel Computers, Cache Memory Is Not Shared, Implications of Private Cache Memory, Programming SMPs and the Origin of OpenMP. What Are the Needs, A Brief History of Saving Time, What Is OpenMP? Creating an OpenMP Program, The Bigger Picture, Parallel Programming Models, Realization of Shared- and Distributed-MemoryModels.

Self Learning Exercise: Ways to Create Parallel Programs, A Simple Comparison.

MODULE2: 8 Hrs

Overview of OpenMP: Introduction, The Idea of OpenMP, The Feature Set, Creating Teams of Threads, Sharing Work among Threads, The OpenMP Memory Model, Thread Synchronization, Other Features to Note, OpenMP Programming Styles, Correctness Considerations.

Self Learning Exercise: Performance Considerations

MODULE3: 8 Hrs

Writing OpenMP programs: Introduction, Matrix Times Vector Operation, C Implementations of the Problem, A Sequential Implementation of the Matrix Times, Vector Operation Using OpenMP to Parallelize the Matrix Times VectorProduct.

Self Learning Exercise: Keeping Sequential and Parallel Programs as a Single Source Code.

MODULE4: 8 Hrs

OpenMP Language Features: Introduction, Terminology, Parallel Construct, Sharing the Work among Threads in an OpenMP Program , Loop Construct , The Sections Construct, The Single Construct, Workshare construct Combined Parallel Work-Sharing Constructs, Clauses to Control Parallel and Work-Sharing Constructs, Shared Clause, Private Clause, Lastprivate Clause, Firstprivate Clause, Default Clause.

Self Learning Exercise: *Nowait* Clause, Schedule Clause.

MODULE5: 7 Hrs

OpenMP synchronization: OpenMP Synchronization Constructs, Barrier Construct, Ordered Construct, Critical Construct, Atomic Construct, Locks , Master Construct , Interaction with the Execution Environment, More OpenMP Clauses, If Clause , Num threads Clause , Ordered Clause, Reduction Clause, Copyin Clause, Copyprivate Clause, Advanced OpenMP Constructs , Nested Parallelism.

Self Learning Exercise: Flush Directive, Thread-private Directive

TEXTBOOK:

1.Using OpenMP Portable Shared Memory Parallel Programming, Barbara Chapman, Gabriele Jost, Ruud van der Pas, The MIT Press Cambridge, Massachusetts, 2008.

REFERENCE BOOK:

1.OpenMP Application Program Interface version 3.0 May 2008. OpenMP architecture Review board

E-BOOKS:

1. https://apps2.mdp.ac.id/perpustakaan/ebook/Karya%20Umum/Parallel_Programming_in_OpenMP.pdf

MOOC's:

1.http://freevideolectures.com/Course/2836/An-Introduction-To-Parallel-Programming

COMPUTER FORENSICS (3:0:0)

Subcode	**:IS0319**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Identify the need for computer forensics
2. Describe the computer forensictechnology
3. Illustrate the process of datarecovery
4. Determine various aspects of collecting and preserving computerevidence
5. Analyze the authenticity of evidences and forensicidentification.

MODULE1: 8 Hrs

Computer forensics fundamentals:

Introduction: what iscomputer forensics?Use of computer forensics in law enforcement, Computer forensics assistance to human resources /employment proceedings, Computer forensics services, Benefits of professional forensics methodology, Steps taken by computer forensicsspecialists.

Self Learning Exercise:Use of computer forensic evidence and problems of computer forensic evidence.

MODULE2: 7 Hrs

Types of computer forensics technology:

Types of military computer forensic technology, Types of law enforcement, Computer forensic technology, Types of business computer forensic technology, Occurrence of cybercrime, Cyber detectives, Fighting cybercrime with risk –management techniques, Computer forensics investigative services.

Self Learning Exercise:Forensic process improvement**.**

MODULE3: 8 Hrs

Data recovery: Introduction of Data recovery, Data back-up and recovery, the role of back- up in data recovery.

Self Learning Exercise:The data-recovery solution**.**

MODULE4: **8 Hrs**

Evidence collection and data seizure:

Why collect evidence?, Collection options, Obstacles, Types of evidence, The rules of evidence, Volatile evidence, General procedure, Collection and archiving, Methods of collection, Artifacts, Collection steps, Preserving the digital crime scene, Computer evidence processing scene, Legal aspects of collecting forensicevidence.

