S31LBH11	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand and analyze fundamental data structures, such as binary search trees, disjoint sets and self- adjusting lists.
- To state the significance of the different types of tree structures.
- To develop the ability to design and analyze basic algorithms and prove their correctness using the appropriate data structure.

UNIT 1 INTRODUCTION TO ALGORITHMS 12 Hrs.

Role of Algorithms in Computing - Analyzing Algorithms - Designing Algorithms - Asymptotic Notations - Summations - Formulas and Properties - Recurrences - Sorting Techniques: Heap Sort – Quick Sort - Radix Sort - Bucket Sort - Analysis of Sorting Algorithms.

Practical:

1. Implementation of Heap sort
2. Implementation of Quick sort
3. Implementation of Radix sort
4. Implementation of Bucket sort

UNIT 2 TREE STRUCTURES 12 Hrs.

Binary Search Trees- AVL Trees - Red-Black Trees - B-Trees - Splay Trees - Heap Structures: Min/Max Heaps - Leftist Heaps - Binomial Heaps - Fibonacci Heaps.

Practical:

1. Implement the following operations on Binary search tree a) Insert b) Delete c) Display.
2. Perform a Binary search for a given set of integer values.

UNIT 3 MULTIMEDIA STRUCTURES 12 Hrs.

Segment Trees - K-D Trees - Point Quad Trees - MX-Quad Trees – R Trees - TV Trees.

Practical:

1. Program to implement Segment tree.
2. Implement the Quad tree.

UNIT 4 PROBLEM SOLVING TECHNIQUES 12 Hrs.

Branch and Bound - NP Hard and NP Complete Problems - Huffman Coding - Activity Networks - Flow Shop Scheduling - Randomized Algorithms - Greedy Algorithms – Backtracking - Dynamic Programming - Divide and Conquer.

Practical:

1. To find the solution for the knapsack problem using the greedy algorithms.

UNIT 5 GRAPH ALGORITHMS 12 Hrs.

Graph Representation – BFS – DFS – Topological Sort – Connected Ccomponents – Minimum Spanning Trees - Kruskal's Algorithm - Prim's Algorithm – Dijkstra's Algorithm – Floyd's Algorithm – Bellman Ford Algorithm.

Practical:

1. To find a single source shortest path for a given graph.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Determine the time and space complexities for searching and sorting algorithms.
CO2 - Implement algorithms like binary tree, Red-Black tree and heap structures.
CO3 - Design and implement solutions to problems using Segment tree and Quad tree structures.
CO4 - Implement Greedy algorithms and divide and conquer techniques.
CO5 - Implement graph traversal algorithms..
CO6 - Apply the various algorithm design techniques and data structures to real world solve problems.

TEXT / REFERENCE BOOKS

1. Thomas H Coreman, Charles E. Leiserson, Ronald L.Rivest ,"Introduction to Algorithms" , Mc. Graw Hill , 2009.
2. Sara Baase, Allenran Gelda, "Computer Algorithms and Introduction to Design and Analysis", Pearson, 2000.
3. Sahni,"Data Structures Algorithm and Application in C++", PHI , 2000.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Addison Wesley, 3rd Edition, 2006.
5. Aho A.V., Hopcroft J.E. and Ullman J.D. ,"Design and Analysis of Computer Algorithms", 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB5101	CLOUD COMPUTING AND VIRTUALIZATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand basic concepts of cloud computing , virtualization and computer nnetworks.
- To provide the fundamental and essentials of cloud computing services.
- To explore the security threats and solutions in cloud.

UNIT 1 UNDERSTANDING CLOUD COMPUTING 9 Hrs.

History of Cloud Computing - Cloud Computing Reference Model – NIST Architectural Framework - Types of Clouds- Pros and cons of Cloud Computing –Difference between Web 2.0 and Cloud - Key Challenges in Cloud Computing - Major Cloud Players - Cloud Deployment Models - Virtualization in Cloud Computing- Types of Virtualization – Web services – Key concepts.

UNIT 2 CLOUD SERVICE MODELS 9 Hrs.

Software as a Service (SaaS) - Infrastructure as a Service (IaaS)- Platform as a Service (PaaS)- Service Oriented Architecture (SoA) - Elastic Computing – On-Demand Computing - Parallelization in Cloud Computing – Cloud Resource Management – Dynamic Resource Allocation- Optimal Allocation of Cloud Models.

UNIT 3 CLOUD DEPLOYMENT MODELS 9 Hrs.

Deployment Models: Public Cloud – Private Cloud –Hybrid Cloud – Community Cloud - Deployment of Applications on the Cloud - Hypervisor - Case Studies- Xen - Hyper V - Virtual Box - Eucalyptus - Amazon Cloud Computing - Amazon S3 - Amazon EC2- - Windows Azure – Creating Deploying Cloud Services - Working with Google Appengine - Disaster Recovery.

UNIT 4 VIRTUALIZATION 9 Hrs.

Cloud Data Centers – Energy Efficiency in Data Centre – Mobile Cloud Computing Service Models– Need for Virtualization – Types of Virtualization – Virtualization OS – VMware - KVM – System VM – Process VM - Virtual Machine Monitor – Properties – Interpretation and Binary Translation – HLL VM.

UNIT 5 CLOUD SECURITY 9 Hrs.

Cloud Security – Security Threats and Solutions in Clouds – Auditing Protocols – Dynamic Auditing – Storage Security –Privacy Preserving – Fully Homomorphic Encryption – Big Data Security- Cloud Availability- Dos Attacks – Fault Tolerance Management in Cloud Computing- Cloud Computing in India.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Differentiate between various cloud deployment models,service models and cloud providers.
CO2 - Deploy, configure,and manage virtual machines using hypervisors and virtualization software.
CO3 - Develop and deploy cloud-native applications and micro services using cloud platforms and APIs.
CO4 - Apply the concepts to design and deploy cloud-based solutions.
CO5 - Understand emerging cloud trends and technologies such as serverless computing,edge computing, and AI.
CO6 - Analyze various cloud programming models and apply them to solve problems on the cloud.

TEXT / REFERENCE BOOKS

1. Anthony T.Velte,Toby J. Velte Robert Elsenpeter , "Cloud computing a practical approach", Tata McGraw- Hill, 2017.
2. Michael Miller , Que,"Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate",Online,2008.
3. Bible , Barrie Sosinsky, "Cloud Computing",Wiley,2010.
4. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski , "Cloud Computing: Principles and Paradigms", Wiley, 2011.
5. Antonopoulos,Lee, Gillam Nikos, "Cloud Compting: Principles - Systems and Applications", Springer, 2012.
6. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing",Wiley India, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB5102	ADVANCED DATABASES SYSTEMS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain knowledge on the object orientated database concepts.
- To identify and resolve distributed database design and implementation issues
- To develop in-depth knowledge about web and intelligent databases.

UNIT 1 OBJECT ORIENTED DATABASES 9 Hrs.

Database System Concepts and Architecture: Three-Schema Architecture and Data Independence - Entity Relationship Model: Entity Types - Entity Sets - Attributes and keys - Relationships Types and Instances - ER Diagrams - Naming conventions and Design Issues - Object oriented databases – Introduction – Weakness of RDBMS – Object Oriented Concepts: Storing Objects in Relational Databases – Next Generation Database Systems – Object Oriented Data Models – OODBMS Perspectives – Persistence – Issues in OODBMS – Object Oriented Database Management System Manifesto – Advantages and Disadvantages of OODBMS.

UNIT 2 DISTRIBUTED DATABASES 9 Hrs.

Distributed DBMS Concepts and Design – Introduction – Functions and Architecture of DDBMS – Distributed Relational Database Design – Transparency in DDBMS– Distributed Transaction Management – Concurrency Control – Deadlock Management – Database Recovery – The X/Open Distributed Transaction Processing Model – Replication Servers – Distributed Query Optimization - Distribution and Replication in Oracle.

UNIT 3 WEB DATABASES 9 Hrs.

Web Technology and DBMS – Introduction – The Web – The Web as a Database Application Platform – Scripting languages – Common Gateway Interface – HTTP Cookies – Extending the Web Server – Java – Microsoft's Web Solution Platform – Oracle Internet Platform – Semi structured Data and XML – XML Related Technologies – XML Query Languages.

UNIT 4 INTELLIGENT DATABASES 9 Hrs.

Enhanced Data Models for Advanced Applications – Active Database Concepts and Triggers – Temporal Database Concepts – Deductive Databases – Knowledge Databases.

UNIT 5 CURRENT TRENDS 9 Hrs.

Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Parallel Database – Spatial Databases - Database administration – Data Warehousing and Data Mining.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe the fundamental elements of database management systems.
CO2 - Design and develop distributed databases.
CO3 - Develop database driven web applications using the acquired knowledge.
CO4 - Create data models for advanced applications.
CO5 - Implement the geographic information systems.
CO6 - Design contemporary information management systems.

TEXT / REFERENCE BOOKS

1. Thomas M. Connolly,Carolyn E. Begg, "Database Systems - A Practical Approach to Design, Implementation and Management", 6th Edition, Pearson Education, 2019.
2. Ramez Elmasri and Shamkant B.Navathe,"Fundamentals of Database Systems",4th Edition, Pearson Education,2004.
3. M.Tamer Ozsu, Patrick Ualduriel, "Principles of Distributed Database Systems" ,2nd Edition, Pearson Education, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB5103	COMPUTATIONAL INTELLIGENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain a historical perspective of AI and its foundations
- To emphasize on the practical applications of concepts, paradigms, algorithms in engineering and computer science
- To introduce the basic tools and techniques in computational intelligence such as neural networks and genetic algorithms.

UNIT 1 ARTIFICIAL NEURAL NETWORKS 9 Hrs.

The Artificial Neuron - Supervised Learning Neural Networks-Supervised Learning rules -Unsupervised Learning Neural Networks - Reinforcement Learning – Learning through Awards - Model Free Reinforcement Learning – Performance Measures - Performance Factors.

UNIT 2 EVOLUTIONARY COMPUTATION 9 Hrs.

Introduction to Evolutionary Computation - Genetic Algorithms - Genetic Programming – Basic Evolutionary Programming – Generic Evolution Strategy Algorithm – Basic Differential Evolution – Basic Cultural Algorithm - Belief Space – Convolution - Applications of various evolutionary computation techniques.

UNIT 3 SWARM INTELLIGENCE 9 Hrs.

Basic Particle Swarm Optimization – Social Network Structures - Basic Variations - Basic PSO Parameters - Ant Colony Optimization – Ant Algorithms - Simple Ant Colony Optimization Algorithm - Ant System – Ant Colony System - Max-Min Ant System - Basic Artificial Bee Colony Algorithm.

UNIT 4 ARTIFICIAL IMMUNE SYSTEMS 9 Hrs.

Natural Immune System - Learning the Antigen Structure - Artificial Immune System Algorithm - Classical View Models - Clone Selection Theory Models - Network Theory Models - Artificial Immune Network - Adapted Artificial Immune Network.

UNIT 5 FUZZY SYSTEMS 9 Hrs.

Fuzzy Sets - Fuzzy Logic and Reasoning - Fuzzy Inferencing - Fuzzy Controllers - Mamdani Fuzzy Controller - Takagi-Surgeon Controller – Introduction to Rough sets.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply neural network fundamentals to create correct and efficient computational intelligence solutions
CO2 - Design and evaluate intelligent expert models for perception and prediction from intelligent environment.
CO3 - Design solutions to various applications by applying swarm optimization.
CO4 - Understand the natural immune system.
CO5 - Create intelligent systems by exploiting the soft computing concepts.
CO6 - Explore the current scope, potential, limitations and implications of intelligent systems.

TEXT / REFERENCE BOOKS

1. Andries P Engelbrecht, "Computational Intelligence", Wiley Publications, 2nd Edition.
2. Leszek Rutkowski ,"Computational Intelligence Methods and Techniques",Springer, 2008.
3. Lakhmi C.Jain, "Computational Intelligence Paradigms Innovative Applications",Springer, 2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SISB9101	RESEARCH METHODOLOGY AND IPR	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of research.
- To provide an insight into the techniques of research.
- To learn the requisites of writing a research report.
- To impart knowledge on formulation of research problem , research methodology , ethics involved in doing research and importance of IPR protection.

UNIT 1 RESEARCH PREPARATION AND PLANNING 9 Hrs.

Objectives of research – Understanding research and its goals - Critical thinking - Techniques for generating research topics. Topic selection and justification. Techniques involved in designing a questionnaire – Methods of scientific enquiry – Formulation of hypotheses and testing of the same – Development of a research proposal.

UNIT 2 RESEARCH RESOURCES 9 Hrs.

Sources of information. Literature search. World Wide Web - Online data bases – search tools. Citation in dices – Principles underlying impact factor – Literature review – Case studies - review articles and Meta analysis – Role of the librarian. Ethical and moral issues in Research - Plagiarism - tools to avoid plagiarism.

UNIT3 ACADEMIC WRITING AND PRESENTATION 9 Hrs.

Proposal submission for funding agencies - Elements of Style. Organization of proposals - Basic knowledge of funding agencies - Research report writing - Communication skills - Tailoring the presentation to the target audience – Oral presentations - Poster preparations - Submission of research articles for Publication in Reputed journal - Thesis writing and Research report writing. Elements of excellent presentation: preparation - visual and delivery - oral communication skills and oral defense.