Self Learning Exercise:Controlling contamination: The chain of custody

MODULE5: **8 Hrs**

Computer image verification and authentication:

Special needs of evidential authentication, Practical consideration, Practical implementation, Electronic document discovery: a powerful new litigation tool, Time travel.

Self Learning Exercise:Forensics identification and Analysis of technical surveillance devices.

TEXTBOOK:

1. Computer Forensics computer crime scene investigation by John R VACCA, Firewall Media, 2009 edition Reprint 2012.

REFERENCE BOOKS:

1. Guide to computer forensics and investigations by Bill Nelson, Amelia Phillips, Christopher Stuart, Cengage Learning publications, 4th edition2013.
2. ComputerForensicsbyDavid Cowen-CISSP, McGrawHillEducation, Indianedition2013.

E-BOOKS:

1. https://www.pdfdrive.com/computer-forensics-digital-investigation-with-encase-forensic-v7-e53817675.html

MOOC:

https://www.youtube.com/watch?v=HKzcQD8KbtE

SEMANTIC WEB (3:0:0)

Subcode	**:IS0326**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Apply semantic web technologies using RDF
2. Demonstrate the querying of semantic web using SPARQL
3. Organize the knowledge representation using OWL
4. Distinguish between monotonic and nonmonotonic rules in ontological representation of knowledge.
5. Describe the Semantic and Web Rules Language (SWRL)

MODULE1: 8 Hrs

Semantic Web Vision and RDF

Introduction tosemantic webtechnologies, Development of semantic web inlayered architecture, describing web resources using RDF: Data Model, Syntaxes, RDFS Semantics, RDFSchema, Axiomatic Semantics for RDFSchema.

Self Learning Exercise: A Direct Inference System for RDS and RDFS

MODULE2: 7 Hrs

Querying Semantic Web

SPARQL Infrastructure, Matching Patterns, Filters, Constructs of SPARQL, Results sets, Querying Schemas, SPARQL Update.

Self Learning Exercise:Other forms of SPARQL Queries

MODULE3: 8 Hrs

Web Ontology Language: OWL Syntax, Ontology Documents, Property Types, Property Axioms, Class Axioms, Individual Facts.

Self Learning Exercise: OWL Profiles

MODULE4: 8 Hrs

Logic and Inference Rules -I

Logic and Rules, Rules on the semantic web, Monotonic Rules examples, Syntax and Semantics of Monotonic Rules, Intersection of Logic and Rules, Rules Interchange Format.

Self Learning Exercise: Inconsistency Rules, List Rules, Datatype Rules.

MODULE5: 8 Hrs

Logic and Inference Rules -II

Semantic and Web Rules Language (SWRL), Rules in SPARQL: SPIN, Nonmonotonic Rules: Syntax, Definition of Syntax, Example of Nonmonotonic Rule: Brokered Trade, Formalization of Carlos' Requirements.

Self Learning Exercise: Rules Markup Language (RuleML)

TEXTBOOK:

1. ***A Semantic Web Primer*** 3rd Edition, Grigoris Antoniou, Paul Groth, Frank Van Harmelen and Rinke Hoekstra. MIT Press Publication. September2012.

REFERENCE BOOKS:

1. ***Semantic Web Programming***, Mike Dean, Andrew Perez-Lopez, Ryan Blace, Matthew Fisher, John Hebeler. John Wiley and Sons Publication, April2009.
2. ***OWL: Representing Information Using the Web Ontology Language,*** Lee W. Lacy. Trafford Publishing (July 6,2006).
3. ***Practical RDF Solving Problems with the Resource Description Framework,*** Shelley Powers. O'Reilly Media Publishers, Feb 2009.

E-BOOKS:

1. ***A Developer's Guide to the Semantic Web 2nd Edition***, Liyang Yu. Springer 2014.

MOOC:

1. https://www.youtube.com/watch?v=V6BR9DrmUQA

VIII SEMESTER

INFORMATION STORAGE (3:0:0)

Subcode	**:IS0304**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Distinguish between various physical and logical components of storage systems.
2. Determine efficient storage provisioning technique and RAID implementation.
3. Identify different components of FC SAN and fabric login types.
4. Explain storage networking option such as IP SAN and NAS solutions.
5. Describe business continuity strategy and solution.