UNIT 4 DATA COLLECTION - ANALYSIS AND INFERENCE 9 Hrs.

Basic statistical distributions and their applications. Sample size determination and sampling techniques. Large sample tests and small sample tests.

UNIT 5 INTELLECTUAL PROPERTY RIGHTS 9 Hrs.

Nature of Intellectual Property: Patents - Designs - Trade Mark and Copyright. Process of Patenting and Development: technological research - innovation - patenting & development. Procedure for grants of patents - Patenting under PCT. Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the important basics of research and Intellectual Property Rights

CO2 - Write research problem formulations through various methods of literature survey

CO3 - Analyze research related information and Follow research ethics

CO4 - Correlate the results of any research article with other published results. Write a review article in the field of engineering

CO5 - Differentiate patents, copyrights, trademark and designs.

CO6 - Apply the process for IPR protection

TEXT / REFERENCE BOOKS

1. Cooper Donald R, Schindler Pamela S and Sharma JK , “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland,“Intellectual property: Patents,Trademarks,Copyrights,Trade Secrets”, Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
4. The Institute of Company Secretaries of India,Statutory body under an Act of parliament - “Professional Programme Intellectual Property Rights - Law and practice”, 2013.
5. James C. Van Horne,“Financial Management and Policy”, Prentice Hall.
6. James R. McGuigan,R. Charles Moyer,Frederick H.Harris,“Managerial economics, applications,strategy and Tactics”, Cengage learning, India.
7. Philip Kotler, “Marketing managemen”, Pearson Education,India.
8. Elwood S. Buffa and Rakesh Sarin, ”Modern Production / Operations Management”,Wiley, India.
9. Ronald R. Sims,“Organizational success through effective human resources Management”, Quorum books,London.
10. Ganesan R, “Research Methodology for Engineers”, MJP Publishers, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice	**30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks	**70 Marks**

SCSB5201	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	EL	Credits	Total Marks
		3	1	0	1	3	100

COURSE OBJECTIVES

- To introduce basic artificial intelligence concepts, methodologies, and applications.
- To learn about different algorithms and their applicability in real-world scenarios.
- To understand the features of machine learning to apply on real world problems.

UNIT 1 INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9 Hrs.

Introduction to AI- Intelligent Agent -Search Methods and Knowledge representation- Use cases of AI – Role of Machine Learning- Machine Learning Tools & Package.

UNIT 2 ARTIFICIAL INTELLIGENCE 9 Hrs.

Plotting for exploratory data analysis (EDA) - Linear Algebra- Probability and Statistics- Dimensionality reduction and Visualization: PCA (principal component analysis)- (t-SNE) T-distributed Stochastic Neighborhood Embedding.

UNIT 3 REAL WORLD PROBLEM 9 Hrs.

Real world problem: Predict rating given product reviews on Amazon- Classification and Regression Models: K-Nearest Neighbors- Classification algorithms in various situations- Performance measurement of models- Naive Bayes- Logistic Regression- Linear Regression- Solving Optimization Problems.

UNIT 4 MACHINE LEARNING ALGORITHMS 9 Hrs.

Support Vector Machines (SVM)- Decision Trees-Ensemble Models- Random Forest-Unsupervised Learning- K-Means Clustering – Ridge Regression.

UNIT 5 CASE STUDIES 9 Hrs.

Quora question Pair Similarity Problem- Personalized Cancer Diagnosis-Facebook Friend Recommendation using Graph Mining-Taxi demand prediction in Indian Cities-Stack overflow tag predictor- Microsoft Malware Detection.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply AI techniques to find solutions to a variety of engineering applications.
CO2 - Understand the fundamental concepts involved in developing effective AI systems.
CO3 - Interpret the various classification algorithms and its efficiency.
CO4 - Demonstrate proficiency in applying scientific method to models of machine learning..
CO5 - Investigate the issues involved in building solutions for real-world applications.
CO6 - Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

TEXT / REFERENCE BOOKS

1. Stuart Russell and peter Norvig, " Artificial Intelligence- A Modern Approach",4th Edition, Pearson Education, 2022.
2. Em Alpaydin, "Introduction to Machine Learning", MIT Press,4th Edition, 2020.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice	**30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks	**70 Marks**

S31LBH21	COMPUTER NETWORKS AND SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To understand the different types of networks, transmission methodologies and layered protocols.
- To gain knowledge on the different types of cryptographic algorithms.
- To compare and contrast technologies in networking and security designed to solve similar problems.

UNIT 1 INTRODUCTION 12 Hrs.

Data Communication - Transmission Methodologies - Data Link Layer - Multiple Access and Local Area Networks - Connecting Devices and Backbone Networks - Network Layer and Transport Layer - Application Layer.

Practical:

1. To find IP address of a machine.
2. Time and Date server.
3. Echo UDP server.

UNIT 2 MOBILE & WIRELESS NETWORKS 12 Hrs.

Wireless networking - wireless LANS and PANS - Ad-hoc Wireless Networks and Security - Wireless Sensor Networks- Cellular Mobile Wireless Networks - Evolution of Modern Mobile Wireless Communication System.

Practical:

1. Demonstration of a Peer-to-Peer network topology using Coordinator and end device network device types.
2. Topology discovery using distributed algorithms.

UNIT 3 CRYPTOGRAPHY AND NETWORK SECURITY 12 Hrs.

Introduction to the Concept of Security - Cryptographic Techniques - Computer-based Symmetric and Asymmetric Key Cryptographic Algorithms - Public Key Infrastructure (PKI) - Internet Security Protocols - Network Security- Database security - Data management Technologies - Information Security - Information Management Technologies- Security policies -Policy enforcement and related issues - Design Principles - Multilevel Relational Data Models- Security Impact on Database Function- Inference Problem Software Security Defining a Discipline.

Practical:

1. Write a program to perform encryption and decryption using the following algorithms:
   i. Ceaser Cipher
   ii. Substitution Cipher
   iii. Hill Cipher
2. Write a program to implement the DES algorithm logic.

UNIT 4 RISK MANAGEMENT FRAMEWORK 12 Hrs.

Code review with tools- Architectural risk analysis- Software penetrating testing- Risk Based security Testing - An Enterprise S/W security program - Security knowledge Intrusion detection -Defining Intrusion Detection - Security concepts - Determining strategies for Intrusion Detection - Responses - Vulnerability Analysis -Credentialed approaches - Technical issues.

Practical:

1. Study the working of Suricata for real time intrusion detection (IDS) - inline intrusion prevention (IPS) - and network security monitoring (NSM).

2. Study Moloch - the open-source full-packet capturing - indexing - and database tool aims to extend existing security infrastructure by storing and indexing network traffic.

UNIT 5 BIOMETRIC SECURITY 12 Hrs.

Biometric Fundamentals- Types of Biometrics - Fingerprints and Hand Geometry - Facial and Voice Recognition- Iris and Retina Scanning- Signature Recognition and Keystroke Dynamics - Behavioral and Esoteric Biometric Technologies - Issues Involving Biometrics – Privacy - Policy and Legal Concerns Raised by Biometrics.

Practical:

1. Face Recognition using Images
2. Fingerprint Examination

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe the foundations of communication, network and transmission along with its devices, types, topologies and protocols.
CO2 - Evaluate the different wireless networks using distributed algorithms.
CO3 - Classify the various security algorithms and implement in the various security applications.
CO4 - Identify and implement the various risk based security algorithms in real world applications.
CO5 - Design various biometric security applications.
CO6 - Create security plans and address network and computer security issues in an organization.

TEXT / REFERENCE BOOKS

1. Stallings William, ”Computer Networks and Security “, 7th Edition , Pearson,2017.
2. ManojS. Kavedia, Dr.Urmila Abjeet,”Computer Networks and Security”, 2021.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB5301	CYBER SECURITY AND PROTOCOLS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire a basic understanding of security threats, target assets and vulnerabilities.
- To classify the various protocol and cryptography signatures
- To understand the protocols being implemented in real life situation.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers - Insider threats - Cyber crimes. Network Threats: Active/ Passive – Interference – Interception –Impersonation – Worms –Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels –Backdoors – Bots – IP - Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security.

UNIT 2 SECURITY ELEMENTS 9 Hrs.

Security Elements: Authorization and Authentication - types - policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures - Firewalls - IDS - Log Files - Honey Pots

UNIT 3 BASIC PROTOCOL 9 Hrs.

Protocol Building Blocks - Communication Using Symmetric Cryptograph -One Way Hash Functions - Communication using Public Key Cryptography - digital signatures - signature with encryption - Random and Pseudo random sequence generation - Basic Protocols: key exchange - Interlock Protocol - Key Exchange with Digital Signatures - Key and Message Broadcast - Basic Protocols: Authentication using hash functions - Authentication using public key cryptography.

UNIT 4 INTERMEDIATE PROTOCOLS 9 Hrs.

Intermediate Protocols: Time stamping services - Arbitrated Protocol - Linking Protocol - subliminal channels - Elgamal Subliminal Channel - Undeniable Digital signatures: Chaum protocol - Proxy signatures - Group signatures - Bit Commitment using symmetric cryptography - Bit Commitment using hash functions - fair coin flips - coin flipping protocol using hash functions and public key cryptography - key escrow.

UNIT 5 ADVANCED PROTOCOLS 9 Hrs.

Advanced Protocols: Zero knowledge proofs - Zero knowledge proof for identity - interactive ZKP: Graph Isomorphism - Hamiltonian Cycles - Non-interactive Zero knowledge proof - blind signatures - identity based public key cryptography - Oblivious transfer - oblivious signatures - Simultaneous contact signing - Digital certified Mail - Esoteric protocols - secure elections.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explore the cyber security world, threats present and how the target can be exploited.
CO2 - Segregate the various elements of cyber security.
CO3 - Understand the various cyber security protocols.
CO4 - Interpret the various intermediate protocols.
CO5 - Comprehend the advanced protocols for security.
CO6 - Develop operational and strategic cyber security policies and strategies.

TEXT / REFERENCE BOOKS

1. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 4th Edition, 2017.
3. Joseph M Kizza , “Computer Network Security” , Springer Verlag, 2005.
4. W. Stallings,“Cryptography and Network Security: Principles and Practice”, Prentice Hall,7th Ed ., 2017.
5. B. Schneier, “Applied Cryptography: Protocols - Algorithms and Source Code in C” - John Wiley & Sons - 2nd Ed. - 2015.
6. Bernard Menezes - “Network Security and Cryptograph”,Cenege Learning, 2nd Ed., 2012.
7. Menezes, P. van Oorschot, S. Vanstone, “Handbook of Applied Cryptography”,CRC press, Hardcover Edition, 2018.
8. Dong,Ling,Chen, Kefei, “Security Analysis Based on Trusted Freshness”,1st Ed.,Springer, 2012.
9. Johannes Buchman, “Introduction to Cryptography”,2nd Ed., Springer, 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB5302	COMPUTER VISION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand image processing techniques for computer vision.
- To recognize shape and region analysis, Hough transforms and its applications to detect lines, circles, ellipses.
- To comprehend three-dimensional image analysis and motion analysis techniques.

UNIT 1 IMAGE PROCESSING FOUNDATIONS 9 Hrs.

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

UNIT 2 SHAPES AND REGIONS 9 Hrs.

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT 3 HOUGH TRANSFORM 9 Hrs.

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT 4 3D VISION AND MOTION 9 Hrs.

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT 5 APPLICATIONS 9 Hrs.

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching - tracking - and occlusion – combining views from multiple cameras – human gait analysis Application: In- vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of image processing.
CO2 - Analyse the different shapes and regions in an image.
CO3 - Apply the relevant techniques for object detection.
CO4 - Comprehend the various types of 3D projection and motion schemes.
CO5 - Develop efficient face recognition systems.
CO6 - Apply the acquired knowledge to develop solutions to real time applications.

TEXT / REFERENCE BOOKS

1. E.R. Davies, "Computer & Machine Vision" ,4th Edition, Academic Press, 2017.
2. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2022.
3. Simon J.D. Prince ,"Computer Vision: Models - Learning and Inference", Cambridge University Press , 2012.
4. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision",3rd Edition, Academic Press, 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB6301	COMPUTER VISION LAB	L	T	P	EL	Credits	Total Marks
		0	0	2	0	2	100

COURSE OBJECTIVES

- To learn the Basic image processing techniques.
- To understand the shapes and regions of images.
- To apply the different techniques in image pre-processing.
- To know the 3D vision techniques.
- To implement segmentation techniques.

LIST OF EXPERIMENTS

1. Display of gray scale images.
2. Histogram Equalization.
3. Design non-linear filtering.
4. Determination of edge detection using operators.
5. 2-D DFT and DCT.
6. Filtering in Frequency domain.
7. Display of colour images.
8. Conversion between colour spaces.
9. DWT of images.
10. Segmentation using watershed transform.

SCSB7001	ADVANCED SOFTWARE PLANNING AND MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To realise Software Project Management.
- To identify the objectives, various characters and how to apply the various techniques to plan the Project.
- To identify the evaluation and estimation techniques to apply in various project.

UNIT 1 INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT 9 Hrs.

Definition of a Software Project (SP) - SP Vs. other types of projects activities covered by SPM - categorizing SPs - project as a system - management control - requirement specification - information and control in organization - Objectives - issues - and problems relating to software projects - role of the software project manager.

UNIT 2 PROJECT PLANNING 9 Hrs.

Stepwise Project planning: Introduction - selecting a project - identifying project scope and objectives - identifying project infrastructure - analyzing project characteristics - identifying project products and activities - estimate efforts each activity - identifying activity risk - allocate resources - review/ publicize plan - forecasting demand for product - proposal writing - requirement analysis - legal issues (patent - copyright - liability - warranty) - Cost –benefit Analysis - Cash flow forecasting - plan documentation methods: PERT and CPM.

UNIT 3 PROJECT EVALUATION & ESTIMATION 9 Hrs.

Cost benefit analysis - cash flow forecasting - cost benefit evaluation techniques - risk evaluation. Selection of an appropriate project report - Albrecht function point analysis - Problem in software estimation - Size Estimation: Function Point Analysis - Mask II FPA - LOC estimation - Conversion between size measures - Effort - schedule and cost estimation: Estimation factor - COCOMO-II - Putnam Estimation Model - Estimation by Analogy - Validating Software Estimates.

UNIT 4 ACTIVITY PLANNING AND MANAGING RESOURCE ALLOCATION 9 Hrs.

Activity planning and Managing Resource Allocation: Objectives of activity planning - project schedule - projects and activities - sequencing and scheduling activities - network planning model - representation of lagged activities - adding the time dimension - backward and forward pass - identifying critical path - activity throat - shortening project - precedence networks. Introduction - the nature of resources - identifying resource requirements - scheduling resources creating critical paths - counting the cost - being specific - publishing the resource schedule - cost schedules Risk Management: Introduction - the nature of risk - managing risk - risk identification - risk analysis - reducing the risks - evaluating risks to the schedule - calculating the z values.

UNIT 5 MANAGING CONTRACTS AND PEOPLE 9 Hrs.

Introduction - types of contract - stages in contract – placement - typical terms of a contract - contract management – acceptance - managing people and organizing terms: instruction in the best methods – motivation - working in groups - becoming a team - decision making - leadership - organizational structures - Software Quality The place of software quality in project - planning - the importance of software quality - defining software quality - ISO 9126 Practical software quality measures - product versus process quality management.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe basics of Software Project Management.
CO2 - Competent to know pproject planning for various projects.
CO3 - Identify the various pproject evaluation and eestimation techniques.
CO4 - Layout the Activity Planning and Resource Allocation.
CO5 - Apply Managing people and organizing terms.
CO6 - Ability to design real life project schedule.

TEXT / REFERENCE BOOKS

1. Bob Hughes and Mike Cotterell,"Software Project Management",,3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi - 2011.
2. Tom Glib, Finzi Susannah,"Principles of Software Engineering Management",Addison Wesley, England.
3. Pankaj Jalote,"Software Project Management in Practice", Pearson Education Asia.
4. Watts S. Humphrey,"Winning with Software? An Executive Strategy",Pearson Education Asia.
5. Philip Metzger, "Managing a Programming Project", Prentice Hal, New Jersey.
6. Kishore - Swapna,"Software Requirements and Estimation",Tata McGraw Hill, 2001.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7002	ADVANCED COMPUTATIONAL COMPLEXITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To acquire the various computational and circuit complexity theory.
- To recognize how to work along with Computational goals.
- To develop Counting classes, interactive proofs and algorithms.

UNIT 1 INTRODUCTION TO COUNTING COMPLEXITY 9 Hrs.

Counting complexity – Counting classes: #P - FP - GaP - Parsimonious reductions - #P-completeness - Examples of counting problems - Permanent is #P-complete - Valiant's theorem - Quantifiers versus counting: Valiant-Vazirani Lemma - Unique SAT - randomized reductions - Toda's theorem.

UNIT 2 CIRCUIT COMPLEXITY 9 Hrs.

Circuit Complexity – Sequential versus parallel computation - Boolean circuits - basis and complete basis - Shannon's lower bound - Lupanov's upper bound - Circuit complexity classes – NC - SAC - AC and their relation to other complexity classes - Constant depth reductions - Space bounded computation – Branching programs - Bounded width branching programs and Barrington's theorem.

UNIT 3 CIRCUIT LOWER BOUNDS 9 Hrs.

Circuit lower bounds – Gate elimination technique - Formula lower bounds - Subbotovskaya and Neciporuk's lower bound - Random restrictions - Parity cannot be computed by AC0 circuits - Razborov-Smolensky polynomial approximation method and ACC lower bounds - Razborov's proof of clique lower bounds for monotone circuits.

UNIT 4 INTERACTIVE PROOFS 9 Hrs.

Interactive Proofs – Motivation and definition - AM - MA proof systems - Sum check protocol - Random self-reducibility and interactive proof for Permanent.

UNIT 5 INTRODUCTION TO HARDNESS AND RANDOMNESS 9 Hrs.

Hardness versus Randomness - Pseudorandom generators - Nisan Wigderson generator -DE randomizing BPP under worst case assumption – Impagliazzo - Kabanets theorem.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe basics of Counting Complexity theorem.
CO2 - Competent to know about Circuit Complexity theorem.
CO3 - Classify various lower bounds.
CO4 - Able to know the various proofs
CO5 - Ability to design ACC Lower Bounds.
CO6 - Recognize Hardness,Randomness and how it related .

TEXT / REFERENCE BOOKS

1. Dexter C Kozen , "Theory of Computation", (ISBN-13:978-1846282973), 2013.
2. Sanjeev Arora and Boaz Barak, "Computational Complexity: A modern approach", (ISBN-13:978-0521424264).
3. Oded Goldreich, "Computational Complexity: A Conceptual Perspective", (ISBN-13:978-0521884730).
4. Ding-Zu Du and Ker-I Ko,"Theory of Computational Complexity"(ISBN-13:978-0471345060).
5. Heribert Vollmer ,"Introduction to Circuit Complexity: A Uniform Approach",(ISBN-13:978-0324006384).
6. Stasys Jukna, "Boolean Function Complexity: Advances and Frontiers", (ISBN-13:978-3642245077).

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7003	NATURAL LANGUAGE PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To figure out the use of state automata for language processing.
- To provide the fundamentals of parsing.
- To know the features of the NLP.

UNIT 1 LINGUISTIC BACKGROUND 9 Hrs.

An outline of English Syntax – Grammars and Parsing Features and Augmented Grammars.

UNIT 2 SYNTACTIC PROCESSING 9 Hrs.

Grammars for Natural Language – Toward Efficient Parsing - Bottom-Up Parsing - Top-Down Parsing – Transition Network Grammars.

UNIT 3 FEATURES AND AUGMENTED GRAMMARS 9 Hrs.

Feature Systems and Augmented Grammars – Some Basic Feature Systems for English – Morphological Analysis and the Lexicon – Grammar using Features – Parsing with Features – Augmented Transition Networks – Generalized Feature Systems and Unification grammars.

UNIT 4 GRAMMARS FOR NATURAL LANGUAGE 9 Hrs.

Auxiliary Verbs and Verb Phrases – Movement Phenomena in Language – Handling questions in Context – Free Grammars – Relative Clauses – Hold Mechanism in ATN's.

UNIT 5 TOWARD EFFICIENT PARSING 9 Hrs.

Human Preferences - Parsing Semantic Interpretation – Semantics and Logical Form Word Senses and Ambiguity – The Basic Logical Form Language – Encoding Ambiguity – Verbs and States in Logical Form – Semantic Interpretation and Compositionality – A Simple Grammar and Lexicon with Semantic Interpretation Prepositional Phrases and Noun Phrases.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain basics of English syntax and grammers
CO2 - Comprehend syntactic processing.
CO3 - Know the augmented grammar
CO4 - Learn the application of the verbs, verb phrases and grammar system
CO5 - Gain the ability to know the semantic and logical form word senses
CO6 - Realize the usage of grammar, phrases.

TEXT / REFERENCE BOOK

1. James. Allan, " Natural Language understanding", Benjamin/Gumming Publishing Company Inc, 5th edition, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7004	INTERNET OF THINGS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concept of Internet of Things.
- To identify the various elements of an IoT System.
- To recognize the various means of communication from Node / Gateway to Cloud Platforms.

UNIT 1 INTRODUCTION TO IOT 9 Hrs.

Introduction to IoT - Current technological trends and future prospects - Evolution of IoT- Business Scope - Relation with embedded system - Basic Architecture of an IoT - From M2M to IoT - M2M towards IoT - IoT Value Chains - An emerging industrial structure for IoT.

UNIT 2 ELEMENTS OF IOT 9 Hrs.

Application Sensors and Actuators - Edge Networking (WSN) – Gateways - IoT Communication Model – WPAN and LPWA - Overview of IoT supported Hardware platforms such as: Raspberry pi - ARM Cortex Processors - Arduino and Intel Galileo boards - Wearable Development Boards.

UNIT 3 COMMUNICATION AND CONNECTIVE TECHNOLOGIES 9 Hrs.

IoT Communication Model - Cloud computing in IoT - IoT in cloud architecture - Logging on to cloud - Selecting and Creating cloud service - cloud based IoT platforms - IBM Watson - Google cloud.

UNIT 4 DATA ANALYTICS AND IOT PLATFORM 9 Hrs.

Big Data Analytics - Apache Hadoop - Using Hadoop Map Reduce for Batch Data Analysis - Apache Storm - Data Visualization - Visualization tools for IoT.

UNIT 5 HANDS-ON PROJECTS 9 Hrs.

Industry 4.0 concepts - Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino) - DIY Kits – Soil moisture monitoring - Weather monitoring - Air Quality Monitoring - Movement Detection.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe basics of IoT
CO2 - Able to know about elements of IoT.
CO3 - Realize IoT in cloud architecture, communication Models
CO4 - Design data analytics and Resource Allocation for IOT platform
CO5 - Propose a real life project.
CO6 - Become aware of security concerns and challenges while implementing IoT solutions.

TEXT / REFERENCE BOOKS

1. Oliver Hersent, David Boswarthick,Omar Elloumi , ”The Internet of Things: Applications and Protocols”, Wiley publications. .
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles, ”Architecting the Internet of Things” , Springer publications.
3. Marco Schwatrz , ”Internet of Things with Arduino Cookbook”, Packt Publications.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7005	NETWORK SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To study various cryptographic techniques to secure the network.
- To examine security issues in mathematical form.
- To learn authentication applications.

UNIT 1 SECURITY TRENDS 9 Hrs.

Attacks and services – Classical crypto systems – Different types of ciphers – LFSR sequences – Basic Number theory – Congruence's – Chinese Remainder theorem – Modular exponentiation – Fermat and Euler's theorem – Legendre and Jacobi symbols.

UNIT 2 DES AND SDES 9 Hrs.

Simplified DES – Differential cryptanalysis – DES – Modes of operation – Triple DES – AES – RC4 – RSA – Attacks.

UNIT 3 DISCRETE LOGARITHMS AND CRYPTOSYSTEMS 9 Hrs.

Discrete Logarithms – Computing discrete logs – Diffie-Hellman key exchange – ElGamal Public key cryptosystems – Hash functions – Secure Hash – Birthday attacks - MD5 – Digital signatures – RSA – ElGamal – DSA-SHAI.

UNIT 4 AUTHENTICATION APPLICATIONS 9 Hrs.

Kerberos - X.509 - PKI – Electronic Mail security – PGP - S/MIME – IP security – Web Security – SSL - TLS - SET.

UNIT 5 SYSTEM SECURITY 9 Hrs.

Intruders – Malicious software – viruses – Firewalls - Firewall Design Principles-– Security Standards – Case Study: Practical Implementation of Cryptography and Security.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe basics of Security trends
CO2 - Gain knowledge about DES, Modes of operations of DES.
CO3 - Identify the discrete logarithms, key exchange.
CO4 - Design authentication applications
CO5 - Acquire knowledge of malicious software, viruses and firewalls.
CO6 - Become aware of security concerns and challenges while implementing the security.

TEXT / REFERENCE BOOKS

1. Wade Trapp,Lawrence C Washington,"Introduction to Cryptography with coding theory", 2nd Edition, Pearson, 2007.
2. William Stallings , "Cryptography and Network Security Principles and Practices", Pearson/PHI, 4th Edition, 2006.
3. W. Mao, "Modern Cryptography, Theory and Practice", Pearson Education, 2nd Edition, 2007.
4. Bruce Schneider, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India, 1st Edition ,2003.
5. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in computing", 3rd Edition, Prentice Hall of India - 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice	**30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks	**70 Marks**

SCSB7006	BLOCKCHAIN ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To introduce Blockchain and other Design goals.
- To study the algorithms and techniques in block chain.
- To design, code, deploy and execute a Decentralized Applications.