MODULE1: 7 Hrs

Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure.

Data Center Environment: Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application Requirements and Disk Performance, Disk Native CommandQueuing

Self Learning Exercise: Virtualization and Cloud Computing.

MODULE2: 7 Hrs

Data Protection: RAID,RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares.

Intelligent Storage Systems: Components of an Intelligent Storage System, Storage Provisioning

Self Learning Exercise:Types of Intelligent Storage System.

MODULE3: **7 Hrs**

Fibre Channel Storage Area Networks: Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies

Self Learning Exercise: Virtualization in SAN.

MODULE4: **8 Hrs**

IP SAN and FCoE: iSCSI, FCIP, FCoE

Network-Attached Storage: General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance

Self Learning Exercise: File-Level Virtualization.

MODULE5: **10 Hrs**

Object-Based and Unified Storage: Object-Based Storage Devices, Content-Addressed Storage Unified Storage.

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions

Backup and Archive: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments, Backup Targets.

Self Learning Exercise: Data De-duplication for Backup.

TEXTBOOKS:

1. **Information Storage and Management,** 2nd Edition, John Wiley- India 2012, G. Somasundaram, Alok Shrivastava (Editors)

REFERENCE BOOKS:

1. **Storage Networks Explained,** Wiley India, 2003. Ulf Troppens, Rainer Erkensand WolfgangMuller
2. **StorageNetworks, The Complete Reference,** Tata McGraw Hill, 2003.Rebert Spalding
3. **StorageArea NetworksEssentials A Complete Guide to Understanding and Implementing SANs,** Wiley India, 2002. Richard Barker and PaulMassiglia**.**

EBOOKS:

1. http://aad.tpu.ru/practice/EMC/Information%20Storage%20and%20Management-v.2.pdf

MOOCs:

1. https://www.youtube.com/watch?v=JITUFtzGhM0

ARTIFICIAL INTELIGENCE (4:0:0)

Subcode	**:IS0442**	**CIE**	**: 50Marks**
Hrs/week	**:04**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Define the role of computer engineers in Artificial Intelligence.
2. Categorize the properties of task environment.
3. Describe various strategies in formulation of problems.
4. Compare various search techniques used inAI.
5. Determine optimal decisions in games.
6. Differentiate between mental events and mental objects.

MODULE1: 8 Hrs

Introduction, what is AI? The foundations of Artificial Intelligence. The history of artificial Intelligence, The gestation of artificial intelligence (1943–1956), Early enthusiasm, great expectations (1952–1969), A dose of reality (1966–1974), Knowledge-based systems: The key to power? (1969–1979), The return of neural networks (1986–present).

Self Learning Exercise: State of the art of AI Systems.

MODULE2: 9 Hrs

Intelligent agent, Agents and environments, types of agents, behavior of agents. The concept of rationality. The nature of environments. The structure of agents.

Self Learning Exercise: **C**omponents of agents.

MODULE3: 9 Hrs

Solving problems by searching problem solving agents, example problems, searching for solutions, uninformed search strategies, Informed (heuristic) search strategies, Heuristic functions

Self Learning Exercise: Learning heuristics from experience.

MODULE4: 9 Hrs

Beyond classical search

Local search algorithms and optimization problems – this climbing search, simulated annealing, local beam search, genetic algorithms, local search in continuous spaces, searching with nondeterministic action searching with partial observations. Online search agents and unknown environments

Self Learning Exercise: Learning in online search.

MODULE5: **8 Hrs**

Adversarial search

Games, optimal decision in games, Alpha-beta pruning, imperfect real-time decision

Self-LearningExercise: Stochastic games

MODULE6: **9 Hrs**

Knowledge representation

Ontological engineering, categories and objects, events, mental events and mental objects, reasoning system for categories.

Self Learning Exercise: Reasoning with default information.

TEXTBOOK:

1. Artificial Intelligence A Modern Approach Stuart Russell, Peter Norvig Third edition, Pearson publication, 2010

EBOOK:

1. https://courses.csail.mit.edu/6.034f/ai3/rest.pdf

MOOC's:

1. https://www.edx.org/course/artificial- intelligence- uc-berkeleyx-cs188-1x

MAJOR PROJECT (0:0:12)

Subcode :IS0602 **Max. Marks:100**
Hrs/week 12

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Identify different areas of interest, feasible for the project team.
2. Formulate the problem and perform analysis.
3. Develop the cost effective design methods to solve the identified problem
4. Compute the results obtained from the implementation
5. Validate using various test cases and demonstrate the project work inteam.
6. Prepare the report of the project work.

Note: A team consists of maximum four students.

PAPER PRESENTATION / INTERNSHIP (0:0:2)

Subcode :IS0118 **Max. Marks:100**
Hrs/week 02

***Course Outcomes:* for Paper Presentation**
On Successful completion of the course, the students will be able to:

1. Identify the emerging engineering problem..
2. Analyze the various solutions of problems in the selected area.
3. Summarize the review conducted with a publication.

***Course Outcomes:* for Internship**
On Successful completion of the course, the students will be able to:

1. Explain the problem to be analyzed in the internship
2. Apply the knowledge of the engineering to solve the problems.
3. Outline the internship work with a report.

ELECTIVE – V

COGNITIVE SCIENCE (3:0:0)

Subcode	**:IS0320**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Discuss basics of cognitivescience
2. Describe the philosophical approach towards cognitivescience
3. Distinguish the different theories of pattern recognition
4. Describe the Network Approach- Mind as aWeb
5. Explain artificial intelligence used in cognitivescience

MODULE1: 8 Hrs

Introduction: Exploring Inner Space, A BraveNew World, What Is Cognitive Science? Representation, Digital Representations, Analog Representations, The Dual-Coding Hypothesis, Propositional Representations Computation, The Tri-Level Hypothesis, The Classical and Connectionist Views of Computation, The interdisciplinary Perspective,

The Philosophical Approach, The Psychological Approach, The Cognitive Approach, The Neuroscience Approach, The Network Approach, The Evolutionary Approach, The Linguistic Approach, The Artificial Intelligence Approach, The Robotics Approach.

Self Learning Exercise: Categories of Mental Representation

MODULE2: 8 Hrs

The Philosophical Approach: Enduring Questions What Is Philosophy? The Mind-Body Problem, Flavors of Monism, Flavors of Dualism, Evaluating the Dualist Perspective, Functionalism ,Evaluatingthe Functionalist Perspective, The Free Will–DeterminismDebate

,The Issue of Determinism ,The Issue of Free Will, Evaluating the Free Will–Determinism Debate ,The Knowledge Acquisition Problem, Evaluating the Knowledge Acquistion Debate, The Mystery of Consciousness, The What-It's-Like Argument, Mind as an Emergent Property,

Self Learning Exercise*:* Overall Evaluation of the Philosophical Approach.

MODULE3: 9 Hrs

The Cognitive Approach I: History, Vision, and Attention, Evaluating the Modular Approach, Theories of Vision and Pattern Recognition, Template Matching Theory, Evaluating Template Matching Theory, Feature Detection Theory, Evaluating Feature Detection Theory, A

Computational Theory of Vision, Evaluating the Computational Theory, of Pattern Recognition, The Deutsch-Norman Memory Selection Model, Theory of Pattern Recognition
The Cognitive Approach II: Memory, Imagery, and Problem Solving
Types of Memory, Sensory Memory, Working Memory, Long-Term Memory, Memory Models, The Working Memory Model, Evaluating the Working Memory Model, Visual Imagery, Image Structures, Image Processes, The Imagery Debate, Problem Solving, The General Problem Solver Model, Evaluating the General Problem Solver Model, Some History First: The Rise of Cognitive Psychology the Cognitive Approach: Mind as an Information Processor Modularity of Mind
Self Learning Exercise: Overall Evaluation of the Cognitive Approach In Depth: Search in Working Memory.