UNIT 1 **9 Hrs.**

Blockchain Basics-Introduction to Blockchain-History: Digital Money to Distributed Ledgers-Design Primitives: Protocols - Security - Consensus - Permissions - Privacy-Blockchain Architecture and Design- Basic crypto primitives: Hash - Signature-Hash chain to Block chain-Basic consensus mechanisms-Consensus-Requirements for the consensus protocols-Proof of Work (PoW)- Scalability aspects of Blockchain consensus protocols- Permissioned Blockchains-Design goals- Consensus protocols for Permissioned Blockchains

UNIT 2 **9 Hrs.**

Hyper ledger Fabric and Blockchain Use-cases-Hyper ledger Fabric I- Decomposing the consensus process 2.2 Hyper ledger fabric components- Chain code Design and Implementation-Hyper ledger Fabric II- Beyond Chain code: fabric SDK and Front End 2.5 Hyper ledger composer tool-Use case I: Blockchain in Financial Software and Systems (FSS)-Settlements - KYC - 8 Capital markets - Insurance-Use case II: Block chain in trade/supply chain - Provenance of goods - visibility - trade/supply chain finance - invoice management/discounting - etc.

UNIT 3 **9 Hrs.**

Blockchain for Government and Blockchain Security-Use case III: Blockchain for Government-Digital identity - land records and other kinds of record keeping between -government entities - Public distribution system / social welfare systems - Blockchain Cryptography- Privacy and Security on Blockchain-

UNIT 4 **9 Hrs.**

Research Aspects and Advanced Topics-Research aspects I-Scalability of Blockchain consensus Protocols-Case Study – Various recent works on Scalability-Research aspects II-Secure cryptographic protocols on Blockchain-Case Study – Secured Multi-Party Computation. Blockchain for science: making better use of the data-mining network- Case Studies: Comparing Ecosystems - Bitcoin - Hyperledger - Ethereum and more

UNIT 5 **9 Hrs.**

Hands-on Blockchain Tools and Technologies-Development of Blockchain Application using Hyperledger Fabric-Department of Computer Science and Engineering-The LNMIIT - Jaipur-Development of Decentralized applications (DApps) in Bitcoin- Smart Contract development in Ethereum and Solidity

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Discuss the basic concepts and idea behind the Blockchain.
CO2 - Explain various terms associated with the Blockchain and cryptocurrency
CO3 - Comprehend the applicability of Blockchain in various applications
CO4 - Develop distributed application (DApps) for various domains
CO5 - Apply various technology to design and develop DApps
CO6 - Describe the Various Tools and Technologies

TEXT / REFERENCE BOOKS

1. Joseph J. Bambara, Paul R. Allen and Kedar Iyer, Michael Wuehler, Rene Madsen, Solomon Ledererm," Blockchain: A Practical Guide to Developing Business - Law - and Technology Solutions", McGraw-Hill Education, 1st edition - 2018.
2. Melanie Swan," Blockchain: Blueprint for a new economy", O'Reilly Media Inc.,1st edition,2015.
3. Bob Dill, David Smits ,"Zero to Blockchain - An IBM Redbooks course", https://www.redbooks.ibm.com/ Redbooks.nsf /RedbookAbstracts/crse0401.html.
4. Blockchain for Dummies, IBM https://www.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=XIM12354USEN.
5. Andreas Antonopoulos,"Mastering Bitcoin: Programming the Open Blockchain", 2nd Edition, 2017.
6. Narayan Prusty, "Building Blockchain Projects",PACKT Publishing Ltd - 1st edition - 2017.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7007	ETHICAL HACKING AND DIGITAL FORENSICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn various hacking techniques and attacks.
- To know how to protect data assets against attacks from the Internet.
- To enable students to understand issues associated with the nature of forensics.

UNIT 1 HACKING WINDOWS 9 Hrs.

Hacking windows – Network hacking – Web hacking – Password hacking - A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

UNIT 2 TCP/IP AND FIREWALLS 9 Hrs.

TCP / IP – Checksums – IP Spoofing port scanning - DNS Spoofing. Dos attacks – SYN attacks - Smurf attacks - UDP flooding - DDOS – Models. Firewalls – Packet filter firewalls - Packet Inspection firewalls – Application Proxy Firewalls - Batch File Programming.

UNIT 3 COMPUTER FRAUD 9 Hrs.

Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.

UNIT 4 ARCHITECTURE STRATEGIES 9 Hrs.

Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS - HIDS – Penetrating testing process – Web Services – Reducing transaction risks.

UNIT 5 FRAUD SELECTION AND DETECTION 9 Hrs.

Key Fraud Indicator selection process - customized taxonomies – Key fraud signature selection process – Accounting Forensics – Computer Forensics – Journaling and it requirements – Standardized logging criteria – Journal risk and control matrix – Neural networks – Misuse detection and Novelty detection.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the various hacking windows
CO2 - Experience the TCP/IP, Spooling, DOS attacks
CO3 - Identify the fundamentals of computer fraud, threats concepts
CO4 - Recognize to know architecture strategies for computer protection
CO5 - Apply to the key for fraud indicator selection process
CO6 - Implement the prevention techniques against the computer fraud.

TEXT / REFERENCE BOOKS

1. Kenneth C.Brancik, “Insider Computer Fraud”, Auerbach Publications Taylor & Francis, Group 2008.
2. Ankit Fadia, “Ethical Hacking”, 2nd Edition Macmillan India Ltd, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7008	ADVANCED MOBILE COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To know the introduction about Mobile Computing
- To comprehend the Mobile Agent, Fault Tolerance
- To recognize the applications of Mobile Agent

UNIT 1 INTRODUCTION TO MOBILE COMPUTING **9 Hrs.**

Introduction to Mobile Computing – Mobile Technology and Generation – characteristics of GSM and CMDA- Service architecture of GSM and Mobile Computing - characteristics - applications and Security issues of Mobile Computing- Middleware and Gateway of Mobile Computing- Mobile IP and Mobile Communication protocols.

UNIT 2 INTRODUCTION TO ANDROID **9 Hrs.**

Introduction to Android- Analyze opensource Technology - Mobile Technology- Framework - SDK - Emulation- Android Application Structure- Android Activities Life Cycle and UI Layout.

UNIT 3 DATA MANAGEMENT ISSUES **9 Hrs.**

Data management issues - data replication for mobile computers - adaptive clustering for mobile wireless networks - File system - Disconnected operations.

UNIT 4 MOBILE AGENTS COMPUTING **9 Hrs.**

Mobile Agents computing - security and fault tolerance - transaction - processing in mobile computing environment.

UNIT 5 APPLICATIONS **9 Hrs.**

Toast - Menu - Dialog - List and Adapters .

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the Mobile Computing concepts.
CO2 - Demonstrate Android activities life cycle
CO3 - Recognize the Data Management issues in the mobile.
CO4 - Describe about the security and fault tolerance of mobile computing environments.
CO5 - Grasp about the various operations on working with menu, list and various adapters.
CO6 - Implement the various techniques of mobile computing in applications.

TEXT / REFERENCE BOOKS

1. Mike McGranth ,"Building Android Apps in Easy Steps", McGraw -Hill Publications.
2. Mark L Murphy ,"Beginning Android", Wiley India Pvt. Ltd.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7009	CYBER DIGITAL TWINS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To know the introduction about cyber digital
- To perceive the how to manage the risk of the digital twin.
- To recognize the applications where the digital twin is implemented.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction- Cyber Digital twin-definition-uses and benefits-need for digital twin-working principle Technology Digital thread-digital shadow-building blocks of digital twin-digital twin technology drivers and enablers.

UNIT 2 TYPES OF DIGITAL TWIN 9 Hrs.

Types of digital Twin-Based on Product and Process-Based on Functionality-Based on Maturity. Development Considerations-Overview of Data-Modeling Environment. Modelling-model and data Management-Managing data-implementing the model- Cloud and IOT technologies.

UNIT 3 CYBER RANGE Vs DIGITAL TWIN 9 Hrs.

Cyber range vs digital twin-human behavior modeling in digital twin-optimization using digital twin-digital twin and cyber Security-Techniques. Technologies-Industrial IOT and Digital Twin-simulation and digital Twin-Machine learning and digital twin-virtual reality and digital twin-cloud technology and digital twin.

UNIT 4 RISK ASSESSMENT 9 Hrs.

Digital twin and Risk Assessment-Digital twin reference Model-Implementation-Development of risk assessment Plan-Development of communication and control System-Development of digital twin Tools-Integration-platform Validation-Difficulties-Practical implications.

UNIT 5 APPLICATIONS 9 Hrs.

Applications: Digital Twin in Manufacturing-Digital Twin in Automotive-Digital Twin in Healthcare-Digital Twin in Utilities-Digital Twin in Construction.

Max. 45 Hrs

COURSE OUTCOME

On completion of the course, student will be able to

CO1 - Comprehend the basic principles of the cyber digital twin.
CO2 - Classify the different types of digital twins.
CO3 - Recognize the Cyber Range and the digital Twin
CO4 - Get to know how to manage the risk of the digital twin
CO5 - Identify Digital Twin applications in Manufacturing, Automotive and Healthcare
CO6 - Implement the cyber digital twin technology

TEXT / REFERENCE BOOKS

1. Michael E. AuerKalyan Ram B.Digital ,“Cyber-physical System and Digital Twins”, Part of the Lecture Notes in Networks and Systems book series.
2. Nassim Khaed, Bibin Pattel and Affan Siddiqui, “Development and Deployment on the Cloud”, Elsevier 2020.
3. Clint Bodungen,Bryan Singer,Aaron Shbeeb,Kyle Wilhoit, and Stephen Hilt, “Hacking Exposed Industrial Control Systems: ICS and SCADA Security Secrets & Solutions”, ISBN: 978-1259589713.
4. Eric D. Knapp and Raj Samani,”Applied Cyber Security and the Smart Grid: Implementing Security Controls into the Modern Power Infrastructure”, The Art of Invisibility , Kevin Mitnick - 2017.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7010	KNOWLEDGE ENGINEERING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn about knowledge representation schemes and reasoning.
- To have a thorough understanding of action planning and its representation.
- To gain skill in designing agents for the real world problems.

UNIT I INTRODUCTION 9 Hrs.

Key concepts – Why knowledge Representation and Reasoning – Language of first order Logic – Syntax - Semantics Pragmatics – Expressing Knowledge – Levels of Representation – Knowledge Acquisition and Sharing – Sharing Ontologies – Language Ontologies –Language Patterns – Tools for Knowledge Acquisition

UNIT 2 RESOLUTION AND REASONING 9 Hrs.

Proportional Case – Handling Variables and Qualifies – Dealing with Intractability – Reasoning with Horn Clauses - Procedural Control of Reasoning – Rules in Production – Description Logic - Vivid Knowledge – Beyond Vivid.

UNIT 3 REPRESENTATION 9 Hrs.

Object Oriented Representations – Frame Formalism – Structured Descriptions – Meaning and Entailment - Taxonomies and Classification – Inheritance – Networks –Strategies for Defensible Inheritance – Formal Account of Inheritance Networks.

UNIT 4 DEFAULTS - UNCERTAINTY AND EXPRESSIVENESS 9 Hrs.

Defaults – Introduction – Closed World Reasoning – Circumscription – Default Logic Limitations of Logic – Fuzzy Logic – Nonmonotonic Logic – Theories and World – Semiotics – Auto epistemic Logic - Vagueness – Uncertainty and Degrees of Belief – Noncategorical Reasoning – Objective and Subjective Probability.

UNIT 5 ACTIONS AND PLANNING 9 Hrs.

Explanation and Diagnosis – Purpose – Syntax - Semantics of Context – First Order Reasoning – Modal Reasoning in Context – Encapsulating Objects in Context – Agents – Actions – Situational Calculus – Frame Problem – Complex Actions – Planning – Strips – Planning as Reasoning – Hierarchical and Conditional Planning.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Describe basics of key concepts syntax and grammar
CO2 - Learn about variables and qualifies and rules in production
CO3 - Distinguish the representations of frame,structure
CO4 - Classify the various logic in the knowledge engineering
CO5 - Gain the ability to know the semantic and logical form word senses
CO6 - Comprehend the concept of grammar, phrases.

TEXT / REFERENCE BOOKS

1. Ronald Brachman, Hector Levesque,"Knowledge Representation and Reasoning",The Morgan Kaufmann Series in Artificial Intelligence,2004.
2. John F. Sowa," Knowledge Representation: Logical - Philosophical - and Computational Foundations", 2000.
3. Arthur B. Markman, "Knowledge Representation",Lawrence Erlbaum Associates,1998.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB70011	BIO-INSPIRED COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Learn bio-inspired theorem and algorithms
- To Comprehend random walk and simulated annealing
- To Examine swarm optimization and ant colony for feature selection

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to algorithm - Newton ' s method - optimization algorithm - No-Free-Lunch Theorems - Nature-Inspired Metaheuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control.

UNIT 2 RANDOM WALK AND ANEALING 9 Hrs.

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

UNIT 3 GENETIC ALOGORITHMS AND DIFFERENTIAL EVOLUTION 9 Hrs.

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA variants - schema theorem - convergence analysis - introduction to differential evolution - variants - choice of parameters - convergence analysis - implementation.

UNIT 4 SWARM OPTIMIZATION AND FIREFLY ALGORITHM 9 Hrs.

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - variants- Ant colony optimization toward feature selection.

UNIT 5 APPLICATION IN IMAGE PROCESSING 9 Hrs.

Bio-Inspired Computation and its Applications in Image Processing: An Overview - Fine- Tuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization - Fine-Tuning Deep Belief Networks using Cuckoo Search - Improved Weighted Threshold Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model - Mobile Object Tracking Using Cuckoo Search.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Implement bio-inspired algorithms in applications.
CO2 - Explain random walk and simulated annealing.
CO3 - Apply genetic algorithms bio related real time applications.
CO4 - Describe swarm intelligence and ant colony for feature selection.
CO5 - Apply bio-inspired techniques in image processing.
CO6 - Identify and implement the techniques in bio related image processing applications.