MODULE4: 7 Hrs

Outline: The Network Approach: Mind as a Web, Evaluating the Connectionist Approach, Semantic Networks: Meaning in the Web, Characteristics of Semantic Networks, A Hierarchical Semantic Network, Evaluating the Hierarchical Model, Propositional Semantic Networks, Evaluating Semantic Networks, Overall Evaluation of the Network Approach, In Depth: NETtalk, Back Propagation and Convergent Dynamics, Artificial The Network Perspective, Principles Underlying Artificial Neural Networks, Early Conceptions of Neural Networks, Advantages, Problems and Disadvantages, Characteristics ofArtificial Neural Networks
Self Learning Exercise: Neural Network Topologies

MODULE5: 7 Hrs

Artificial Intelligence I: Definitional Perspective Introduction Historical and Philosophical Roots, The Quest for "Mechanical Life" , Philosophical Origins—Man as a Machine, Evaluating Descartes' Approach, Mechanical Computation, Defining Artificial Intelligence (AI), Evaluating the Concept of AI, Strong AI, Applied AI, Cognitive Simulation and Natural, Language Communication, AI Methodologies, The Computer as the Tool of AI research, Evaluation of the Computer as a Model of Brain Organization, Programming, Evaluation of Programming Languages, Evaluation of the Turing Test (TT) and Turing's Detractors, Battle Lines: Overall Evaluation of the AIConcept:
Self Learning Exercise*:* Summarizing the Meaning of AI in Depth: Behaviorism and Ned Block Evaluating the Block Approach.

TEXTBOOK:

1. Jay Friedenberg, Gordon Silverman, cognitive science, An Introduction to the Study of Mind, SAGE publications 2006, ISBN 1-4129-2568-1

REFERENCE BOOK:

1. 1.Philip Johnson-Liard, the computer and mind: an introduction to cognitive science, ISBN 1- 4129-2568-1, Sage publications, 2006

EBOOK:

1. http://www2.fiit.stuba.sk/~kvasnicka/CognitiveScience/Friedenberg_Cognitive%20science.pdf

MOOC's:

1. **https://www.youtube.com/watch?v=c9j1hlVQ_-E**

WIRELESS AH-HOC NETWORKS (3:0:0)

Sub code	**: IS0327**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will be able to:

1. Apply knowledge of wireless sensor networks to various applicationareas.
2. Discuss the working of routingprotocols.
3. Apply the knowledge of Multicast Routing in Ad hoc Wireless Networks.
4. Compare different Transport Layer and Security Protocols for Ad hocNetworks.
5. Describethe Energy Management issues.

MODULE1: 8 Hrs

Ad hoc Wireless 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, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with SchedulingMechanisms

Self Learning Exercise: MAC Protocols that use Directional Antennas.

MODULE2: 8 Hrs

Routing Protocols for Ad Hoc Wireless Networks:Introduction, Issues in Designing a Routing Protocol for Ad hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols: Destination Sequenced Distance-Vector Routing Protocol, Cluster-Head Gateway Switch Routing Protocol; On-Demand Routing Protocols: Dynamic Source Routing Protocol, Ad Hoc On-Demand Distance-Vector Routing Protocol, Hierarchical State Routing Protocol

Self Learning Exercise:Power-Aware Routing Protocols.

MODULE3: 8 Hrs

Multicast Routing in Ad hoc Wireless Networks: Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols: Preferred Link-Based Multicast Protocol,

Self Learning Exercise:Mesh-Based Multicast Routing Protocols: On-Demand Multicast Routing Protocol

MODULE4: 8 Hrs

Transport Layer and Security Protocols for Ad hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions: Why Does TCP Not Perform Well in Ad Hoc Wireless, TCP with Explicit Link Failure Notification, TCP-Bus, Split TCP, A Comparison of TCP Solutions for Ad Hoc Wireless Networks; Security in Ad hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks: Transport Layer Attacks, Application Layer Attacks, Other Attacks; Key Management.
Self Learning Exercise:Security-Aware AODV Protocol.

MODULE5: 7 Hrs

Quality of Service and Energy Management in Ad hoc Wireless Networks Introduction, Issues and Challenges in Providing QoS in Ad hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions: IEEE 802.11e, DBASE, Network Layer Solutions: Ticket-Based QoS Routing Protocol, Bandwidth Routing Protocol, On-Demand QoS Routing Protocol;
Self Learning Exercise:Relevant Case study.

TEXTBOOK:

1. C. Siva Ram Murthy & B. S. Manoj: Ad hoc Wireless Networks, 2nd Edition, Pearson Education, 2011

REFERENCES:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad hoc Wireless Networks, John Wiley,2007.

2. XiuzhenCheng, Xiao Hung, Ding- Zhu Du: Ad hoc Wireless Networking, Kluwer Academic Publishers,2004.

EBOOK:

1. http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w03.pdf

MOOC:

1. https://pdfs.semanticscholar.org/0e97/adc7bef883ab8a7f20ad997ebf007110c144.pdf

INFORMATION RETRIEVAL SYSTEMS (3:0:0)

Sub code	**: IS0328**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

***Course Outcomes:*:**

On Successful Completion of the Course, the students will be able to:

1. Illustrate the process of retrievinginformation.
2. Describe retrieval performance and types ofqueries.
3. Determine automatic local-global analysis, document clustering and text compression techniques.
4. Analyze different indexing and searchingalgorithms.
5. Describe the Challenges of searching theweb.

MODULE1: 8 Hrs

Introduction

Motivation, Basic concepts, The retrieval process.

Modeling: Introduction, A taxonomy of information retrieval models,A formal characterization of IR models, Classic information retrieval,Alternative set theoreticmodels, Alternative algebraic models, Alternative probabilistic models Structured text retrieval models.

Self Learning Exercise:Models for browsing.

MODULE2: 8 Hrs

Retrieval Evaluation: Introduction, Retrieval performance evaluation.

Query Languages: Introduction, keyword-based querying, Pattern matching, Structural queries

Self Learning Exercise:Hierarchical Structure,Query protocols.

MODULE3: 8 Hrs

Query Operations: Introduction, User relevance feedback, Automatic local analysis, Automatic, Global Analysis.

Text Operations: Introduction, Document preprocessing, Document clustering, Text compression.

Self Learning Exercise:Comparing Text compression Techniques

MODULE4: 7 Hrs

Indexing & Searching

Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Patternmatching.

Self Learning Exercise:Pattern matching using indices,Structural queries; Compression.

MODULE5: **8 Hrs**

User Interfaces and Visualization: Introduction, Human-Computer interaction,The informationaccess process, Starting points, Query specification, Context, Using relevance judgments.

Searching the Web: Introduction, Challenges, Characterizing the web, Search engines, Browsing,Metasearchers.

Self Learning Exercise:Searching using hyperlinks.

TEXTBOOKS:

1. Ricardo Baeza-Yates, Berthier Ribeiro-Neto: Modern Information Retrieval, Pearson.

REFERENCE BOOKS:

1. David A. Grossman, Ophir Frieder: Information Retrieval Algorithms and Heuristics, 2nd Edition, Springer, 2004.

E-BOOKS:

2. https://nlp.stanford.edu/IR-book/pdf/irbookonlinereading.pdf
3. http://www.math.unipd.it/~aiolli/corsi/0910/IR/irbookprint.pdf

MOOC:

1. https://www.youtube.com/watch?v=q0srNT_XM_Y&list=PL0ZVw5-GryEkGAQT7lX7oIHqyDPeUyOMQ

ELECTIVE – VI

INTRODUCTION TO MACHINE LEARNING (3:0:0)

Sub code	**: IS0321**	**CIE**	**: 50 Marks**
Hrs/week	**: 03**	**SEE**	**: 50% Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students will beable to:

1. Explain the basics of machine learning and its classifications.
2. Illustrate the working of algorithms onclassifications.
3. Develop the working of Support Vector Machines Decision treelearning.
4. Develop training sets for data processing.
5. Describe compressing data using Dimensionality Reduction techniques.

MODULE1: 8 Hrs

GivingComputers the Ability to Learn from Data Building intelligent machines to transform data into knowledge thethree different types of machine learning

Making predictions about the future with supervised learning Classificationfor predicting class labels Regression for predicting continuous outcomes Solving interactive problems with reinforcement learning Discovering hidden structures with unsupervised learning Finding subgroups with clustering Dimensionality reduction for data compression An introduction to the basic terminology and notations A roadmap for building machine learning systems Preprocessing – getting data into shape Training and selecting a predictive model Evaluating models and predicting unseen data instances, Using Python for machinelearning.