TEXT / REFERENCE BOOKS

1. Eiben, A.E.,Smith.James E, "Introduction to Evolutionary Computing", Springer 2015.
2. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013.
3. Xin-She Yang, Jaao Paulo papa,"Bio-Inspired Computing and Applications in Image Processing" , Elsevier 2016
4. Xin-She Yang , "Nature Ispired Optimization Algorithm", Elsevier,1st Edition,2014
5. Yang, Cui, XIao Gandomi, Karamanoglu, "Swarm Intelligence and Bio-Inspired Computing" - Elsevier ,1st Edition 2013.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7012	SERVICE ORIENTED ARCHITECTURE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend the various architectures for application development.
- To realize the importance of SOA in application integration.
- To learn underlying the service design

UNIT I SOA INTRODUCTION 9 Hrs.

Software Architecture – Web Services - Service-Oriented Architectures - Cloud Computing - Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.

UNIT 2 ANALYSIS AND DESIGN 9 Hrs.

Service-oriented Analysis and Design – Design of Activity - Data - Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario– Business case for SOA – stakeholder objectives - benefits of SPA – Cost Savings.

UNIT 3 SOA TECHNOLOGIES 9 Hrs.

SOA implementation and Governance – Strategy – SOA development – SOA governance –Trends in SOA – Event-driven architecture – Software as a service – SOA technologies – Proof-of-concept – Process orchestration – SOA best practices - Oracle SOA - cloud integration - SOA governance - API management.

UNIT 4 WEB SERVICE FRAMEWORK 9 Hrs.

Meta data management – XML security – XML signature – XML Encryption – SAML – XACML – XKMS – WS- Security – Security in web service framework - Advanced messaging.

UNIT 5 TRANSACTION PROCESSING 9 Hrs.

Transaction processing – Paradigm – Protocols and co-ordination – Transaction specifications – SOA in mobile – Research issues – Oracle SOA event processing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify and learn the various service oriented architectures.
CO2 - Design the data, client, activity and process of SOA.
CO3 - Recognize the SOA technologies
CO4 - Learn how to manage Security in XML related applications.
CO5 - Recognize about protocol to apply in the existing services to add value to them.
CO6 - Implement the SOA in mobile.

TEXT / REFERENCE BOOKS

1. Shankar Kambhampaly, "Service –Oriented Architecture for Enterprise Applications", Wiley India Pvt Ltd - 2008.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services" , Pearson Education.
3. Mark O' Neill, et al., "Web Services Security" , Tata McGraw Hill.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7013	WEB ENGINEERING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the characteristics and requirements to create the electronic documents
- To classify the various architecures, design and testing process in web applications
- To be familiar with the testing techniques for web applications

UNIT 1 INTRODUCTION TO WEB ENGINEERING AND REQUIREMENTS ENGINEERING 9 Hrs.

Motivation - Categories of Web Applications - Characteristics of Web Applications - Product-related Characteristics - Usage related Characteristics - Development-related Characteristic - Evolution of web engineering - Requirements Engineering Activities RE Specifics in Web Engineering - Principles for RE of Web Applications - Adapting RE Methods to Web Application Development - Requirement Types - Notations - Tools.

UNIT 2 WEB APPLICATION ARCHITECTURES & MODELLING WEB APPLICATIONS 9 Hrs.

Introduction- Categorizing Architectures - Specifics of Web Application Architectures - Components of a Generic Web Application Architecture - Layered Architectures - Data-aspect Architectures - Database-centric Architectures - Architectures for Web Document Management - Architectures for Multimedia Data Modeling Specifics in Web Engineering - Levels - Aspects - Phases Customization - Modeling Requirements - Hypertext Modeling - Hypertext Structure Modeling Concepts - Access Modeling Concepts - Relation to Content Modeling - Presentation Modeling - Relation to Hypertext Modeling - Customization Modeling - Relation to Content - Hypertext - and Presentation Modeling

UNIT 3 WEB APPLICATION DESIGN 9 Hrs.

Design for Web Apps- Goals-Design Process-Interactive Design- Principles and Guidelines- Workflow-Preliminaries-Design Steps- Usability- Issues- Information Design- Information Architecture- structuring-Accessing Information-Navigation Design- Functional Design-Web app Functionality- Design Process-Functional Architecture- Detailed Functional Design.

UNIT 4 TESTING WEB APPLICATIONS 9 Hrs.

Introduction - Fundamentals - Terminology - Quality Characteristics - Test Objectives - Test Levels - Role of the Tester - Test Specifics in Web Engineering - Test Approaches - Conventional Approaches - Agile Approaches - Test Scheme - Three Test Dimensions - Applying the Scheme to Web Applications - Test Methods and Techniques - Link Testing - Browser Testing - Usability Testing - Load - Stress - and Continuous Testing - Testing Security - Test-driven Development - Test Automation - Benefits and Drawbacks of Automated Test - Test Tools.

UNIT 5 WEB PROJECT MANAGEMENT 9 Hrs.

Understanding Scope - Refining Framework Activities - building a Web Team - Managing Risk - developing a Schedule - Managing Quality - Managing Change - Tracking the Project. Introduction to node JS - web sockets.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply the characteristics of web applications.
CO2 - Classify and implement the various architectures in applications.
CO3 - Design and implement the web applications for various environment.
CO4 - Describe the various testing methods.
CO5 - Comprehend the Scope, refining framework activities and quality of the web project management
CO6 - Implement the various techniques in real time applications.

TEXT / REFERENCE BOOKS

1. Gerti Kappel, Birgit P roll, "Web Engineering", John Wiley and Sons Ltd - .
2. Roger S. Pressman, David Lowe, "Web Engineering", Tata McGraw Hill Publication - 2007.
3. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning, 2008.
4. Chris Bates, "Web Programming: Building Internet Applications", 3rd Edition, Wiley India Edition - 2007.
5. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dream tech, 2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7014	SOFTWARE PROJECT MANAGEMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the requirement collection process for developing software.
- To learn the leadership qualities to manage people in an organization.
- To recognize the risk management for successful project completion.

UNIT I BASIC CONCEPTS 9 Hrs.

Project Definition – Contract Management – Activities covered by Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT 2 PROJECT EVALUATION 9 Hrs.

Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT 3 ACTIVITY PLANNING 9 Hrs.

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature of Risk – Types of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning and Control.

UNIT 4 MONITORING AND CONTROL 9 Hrs.

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back to Target – Change Control – Managing Contracts – Introduction – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.

UNIT 5 MANAGING PEOPLE AND ORGANIZING TEAMS 9 Hrs.

Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person for The Job – Instruction in The Best Methods – Motivation – The Oldham – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend basic concepts of software project management
CO2 - Distinguish how to evaluate the software project.
CO3 - Apply the activity planning techniques in software projects.
CO4 - Acquire to know how to monitoring and control the projects.
CO5 - Gain skills to manage the people who working in the projects
CO6 - Learn about overall planning, designing and control the projects.

TEXT / REFERENCE BOOKS

1. Bob Hughes, Mike Cotterell, “Software Project Management”, 3rd Edition,Tata McGraw Hill, 2004.
2. Ramesh,Gopalaswamy,"Managing Global Projects",Tata McGraw Hill, 2001.
3. Royce, “Software Project Management”,Pearson Education,1999.
4. Jalote,“Software Project Management in Practice”,Pearson Education,2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7015	DATA COMPRESSION AND TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the compression techniques and modeling of the compression.
- To expose the coding techniques in compression.
- To .classify the various compression techniques in different applications.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction- Types of Compression- Compression Techniques- Lossless Compression- Lossy Compression – Measures of Performance- Modeling and coding- Models: Physical models - Probability models - Markov models - composite source model - Coding: uniquely decodable codes - Prefix codes.

UNIT 2 HUFFMAN CODING 9 Hrs.

Minimum variance Huffman code- Extended Huffman code- Adaptive Huffman code -Encoding procedure- Decoding procedure- Golomb codes- Rice codes- Tunstall codes- Applications of Huffman Coding-Loss less image compression- Text Compression- Audio Compression.

UNIT 3 CODING 9 Hrs.

Coding a sequence - generating a binary code - Comparison of Binary and Huffman coding - Dictionary Techniques Static Dictionary Diagram Coding Adaptive Dictionary The LZ77 Approach The LZ78 Approach Applications File Compression —UNIX compress Image Compression—The Graphics Interchange Format (GIF) Image Compression—Portable Network Graphics (PNG).

UNIT 4 PREDICTIVE CODING 9 Hrs.

Predictive Coding: Prediction with Partial match (ppm): The basic algorithm - The ESCAPE SYMBOL - Length of context - The Exclusion Principle - The Burrows -Wheeler Transform: Move -to -front coding Lossless Image Compression CALIC - JPEG-LS - Multi-resolution Approaches Facsimile Encoding Dynamic Markoy Compression.

UNIT 5 VECTOR QUANTIZATION 9 Hrs.

What is vector Quantization-Advantages of Vector Quantization over Scalar Quantization -The Linde - Buzo -Gray Algorithm - Initializing the LBG Algorithm- The Empty Cell Problem -Use of LBG for Image Compression- Tree-Structured Vector Quantizers - Design of Tree-Structured Vector Quantizers- Pruned Tree-Structured Vector Quantizers -Structured Vector Quantizers -Pyramid Vector Quantization- Polar and Spherical Vector Quantizers- Lattice Vector Quantizers.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend basic foundations of data compression and factual knowledge about existing compression standards.
CO2 - Analyze coding and compression techniques.
CO3 - Differentiate modeling and coding aspect of compression.
CO4 - Explore knowledge in text compression, modern communications, and image compression.
CO5 - Identify and implement lossy compression through various quantization techniques.
CO6 - Comprehend the advantages of Vector Quantization

TEXT / REFERENCE BOOKS

1. Mark Nelson,"The Data Compression",Jean Loup Gaily.
2. David Saloman ,"Data Compression: The Complete Reference",Springer.
3. Khalid Sayood ,"Introduction to Data Compression"",Morgan Kaufmann Publishers.
4. Christopher D.Manning, Prabhakar Raghavan, Hinrich Schütze, "An Introduction to Information Retrieval", Cambridge University Press, Cambridge, England.
5. Robert Korfhage,"Information storage and retrieval", WILEY

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7016	WIRELESS SENSOR NETWORKS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide awareness about challenges in wireless sensor networks.
- To acquire knowledge of various networking sensors.
- To discuss sensor network platforms and tools.

UNIT 1 NETWORK ARCHITECTURE 9 Hrs.

Concept of sensor network – Introduction - Applications - Sensors. Single Node Architecture: Hardware and software component of a sensor Node-Tiny OS operating System-C language. Wireless Sensor Network architecture: Typical network Architectures-Data relaying strategies Aggregation-Role of energy in routing decisions.

UNIT 2 MAC LAYER 9 Hrs.

MAC Layer Strategies: MAC Layer Protocols-Scheduling Sleep Cycles-Energy Management-Contention Based Protocols- Schedule Based Protocols - 802.15.4 Standard. Naming and Addressing: Addressing Services - Publish-Subscribe Topologies. Clock Synchronization: Clustering for Synchronization-Sender-Receiver-Receiver Synchronization-Error Analysis. Power Management – Per Node -System-Wide-Sentry Services-Sensing Coverage.

UNIT 3 NODE LOCALIZATION AND DATA GATHERING 9 Hrs.

Node Localization: Absolute and Relative Localization-Triangulation-Multi-Hop Localization and Error Analysis-Anchoring - Geographic Localization-Target Tracking - Localization and Identity Management-Walking GPS-Range Free Solutions. Data Gathering - Tree Construction Algorithms and Analysis - Asymptotic Capacity- Lifetime Optimization Formulations- Storage and Retrieval. Deployment & Configuration - Sensor deployment - scheduling and coverage Issues-Self configuration and topology control.

UNIT 4 ROUTING AND DISTRIBUTED COMPUTATION 9 Hrs.

Routing: Agent-Based Routing -Random Walk-Trace Routing Data Centric-Hierarchical - Location-Based – Energy Efficient Routing Querying-Data Collection and Processing-Collaborative Information Processing and Group Connectivity.

UNIT 5 SENSOR NETWORK TOOLS 9 Hrs.

Sensor Network Platforms and Tools: Sensor node hardware- Programming Challenges-Node level software Platform-Node level Simulators-Programming beyond individual Nodes-Security-Privacy Issues-Attacks and counter measures.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the basic architecture of the networks
CO2 - Identify the various strategies of Mac Layer.
CO3 - Comprehend the node localization,GPS range and data gathering.
CO4 - Grasp the routing and distributed computation.
CO5 - Explore the Sensor network tools.
CO6 - Apply the tools of networks in different attacks.

TEXT / REFERENCE BOOKS

1. Feng Zhao and Leonidas J Guibas, "Wireless Sensor Networks", Morgan Kaufmann Publishers , Elsevier - 2004.
2. Raghavendra C.S.,Krishna M.Sivalingam, Taieb F.Znati, "Wireless Sensor Networks", 2nd edition, Springer, 2004.
3. Holger Karl,Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley and Sons, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7017	ADVANCED COMPUTATIONAL GAME THEORY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide background in the area of computational game theory.
- To figure out the basic concepts of the computational theory.
- To experience the mixed strategies of computational theory.