Self Learning Exercise:Installing Python packages.

MODULE2: 7 Hrs

Training Machine Learning Algorithms for Classification

Artificialneurons – a brief glimpse into the early history of machine learningImplementing a perceptron learning algorithm in Python Training a perceptron model on the Iris dataset Adaptive linear neurons and the convergence oflearning

Self Learning Exercise: Minimizing cost functions with gradient descent

MODULE3: 8 Hrs

A Tour of Machine Learning Classifers Using Scikit-learn

Choosing a classificationalgorithm First steps with scikit-learn Training a perceptron via scikit-learn Modeling class probabilities via logistic regression Logistic regression intuition and conditional probabilities Learning the weights of the logistic cost function Training a logistic regression model with scikit- learnTackling overfittingvia regularization Maximum margin classification with support vector machines Maximum margin intuition Dealing with the nonlinearly separable case using slack variables Alternative implementations in scikit- learn Solving nonlinear problems using a kernel SVM Using the kernel trick to findseparating hyperplanes in higher dimensional space Decision tree learningMaximizing informationgain – getting the most bang for the buck Building a decision tree Combiningweaktostrong learners via randomforests

Self Learning Exercise: **K-nearest neighbors – a lazy learning algorithm**

MODULE4: 8 Hrs

Building Good Training Sets – Data Preprocessing

Dealing with missing data Eliminating samples or features with missing values Imputing missing values Understanding the scikit-learn estimator API Handling categorical data Mapping ordinal features Encoding class labels Performing one-hot encoding on nominal features Partitioning a dataset in training and test sets Bringing features onto the same scale Selecting meaningful features Sparse solutions with L1regularization

Self Learning Exercise:

Sequential feature selection algorithms, Assessing feature importance with random forests

MODULE5: 8 Hrs

Compressing Data via Dimensionality Reduction

Unsupervised dimensionality reduction via Principal Component Analysis Total and explained variance Feature transformation Principal component analysis in scikit- learn Supervised data compression via linear discriminant analysis Computing the scatter matrices Selecting linear discriminants for the new feature subspace Projecting samples onto the new feature space LDA via scikit- learn Using kernel principal component analysis for nonlinear mappings Kernel functions and the kernel trick Implementing a kernel principal component analysis in Python Example 1 – separating half- moon shapes Example 2 – separating concentric circles Projecting new data points

Self Learning Exercise:

Kernel principal component analysis in scikit- learn

TEXTBOOKS:

1. **Sebastian Raschka, "**Python Machine Learning", Unlock deeper insights into machine learning with this vital guide to cutting-edge predictive analytics, Packt Publishing Ltd., 2015
2. AurelienGeron, **Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O'Reilly Publications, 2017**

REFERENCE BOOKS:

1. EthemAlpaydm, Introduction to Machine Learning (Adaptive Computation and machine learning) The MIT Press Cambridge, Massachusetts London, ISBN: 0-262-01211-1, 2004
2. Simon Rogers, Mark Girolami, A first course in machinelearning, Chapman, & Hall/CRC machine learning& patternrecognition,2011
3. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy, Fundamentals OfMachine Learning For Predictive Data Analytics Algorithms, Worked Examples, and Case Studies, The MIT Press,Cambridge, Massachusetts, London,England

E-books

1. alex.smola.org/drafts/thebook.pdf

MOOC's:

1. https://nptel.ac.in/courses/106/106/106106139/

WEB SECURITY (3:0:0)

Subcode	**:IS0329**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

Course Outcomes:

On Successful completion of the course, the students willbe ableto:

1. Explain the concept of Web SecurityBasics
2. Analyze the different techniques used for attacks inbrowser.
3. Analyze the risks of Downloading Machine Code with Plug-Ins.
4. Illustrate the concept of certificates and codesign.
5. Explain the basics Web Server Security and controlling access.

MODULE1: **7 Hrs**

The Web Security Landscape: Web Security in a Nutshell, The Web Security Problem, Credit Cards, Encryption, and the Web, Firewalls: Part of the Solution.

Self Learning Exercise: Risk Management

MODULE 2: **7 Hrs**

The Buggy Browser: Evolution of Risk, Browser History, Data-Driven Attacks, **Implementation Flaws:** A Litany of Bugs. Java and JavaScript: Denial-of-Service Attacks, JavaScript-Enabled Spoofing Attacks.

Self Learning Exercise: Mirror Worlds

MODULE3: **8 Hrs**

Downloading Machine Code with ActiveX and Plug-Ins: When Good Browsers Go Bad, Netscape Plug-Ins, ActiveX and Authenticode, The Risks of Downloaded Code, Is Authenticode a Solution?, Improving the Security of Downloaded Code. **Privacy:** Log Files, Cookies, Personally Identifiable Information, Anonymizers.

Self Learning Exercise: Unanticipated Disclosure

MODULE4: **8Hrs**

Certification Authorities and Server Certificates: Certificates Today, Certification Authority Certificates, Server Certificates. **Client-Side Digital Certificates**: Client Certificates, A Tour of the VeriSign Digital IDCenter. **Code Signing and Microsoft's Authenticode:** Why Code Signing?, Microsoft's Authenticode Technology. .

Self Learning Exercise: Obtaining a Software Publisher's Certificate.

MODULE5: **9 Hrs**

Web Server Security: **Host and Site Security**: Current Major Host Security Problems, Minimizing Risk by Minimizing Services, Secure Content Updating, Back-End Databases, Physical Security. **Controlling Access to Your Web Server**: Access Control Strategies, Implementing Access Controls with Blocks, A Simple User Management System. **Secure CGI/API Programming**: The Danger of Extensibility, Rules toCode By.

Self Learning Exercise: Specific Rules for Specific Programming Languages.

TEXTBOOK:

1. Web Security, Privacy &Commerce, 2nd Edition, 2nd Edition, Gene Spafford, Simson Garfinkel, O'Reilly Media, Inc. Reprint 2016.

REFERENCE BOOKS:

1. Web Application Security, A Beginner's Guide, Bryan Sullivan, Vincent Liu, McGraw Hill Education,2016
2. Restful Java Web Services Security, RenéEnríquez and Andrés Salazar C., Packet Publishing. ISBN :1783980109 9781783980109,2015.
3. The Web Application Hackers Handbook: Finding andExploiting SecurityFlaws, DafydStuttard, MarcusPinto, 2nd Edition. ISBN13: 9788126533404. ISBN10: 8126533404, 2016

EBOOKS:

1. https://www.datto.com/resource-downloads/cyberlive-ebook.pdf

MOOCs:

1. https://www.edx.org/course/web-security-fundamentals

NETWORK MANAGEMENT (3:0:0)

Subcode	**:IS0330**	**CIE**	**: 50Marks**
Hrs/week	**:03**	**SEE**	**: 50%Marks**
SEEHrs	**:03Hours**	**Max. Marks:100**	

***Course Outcomes:*:**

1. Describe the basics of network management.
2. Discuss the Network management standards, terminology, symbols and conventions.
3. Discuss the SNMP V1 network management and communicationmodels
4. Explain the concepts of RMON.
5. Explain the broadband network management.

MODULE1: 7Hrs

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

Self Learning Exercise:Current Status and Future of Network Management.

MODULE2: 8Hrs

Basic Foundations:Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros

Self Learning Exercise:Functional Model

MODULE3: 8Hrs

SNMPv1 Network Management: Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base.The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group ***Self Learning Exercise:*** SNMP Functional Model

MODULE4: 8Hrs

SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base.

Self Learning Exercise: RMON2 Conformance Specifications.

MODULE5: 8 Hrs

Broadband Network Management: Broadband Access Networks and Technologies: Broadband Access Networks, Broadband Access Technology; HFCT Technology: The Broadband LAN, TheCable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable. Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMPBased ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2,

Self Learning Exercise:ADSL Configuration Profiles.

TEXTBOOKS:

1. Mani Subramanian: Network Management- Principles and Practice, 2nd Pearson Education, 2010.

REFERENCE BOOKS:

1. J. Richard Burke: Network management Concepts and Practices s: aHands-On Approach, PHI,2008.

EBOOK:

1. https://www.usi.edu/business/aforough/Chapter%2020.pdf

MOOC:

http://nptel.ac.in/courses/106105081/37