UNIT 1 PREFERENCES - UTILITY - AND GOALS 9 Hrs.

Preference relations and their interpretation - utility as a numeric model of preference - Decision-making under uncertainty: preferences over lotteries; von Neumann and Morgenstern utility functions; expected utility and expected utility maximization- Paradoxes of expected utility maximization; framing effects and prospect theory- Compact representations for preference relations (e.g. - CP-NETS)-Dichotomous preferences and goals. Representations for specifying goals (e.g. - weighted formula representations for combinatorial domains); expressiveness and computational issues.

UNIT 2 THE BASIC MODEL SOLUTION CONCEPTS 9 Hrs.

Pure strategy Nash equilibrium; dominant strategies - notable coordination games and focal points; complexity of pure strategy Nash equilibrium. Measuring social welfare utilitarian social welfare; egalitarian social welfare. Mixed strategies; Nash's theorem -Nash equilibrium. Computing mixed strategy Nash equilibria: The Lemke-Howson algorithm. Zero sum games the Minimax Theorem. Compact representations for strategic form games Boolean games congestion games.

UNIT 3 MIXED STRATEGIES 9 Hrs.

Nash's theorem and Nash equilibrium - Computing mixed strategy Nash equilibria - Lemke-Howson algorithm - Zero sum games - Minimax Theorem - Compact representations for strategic form games - Boolean games - congestion games - Iterated Games. Finitely repeated games and backward induction - infinitely repeated games - measuring utility over infinite plays modelling strategies as finite state machines with output (Moore machines).

UNIT 4 EXTENSIVE FORM NON-COOPERATIVE GAMES 9 Hrs.

Zermelo's algorithm and backward induction - subgame perfect equilibrium - Zermelo's theorem - Compact representations for extensive form games - PEEK games and EXPTIME-completeness results - the Game Description Language (GDL) - Imperfect information games - PEEK games with incomplete information - Cooperative Games.

UNIT 5 SOCIAL CHOICE 9 Hrs.

Social choice and social welfare functions- Condorcet's paradox- desirable properties of social choice procedures (Pareto condition - independence of irrelevant alternatives)- popular voting procedures (Borda - etc)- Arrow's theorem- strategic manipulation of voting procedures and associated impossibility results (Gibbard-Satterthwaite theorem)-complexity of manipulation for voting protocols.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply the fundamentals like Nash equilibrium, dominant strategies in the applications.
CO2 - Basic understanding of the Co-operative games and iterated games.
CO3 - Comprehension of non-co-operative games, Zermelo's algorithm and their applications.
CO4 - Able to know the social welfare functions and voting protocols.
CO5 - Gain the ability to implement mixed strategies in the games.
CO6 - Apply in the Social Activities.

TEXT / REFERENCE BOOKS

1. G. Chalkiadakis, E. Elkind, and M Wooldridge, "Computational Aspects of Cooperative Game Theory", Morgan,Claypool,2011.
2. Machler, E. Solan, S. Zamir, "Game Theory", Cambridge U.P., 2013.
3. M. J. Osborne - An Introduction to Game Theory - Oxford U.P. - 2004.
4. R. D. Luce and H. Raiffa,"Games and Decisions", Wiley,1958
5. M. Machler,E. Solan,S. Zamir,"Game Theory",Cambridge U.P., 2013 (Excellent contemporary text on game theory that combines rigour with readibility).
6. M. J. Osborne and A. Rubinstein," A Course in Game Theory", 1994 (Mathematically rigorous text. Available online: https://books.osborne.economics.utoronto.ca/)
7. M. J. Osborne," An Introduction to Game Theory", Oxford U.P.,2004 (A somewhat lighter companion to Osborne and Rubinstein's 'A Course in Game Theory').

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7018	DATA MINING AND WAREHOUSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand Data mining principles and techniques and introduce Data Mining as a cutting edge business intelligence.
- To expose the students to the concepts of Data Warehousing Architecture and Implementation.
- To study the overview of developing areas, Web mining,Text mining and ethical aspects of Data mining and to identify Business applications and Trends of Data mining.

UNIT I INTRODUCTION 9 Hrs.

Data mining - Introduction - Data Mining Functionalities - Steps in Data Mining Process - Architecture of a Typical Data Mining Systems - Classification of Data Mining Systems – Major Issues in Data Mining. **Data Preprocessing:** Data Preprocessing-Data Cleaning – Integration – Transformation – Reduction – Entropy based Discretization.

UNIT 2 CONCEPT DESCRIPTION AND ASSOCIATION RULES 9 Hrs.

Concept Description: Attribute Oriented Induction-Mining Class Comparisons-Presentation of both Characterization and Comparison. Association Rules: Frequent Pattern Mining-Apriori Algorithm-Frequent Pattern Growth Tree Algorithm- Mining Multilevel Association Rules-Mining Quantitative Association Rules-Constraint based Association Mining.

UNIT 3 PREDICTIVE MODELING 9 Hrs.

Classification: Decision Tree Induction-Gini Index- Bayes Theorem-Naive Bayesian Classification-K Nearest Neighbor Classifiers- Other Classification Methods Prediction: Linear Regression-Non-Linear Regression **Clusters Analysis:** Types of Data in Cluster Analysis- Categorization of Major Clustering Methods-Partitioning Methods –Hierarchical Methods

UNIT 4 DATA WAREHOUSING 9 Hrs.

Introduction -Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation- From Data warehousing to Data Mining-OLAP-Need- Categorization of OLAP Operations.

UNIT 5 APPLICATIONS 9 Hrs.

Data Mining Applications-Social Impacts of Data Mining- An Introduction to DB Miner-Case Studies-Mining WWW-Text Mining -Mining Spatial Databases-Multimedia Data Mining-Tools.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Classify the various functionalities, architectures of the Data mining systems.
CO2 - Recognize the association rules to apply in data mining.
CO3 - Design Predictive model for real time data mining applications.
CO4 - Explain the architecture of data warehousing.
CO5 - Implement the concepts in the applications.
CO6 - Learn how to use the tools in applications.

TEXT / REFERENCE BOOKS

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques" - Morgan Kaufmann Publishers - 2002.
2. Alex Berson, Stephen J. Smith , “Data Warehousing - Data Mining and OLAP” , Tata Mcgraw-Hill - 2004.
3. Usama M.Fayyad , Gregory Piatetsky, Shapiro , Padhrai Smyth and Ramasamy Uthurusamy, "Advances In Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley and Sons Inc.,1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley and Sons Inc.,1997.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7019	QUANTUM CRYPTOGRAPHY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To figure out the quantum computation techniques.
- To expose the Measurement and Linear transformation.
- To explore the Quantum Applications.

UNIT 1 INTRODUCTION 9 Hrs.

History of quantum computation and quantum information- Classical cryptography-Confidentiality and secret-key Ciphers-Secret- key Authentication-Public-key cryptography- Quantum bits and computation- Single qubit gates - Multiple qubit gates- Quantum circuits - Qubit copying circuit- Bell states - quantum teleportation.

UNIT 2 MEASUREMENT OF MULTIPLE-QUBIT STATES 9 Hrs.

Dirac's BracKet Notation for Linear Transformations - Projection Operators for Measurement - Hermitian Operator Formalism for Measurement - The Measurement Postulate - EPR Paradox and Bell's Theorem - Setup for Bell's Theorem - Bell's Inequality

UNIT 3 QUANTUM STATE TRANSFORMATIONS 9 Hrs.

Unitary Transformations- Some Simple Quantum Gates- Applications of Simple Gates- Realizing Unitary Transformations as Quantum Circuits- Quantum Versions of Classical Computations- From Reversible Classical Computations to Quantum Computations- Reversible Implementations of Classical Circuits.

UNIT 4 INTRODUCTION TO QUANTUM ALGORITHMS 9 Hrs.

Computing with Superposition- Notions of Complexity- Deutsch's Problem- Quantum Subroutines - Bernstein-Vazirani Problem- Simon's Problem - Distributed Computation- Classical Fourier Transform- Quantum Fourier Transform

UNIT 5 ALGORITHMS 9 Hrs.

Classical Reduction to Period-Finding- Shor's Factoring Algorithm- Example Illustrating Shor's Algorithm- The Efficiency of Shor's Algorithm- Omitting the Internal Measurement- Generalizations- Grover's Algorithm- Amplitude Amplification -Optimality of Grover's Algorithm- DE randomization of Grover's Algorithm and Amplitude Amplification- Practical Implications of Grover's Algorithm and Amplitude Amplification.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the this course, the student can able to

CO1 - Learn the fundamentals of the quantum Computation
CO2 - Recognize to apply measurements and Multiple states in various applications.
CO3 - Explore the Quantum applications and transformations in various computations.
CO4 - Implement the algorithms in the different environments.
CO5 - Explain the Grover's algorithm
CO6 - Identify and apply the various algorithms in the different environments.

TEXT / REFERENCE BOOKS

1. Eleanor Rieffel and Wolfgang Polak, “Quantum Computing,A Gentle Introduction”, MIT Press,2014.
2. Michael A. Nielsen & Isaac L. Chu, “Quantum Computation and Quantum Information”, Cambridge University Press, 2011.
3. Arthur O Pittenger,“An Introduction to Quantum Computing Algorithms”, Birkhäuser,2003.
4. Gilles van Assche “Quantum Cryptography and Secret key Dist”,Cambridge University Press, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7020	BUSINESS INTELLIGENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the basics of the business intelligence framework.
- To learn the data integration and multi-dimensional data modeling.
- To build business intelligence applications using tools.

UNIT I INTRODUCTION OF TECHNICAL ARCHITECTURE 9 Hrs.

Technical architecture overview - Back room architecture - Presentation server architecture - Front room architecture – Infrastructure – Metadata - Security.

UNIT 2 DIMENSIONAL MODELING 9 Hrs.

Making the case for dimensional modeling- Dimensional modeling primer- Enterprise data warehouse bus architecture – Updates to the dimension tables - Miscellaneous dimensions - The snow flake schema - Aggregate fact tables.

UNIT 3 DESIGNING THE DIMENSIONAL MODEL 9 Hrs.

Modeling process overview - Getting organized - Four step modeling process - Design the dimensional Model-Embrace data stewardship - Extract - Transform and Load overview – Extract - Transform and Load requirements and steps - Data extraction - Data transformation - Data loading.

UNIT 4 BUSINESS INTELLIGENCE APPLICATIONS 9 Hrs.

Importance of business intelligence applications - Analytical cycle for business intelligence - Types of business intelligence applications - Navigating applications via the business intelligence portal.

UNIT 5 DESIGNING AND DEVELOPING BUSINESS INTELLIGENCE APPLICATIONS 9 Hrs.

Business intelligence application resource planning - Business intelligence application specification – Business intelligence application development - Business intelligence application maintenance.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Recognize the fundamentals of various architectures.
CO2 - Figure out various dimensions of business.
CO3 - Design the dimensional model with data extraction, data transformation and data loading.
CO4 - Acquire the significance of the business intelligence.
CO5 - Develop the business intelligence with various specifications.
CO6 - Design the application with various architecture, dimensions, transformation and data loading.

TEXT / REFERENCE BOOKS

1. Raiph Kimball-Ross, “The Data Warehouse Lifecycle Toolkit”,Wiley Publication, 2008.
2. Ponniah, “Data Warehousing Fundamental”,Wiley Publication,2010.
3. Anahory and Murray,“Data Warehousing in the Real World”,Pearson Education India, 2004.
4. Inmon, W. H. “Building the Data Warehouse”,Wiley Publication,2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7021	HUMAN COMPUTER INTERACTION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of Interaction between the people, computer and communication technologies.
- To be familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.

UNIT I FOUNDATIONS OF HCI 9 Hrs.

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.

UNIT 2 DESIGN AND SOFTWARE PROCESS 9 Hrs.

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.

UNIT 3 MODELS AND THEORIES 9 Hrs.

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

UNIT 4 MOBILE HCI 9 Hrs.

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.

UNIT 5 WEB INTERFACE DESIGN 9 Hrs.

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

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Learn the fundamentals of networks,frame works and ergonomics.
CO2 - Comprehend basic interactive designs.
CO3 - Recognize the cognitive model,organizational issues and requirements of stack holders.
CO4 - Classify and Implement various architecture,widget, framework in different environments.
CO5 - Identify and implement the web interface design using contextual tools
CO6 - Implement the various interfaces in the different web applications.

TEXT / REFERENCE BOOKS

1. Alan Dix, Janet Finlay,Gregory Abowd,Russell Beale,"Human Computer Interaction", 3rd Edition, Pearson Education,2004.
2. Brian Fling,"Mobile Design and Development", 1st Edition, O'Reilly Media Inc.,2009.
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", 1st Edition, O'Reilly, 2009.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice	**30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks	**70 Marks**

SCSB7022	SYSTEM MODELING AND SIMULATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of the simulation software.
- To classify and learn to use the various approaches of mathematical modeling.
- To implement the essentials of Random number and variate generation.

UNIT I INTRODUCTION AND SIMULATION SOFTWARES 9 Hrs.

Introduction to Simulations - simulation examples - Principles – discrete Event Simulation- Event scheduling - Time Advance Algorithm – List processing- Properties and operations- Arrays – dynamic and linked list – Simulation software – JAVA – GPSS – SSF.

UNIT 2 MATHEMATICAL AND STATISTICAL MODELS AND QUEUEING MODELS 9 Hrs.

Statistical Models in Simulation - Statistical Models - Discrete Distributions - Continuous Distributions - Poisson Process - Properties of a Poisson Process - Nonstationary Poisson Process - Empirical Distributions - Queueing Models - Characteristics of Queueing Systems - Queueing Notation - Long-Run Measures of Performance of Queueing Systems - Steady-State Behavior of Infinite-Population Markovian Models - Steady-State Behavior of Finite-Population Models (M/Mic/KIK).

UNIT 3 RANDOM NUMBERS AND RANDOM VARIATE GENERATION 9 Hrs.

Random Numbers - Random-Number Generation - Properties of Random Numbers - Generation of Pseudo- Random Numbers - Techniques for Generating Random Numbers - Tests for Random Numbers - Inverse- Transform Technique - Acceptance-Rejection Technique - Special Properties.

UNIT 4 ANALYSIS OF SIMULATION DATA 9 Hrs.

Input Modeling -Data Collection - Identifying the Distribution with Data -Parameter Estimation - Goodness-of- Fit Tests - Fitting a Nonstationary Poisson Process - Multivariate and Time-Series Input Models - Verification and Validation of Simulation Models - Output Analysis or a Single Model - Comparison and Evaluation or Alternative System Designs.

UNIT 5 APPLICATIONS AND MODEL BUILDING 9 Hrs.

Simulation of Manufacturing and Material-Handling Systems - Simulation of Computer Systems- Simulation Tools - Model Input -High-Level Computer-System Simulation- CPU Simulation -Memory Simulation -Simulation of Computer Networks - Traffic Modeling -Media Access Control -Data Link Layer –TCP-Model Construction –Example.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Discuss the simulation software
CO2 - Comprehend statistical and queuing models
CO3 - Grasp the concepts of random number and how to generate random variate generation
CO4 - Implement the simulation concepts in various applications.
CO5 - Explain to analyse, estimate, verify and validate the data.
CO6 - Apply the Simulation tools I various applications.

TEXT / REFERENCE BOOKS

1. Jerry Banks, John S. Carson II, Barry L Nelson and David M. Nicol, "Discrete-Event System Simulation", 4th edition, Pearson Publications.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7023	DESIGN THINKING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To gain basic skills in creative problem solving, innovation and human centered design thinking.
- To develop rapid evaluation in product and business models.
- To study real world applications on design thinking.

UNIT I INTRODUCTION TO INNOVATION AND DESIGN THINKING 9 Hrs.

Introduction: Overview of Design thinking - different kinds of designs and designers - Good and bad designs - Design problems - Engineering design and design research -Product life cycle - Morphology of design - Introduction to system design process - Stage models.

UNIT 2 DESIGN THINKING ANALYSIS 9 Hrs.

Introduction to Task Clarification - process and steps - Methods for Data collection and collation - patent analysis - Methods for identification of requirements - Role Playing –Checklists -Solution neutral problem statements.

UNIT 3 PROBLEM FORMULATION 9 Hrs.

Introduction to conceptual design: Identification of functions – Ideation - Simulation and Consolidation into solution proposals - Methods for Identification of functions such as functional decomposition techniques - Methods for Ideation- Brainstorming - Synectics.

UNIT 4 DISCOVERING METHODS 9 Hrs.

Methods for consolidation into solution proposals - Morphological charts - Morphological matrix - Methods for simulation: analytical - virtual and physical simulations - Methods for improvement of solution proposals - contradiction analysis - TRIZ techniques - Systematic evaluation of concepts: ordinal methods and cardinal methods.

UNIT 5 CASE STUDIES 9 Hrs.

Case study- design thinking strategies - methods and tools effectively in a business context - integrate critical and creative thinking process.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of this course, the student can able to

CO1 - Recognize fundamentals of design thinking.
CO2 - Appreciate the analysis, methods, requirements of design thinking.
CO3 - Learn how to apply formulas in functions.
CO4 - Implement the Morphological charts, matrix methods for simulation.
CO5 - Identify the application of the design thinking strategies.
CO6 - Distinguish about tools of design thinking.

TEXT / REFERENCE BOOKS

1. Pahl. G and Beitzm W., "Engineering Design: A Systematic Approach", 3rd Ed., Springer, 2007.
2. Cross N., "Engineering Design Methods: Strategies for Product Design", 4th edition, John Wiley and Sons Ltd.,Chichester,2008.
3. Roozenburg, N.F.M., Eekels J.,"Product Design - Fundamentals and Methods",Wiley - Chichester,1995.
4. Jones J.C., "Design Methods", 2nd Edition, John Wiley and Sons Ltd., Chichester,1992.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7024	ADVANCED DATA ACQUISITION AND VISUALIZATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize fundamentals of the data acquisition.
- To classify the various types of the aacquisition ssystem and ssignals in the applications.
- To acquire the knowledge about the data visualization techniques.

UNIT 1 DATA ACQUISITION 9 Hrs.

Introduction-Need of Data Acquisition- Application of Data Acquisition- Principles of Data Acquisition Systems- Data Acquisition System Components- Data Acquisition Systems Measurements - Modules & Methods- Data Acquisition Tools-ActiveX - DATAQ.

UNIT 2 DATA ACQUISITION SYSTEMS AND DATA ACQUISITION SIGNALS 9 Hrs.

Types of Data Acquisition Systems- Data Loggers- Data Acquisition Devices- Modular Data Acquisition Systems- Data Acquisition Signal Capturing Used by DAQ Systems- Voltage Signals- Current Signals- Power Signals- Applications and Benefits of Data Acquisition Systems- Modulation and sampling- Digitization and coding- File formats.

UNIT 3 DATA VISUALIZATION 9 Hrs.

Acquiring and Visualizing Data - Simultaneous acquisition and visualization - Applications of Data Visualization - Keys factors of Data Visualization -Exploring the Visual Data Spectrum: charting Primitives Data Points - Line Charts - Bar Charts - Pie Charts - Area Charts - exploring advanced Visualizations - Making use of HTML5 CANVAS - Integrating SVG.

UNIT 4 BASICS OF DATA VISUALIZATION 9 Hrs.

Tables: Reading Data from Standard text files (.txt - .csv - XML) - Displaying JSON content Outputting Basic Table Data (Building a table - Using Semantic Table - Configuring the columns) - Assuring Maximum readability (Styling your table - increasing readability - adding dynamic Highlighting) - Including computations - using data tables library - relating data table to a chart.

UNIT 5 ADVANCED DATA VISUALIZATION 9 Hrs.

Making charts interactive and Animated: Data joins - updates and exits - interactive buttons - Updating charts - adding transactions - using keys Adding a Play Button - wrapping the update phase in a function - adding a Play button to the page - Making the Play button go - Allow the user to interrupt the play - sequence- Dashboard design issues and assessment of needs - Considerations for designing dashboard-visual perception - achieving eloquence- Designing Bullet Graphs.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course,student will be able to

CO1 - Knowledge about the fundamental need of data acquisition.
CO2 - Figure out types of devices used for data acquisition.
CO3 - Acquire the basics of knowledge of exploring the data.
CO4 - Grasp the data visualization techniques.
CO5 - Gain the ability to make charts with interactive buttons and play buttons in various applications.
CO6 - Implement the animation techniques, visualizations in applications.

TEXT / REFERENCE BOOKS

1. Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, “JavaScript and jQuery for Data Analysis and Visualization”, WROX
2. Ritchie S. King, “Visual story telling with D3” ,Pearson.
3. Ben Fry,"Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
4. A Julie Steele and Noah Iliinsky,”Designing Data Visualizations: Representing Informational Relationships”,O’Relly.
5. Andy Kirk ,”Data Visualization: A Successful Design Process”, PAKT.
6. Scott Murray,” Interactive Data Visualization for Web”, O’Relly.
7. Nathan Yau, "Data Points: Visualization that means something",Wiley,2013.
8. Tamara Munzner,” Visualization Analysis and Design “, AK Peters Visualization Series,CRC Press, Nov. 2014.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7025	SYSTEM SECURITY AND PRACTICES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To learn the core fundamentals of system and web security concepts.
- To have through understanding in the security concepts related to networks.
- To perform a detailed study of Privacy and Storage security and related Issues.

UNIT I SYSTEM SECURITY 9 Hrs.

Building a secure organization- A Cryptography primer- detecting system Intrusion Preventing System Intrusion- Fault tolerance and Resilience in cloud computing environments- Security web applications - services and servers.

UNIT 2 NETWORK SECURITY 9 Hrs.

Internet Security - Botnet Problem- Intranet security- Local Area Network Security -Wireless Network Security - Wireless Sensor Network Security- Cellular Network Security - Optical Network Security- Optical Wireless Security.

UNIT 3 SECURITY MANEGEMENT 9 Hrs.

Information security essentials for IT Managers- Security Management System – Policy Driven System Management- IT Security - Online Identity and User Management System - Intrusion and Detection and Prevention System.

UNIT 4 CYBER SECURITY AND CRYPTOGRAPHY 9 Hrs.

Cyber Forensics- Cyber Forensics and Incidence Response - Security e-Discovery - Network Forensics - Data Encryption- Satellite Encryption - Password based authenticated Key Establishment Protocols.

UNIT 5 PRIVACY AND STORAGE SECURITY 9 Hrs.

Privacy on the Internet - Privacy Enhancing Technologies - Personal Privacy Policies - Detection of Conflicts in security policies- privacy and security in environment monitoring Systems. Storage Area Network Security - Storage Area Network Security Devices – Risk Management - Physical Security Essentials.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Experience the cryptography,system intrusion and fault tolerance.
CO2 - Figure out Network security concepts.
CO3 - Learn the how to manage the security issues.
CO4 - Implement the algorithms of cyber security.
CO5 - Recognize the privacy policy of data storage security.
CO6 - Gain knowedge about all policies, privacy of the security in the data.

TEXT / REFERENCE BOOKS

1. John R.Vacca, "Computer and Information Security Handbook", 2nd Edition, Elsevier 2013.
2. Michael E. Whitman, Herbert J. Mattord," Principal of Information Security", 4th Edition, Cengage Learning,2012.
3. Richard E.Smith," Elementary Information Security", 2nd Edition, Jones and Bartlett Learning, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SMTB5103	ADVANCED OPTIMIZATION TECHNIQUES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To learn linear and non linear programming problem.
- To recognize the concept of queuing model - simulation and decision theory.

UNIT 1 INTRODUCTION TO OPTIMIZATION 9 Hrs.

Formulation of optimization problem- Simplex Method - Big M Method - Two phase method - Dual Simplex method - Integer Programming- Gomory All Integer cutting plane Method-Gomory Mixed Integer Method-Branch and Bound Method

UNIT 2 NON LINEAR PROGRAMMING 9 Hrs.

Introduction – Unconstrained and Constrained Optimization- Kuhn Tucker conditions- Relative Maximum and Minimum values- Method of Lagrangian Multipliers- Hessian Matrix- Quadratic programming- Wolfe's Modified Simplex Method – Problems

UNIT 3 DYNAMIC PROGRAMMING 9 Hrs.

Recursive relationship - Solution to recursive equation - Dynamic Programming Algorithm - Principle of Optimality - Maximum and minimum values - Solution of LPP by Dynamic Programming - Multi stage problem

UNIT 4 QUEUEING NETWORKS 9 Hrs.

Introduction to Concept of Queuing Models - Single Server - Multiple server Models - Problems - Pollaczek Khinchine theorem. Theoretical concepts of Open queuing networks (Theory) - Closed Queuing Networks (Theory) - Queues in series (Theory).

UNIT 5 DECISION ANALYSIS AND SIMULATION 9 Hrs.

Introduction to Decision Making process – Elements – Decision making under uncertainty – Maximin and Maximax criteria- Hurwitz criterion – Laplace criterion – Minimax Regret criterion – Decision tree analysis- Problems - Simulation - Nature and need for simulation - Monte Carlo method – Applications to Queuing systems.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Formulate the linear programming problems.
CO2 - Analyze the non linear and quadratic programming problems.
CO3 - Develop the dynamic programming problems.
CO4 - Investigate the various Queuing models.
CO5 - Describe the decision making process.
CO6 - Design the decision making process using various criterions.

TEXT / REFERENCE BOOKS

1. J.K. Sharma, “Operations Research Theory and Applications”, 4th Edition, Macmillan India Ltd., 2010.
2. F.S.Hillier and G.J. Lieberman ,"Introduction to Mathematical Programming", McGraw Hill International Edition , 2001.
3. H.A.Taha, "Operations Research: An Introduction",10th Edition, Macmillan, 2016.
4. Prem Kumar Gupta and D.S. Hira, “Operations research”,S Chand,2000.
5. Sharma .S.D, “Operations Research”, Kedarnath Ramnath & Co, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7026	DATA SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the basics of data science.
- To get knowledge in analytical methods.
- To know the packages of python for data science.

UNIT 1 INTRODUCTION TO DATA SCIENCE 9 Hrs.

Big Data and Data Science Hype–Characteristics of Big Data– Data Science Life Cycle–Statistical Methods–Probability–Sampling and Sampling Distributions–Statistical Inference–Prediction and Prediction Error–Resampling.

UNIT 2 ANALYTICAL THEORY AND METHODS 9 Hrs.

Linear Discriminant Analysis–Bayesian Methods –Introduction to Clustering Techniques –K means–Gaussian Mixture Models and Expectations – Maximization – agglomerative clustering – evaluation of clustering – Rand index – mutual information-based scores – Fowlkes – Mallows index – Ensemble Techniques – Bagging & Boosting.

UNIT 3 DATA SCIENCE USING PYTHON 9 Hrs.

Data science packages–NumPy Basics-Pandas-Data Loading–Data Wrangling-Plotting and Visualization–Data Aggregation and Group Operations – Data Exploration – Visualization using python.

UNIT 4 INTRODUCING R LANGUAGE 9 Hrs.

R Basics-R Objects–R Notations– Packages – Indexing Data– Loading Data – Exploratory Data Analysis using R– Statistical Methods for Evaluation using R – Data Science applications–Time Series Forecasting - Text Mining & Sentiment Analysis

UNIT 5 DATA VISUALIZATION 9 Hrs.

Data Visualization: Basic Principles– Categorical and Continuous Variables – Exploratory Graphical Analysis – Creating Static Graphs– Animated Visualizations – Loops - GIFs and Videos.

Max.45 Hrs.

COURSE OUTCOMES

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

CO1 - Figure out the basics needs of data science.
CO2 - Acquire knowledge of various analytical methods.
CO3 - Work with data science packages of python.
CO4 - Apply data science algorithms using R language.
CO5 - Implement various visualization techniques.
CO6 - Identify and apply the Data science tools in the real time applications

TEXT / REFERENCE BOOKS

1. Wes McKinney, “Python for Data Analysis”, O'Reilly Media, 2012
2. Garrett Grolemund, “Hands on programming with R”, O’Reilly, 2014
3. Cathy O'Neil and Rachel Schutt, “Doing Data Science - Straight Talk from The Frontline”, O'Reilly. 2014.
4. Gareth James, Daniela Witten,Trevor Hastie,Robert Tibshirani, “An introduction to statistical learning with application in R”, Springer.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7027	IMAGE PROCESSING AND ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend fundamental of image processing and various image models
- To recognize frequency domain filters
- To study different types of segmentation algorithms

UNIT 1 IMAGE MODELS AND PROCESSING 9 Hrs.

Introduction to image processing – imaging modalities – image file formats – image sensing and acquisition – image sampling and quantization – noise models – spatial filtering operations – histograms – smoothing filters – sharpening filters – fuzzy techniques for spatial filtering – spatial filters for noise removal - Color models – pseudo colors – color transformations

UNIT 2 IMAGE ENHANCEMENT IN SPATIAL DOMAIN 9 Hrs.

Basic gray level transformations - histogram processing - enhancement using logical and arithmetic operations - basic spatial filtering - smoothing and sharpening spatial filters. Combining spatial enhancement methods. Smoothing frequency domain filters - sharpening frequency domain filters homomorphic filtering.

UNIT 3 THRESHOLDING TECHNIQUES AND EDGE DETECTION 9 Hrs.

Thresholding techniques – region growing methods – region splitting and merging – adaptive thresholding – threshold selection – global valley – histogram concavity – edge detection – template matching – gradient operators – circular operators – differential edge operators – hysteresis thresholding – Canny operator – Laplacian operator – active contours – Level set and Graph cut approaches to object segmentation.

UNIT 4 IMAGE ANALYSIS 9Hrs.

Feature extraction – reduction – Image retrieval and its performance – Syntax and introduction to semantic based retrieval – introduction to watermarking – steganography –Image Compression – redundancy in images – coding redundancy – irrelevant information in images – image compression models – basic compression methods – Introduction to compression standards

UNIT APPLICATIONS IN IMAGE PROCESSING 9 Hrs.

Case Study: Pattern Recognition - Iris Recognition - Face recognition and Biomedical Applications.

Max .45 Hrs.

COURSE OUTCOMES

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

CO1 - Distinguish the image enhancement in spatial domain and color transformation.
CO2 - Apply the frequency domain filters to enhance the images.
CO3 - Identify and apply the image segmentation and edge detection techniques in image processing applications.
CO4 - Implement feature extraction and Image retrieval.
CO5 - Harness image processing techniques in various applications
CO6 - Learn about the image processing techniques in different applications.

TEXT / REFERENCE BOOKS

1. Rafael Gonzalez and Richard Woods, "Digital Image Processing", 3rd edition, Pearson Publications,2017.
2. Anil K. Jain," Fundamental of Digital Image Processing", PHI publication,1988.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7028	DEEP LEARNING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To develop and Train Deep Neural Networks.
- To understand a Neural Networks concepts.
- To learn and apply the convolutional Networks concepts in various applications.

UNIT 1 DEEP NETWORKS 9 Hrs.

Machine Learning Basics: Learning Algorithms – Supervised and Unsupervised learning – Feed forward Deep networks – Regularization: Regularization and Under-Constrained Problems - Dataset Augmentation – Early stopping. Optimization for training Deep models: Learning vs Optimization – Challenges – Basic Algorithms: Stochastic Gradient Descent - Adam - Conjugate Gradient method

UNIT 2 NEURAL NETWORKS 9 Hrs.

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions - Data Pre-processing for neural networks - Feature Engineering - Over fitting and Under fitting - Hyper parameters.

UNIT 3 CONVOLUTIONAL NETWORKS AND SEQUENCE MODELLING 9 Hrs.

Convolutional Networks – Convolution operation – Motivation Pooling – Basic Convolution function – Algorithms – Recurrent and recursive nets : Recurrent neural networks – Bidirectional RNN – Recursive Neural networks – Auto regressive networks – introduction to Long term dependencies and Temporal dependencies.

UNIT 4 NATURAL LANGUAGE PROCESSING USING RNN 9 Hrs.

Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Co-occurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Back propagation Through Time.

UNIT 5 APPLICATIONS 9 Hrs.

Speech - Audio and Music processing – Language modeling and Natural language processing – Information Retrieval – Object Recognition and Computer Vision – Multi modal and multi task learning.

Max.45Hrs.

COURSE OUTCOMES

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

CO1 - Recognize fundamentals of concepts of machine learning.
CO2 - Apply the neural networks concepts in different environments.
CO3 - Work with convolutional networks and modeling tools.
CO4 - Recognize fundamentals and methods of Natural Language Processing.
CO5 - Appreciate the applications of speech audio and video processing.
CO6 - Implement the deep learning techniques in various real time applications.

REFERENCE BOOKS

1. Yoshua Bengio and Ian J.Goodfellow and Aaron Courville, "Deep Learning", MIT Press, 2015.
2. Li Deng, Dong Yu, "Deep Learning: Methods and Applications", Now Publis.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7029	RECONFIGURABLE COMPUTING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the Basic performance of RC devices.
- To comprehend the architecture of the of RC devices.
- To figure out the future generation of the computing.

UNIT 1 GENERAL OVERVIEW 9 Hrs.

General overview - Goals and motivations - History - state of the art - future trends -Basic RC concepts and related fields of study - Performance - power - size - and other metrics

UNIT 2 RC DEVICES AND ARCHITECTURES 9 Hrs.

FPGAs in general Xilinx Zynq 7000 family programmable SOC (system on chip) in particular - hybrid device with ARM + FPGA architecture -RC architectures in general - Zed Board platform Zynq- 7000 All Programmable SoC XC7Z020 -CLG484-1 Other key components in more detail - Novo-G reconfigurable supercomputer GiDEL board - Other RC platforms Amazon EC2 F1 Instances Microsoft Catapult

UNIT 3 DESIGN TOOLS AND LANGUAGES 9 Hrs.

Hardware description languages - review VHDL - Xilinx Vivad Synthesis - PAR - simulation - debug tools High-level synthesis (HLS) languages and tools OpenCL - Convey Hybrid Threading Tools - C-to-gates languages

UNIT 4 RC APPLICATION DEVELOPMENT 9 Hrs.

Compute models and system architectures: parallelism - systolic arrays - pipelining - optimizations - bottlenecks RC application domains and case studies BioRC (computational biology) - FinRC (computational finance) - DSP (signal and image processing) - Hardware/software partitioning - numerical analysis - performance analysis and prediction - etc.

UNIT 5 SPECIAL TOPICS 9 Hrs.

RC - BioRC - FinRC - DSP projects - Behavioral emulation of future-generation computing systems - High-level synthesis (HLS) development & studies - Hybrid Memory Cube (HMC) in RC - Device and app characterization - Partial reconfiguration

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, the student will be able to

CO1 - Acquire knowledge about reconfigurable computing.
CO2 - Figure out the architecture and devices of RC.
CO3 - Ability to implement design tools and languages in hardware description.
CO4 - Comprehend the application of reconfigurable computing.
CO5 - Learn the future generation computing systems.
CO6 - Implement the tools to develop various projects.

TEXT / REFERENCE BOOKS

1. Scott Hauck and Andre DeHon, “Reconfigurable Computing: The Theory and Practice of FPGA-Based Computation”,Elsevier - Inc. (Morgan Kaufmann Publishers) - Amsterdam - 2008. ISBN: 978-0-12-370522-8.
2. C. Maxfield,” The Design Warrior's Guide to FPGAs”, Newnes, 2004, ISBN: 978-0750676045.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7030	SOFTWARE DEFINED NEWORKING AND NETWORK FUNCTIONS VIRTUALIZATION FOR IOT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend the use of Modern Network approaches
- To apply data center topologies in virtualized environment
- To know various components for building an IoT application

UNIT 1 MODERN NETWORKING 9 Hrs.

Internet of Things - Types of Network and Internet Traffic - Demand: Big Data - Cloud Computing - and Mobile Traffic - Requirements: QoS and QoE – Routing Congestion Control

UNIT 2 SOFTWARE DEFINED NETWORKS 9 Hrs.

Network Requirements - The SDN Approach - SDN- and NFV-Related Standards – SDNData Plane - OpenFlow Logical Network Device - OpenFlow Protocol - SDN Control Plane Architecture - REST API - SDN Application Plane Architecture

UNIT 3 VIRTUALIZATION 9 Hrs.

Background and Motivation for NFV - Virtual Machines - NFV Concepts – NFV Reference Architecture - NFV Infrastructure - Virtualized Network Functions – NFV Management and Orchestration - NFV Use Cases - SDN and NFV

UNIT 4 THE INTERNET OF THINGS: COMPONENTS 9 Hrs.

The IoTEra - Scope of the Internet of Things - Components of IoT-Enabled Things – IoT World Forum Reference Model - ITU-T IoT Reference Model - IoTivity - Cisco IoT System-ioBridge - SDN and NFV over IoT Deployment

UNIT 5 SECURITY 9 Hrs.

Security Requirements - SDN Security - NFV Security - ETSI Security Perspective – IoT Security - The Patching Vulnerability - IoT Security and Privacy Requirements Defined by ITU-T - An IoT Security Framework - The Impact of the New Networking on IT Careers.

Case Study: A study about Defense for all security SDN application.

Max.45 Hrs.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1 - Recognize the use of Modern Network approaches.
CO2 - Figure out how to apply data center topologies in virtualized environment.
CO3 - Know the various Virtualization Techniques in various projects.
CO4 - Learn the components of IoT
CO5 - Comprehend the security requirements of SDN Security and NFV security.
CO6 - Identify the appropriate security features for the SDN and NFV in various real time environments.

TEXT / REFERENCE BOOKS

1. William Stallings, “Foundations of Modern Networking: SDN - NFV - QoE - IoT - and Cloud”,Pearson Education,2015.
2. Jim Doherty, “SDN and NFV Simplified: A Visual Guide to Understanding Software Defined Networks and Network Function Virtualization”,1st Edition ,Pearson Education,2016.
3. Paresh Shah, Syed Farrukh Hassan, Rajendra Chayapathi, “Network Function virtualization with a touch of SDN”, Addison-Wesley,Pearson Education,2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice	**30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks	**70 Marks**

SCSB7031	DIGITAL STEGANOGRAPHY AND WATERMARKING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To figure out the basic principles and different types of steganography techniques.
- To make them understand the steganalysis, techniques to apply in research projects.
- To provide the basic knowledge of various methods in watermarking techniques.

UNIT 1 INTRODUCTION 9 Hrs.

Introduction to Information hiding **– Brief history and applications of information hiding -Principles** of Steganography – Frameworks for secret communication – Security of Steganography systems – Information hiding in noisy data – Adaptive versus non-Adaptive Algorithms – Active and Malicious Attackers – Information hiding in written - Examples of Invisible communications.

UNIT 2 STENOGRAPHIC TECHNIQUES 9 Hrs.

Stenographic techniques – Substitution system and bit plane tools – Transform domain techniques – Spread spectrum and information hiding – Statistical Steganography – Distortion and cover generation techniques.

UNIT 3 STEGANALYSIS 9 Hrs.

Overview of steganalysis- Statistical Properties of Images - Visual Steganalytic System –IQM Based Steganalytic System - Learning Strategies - Frequency-Domain Steganalytic System - Looking for Signatures: Detecting Hidden Information - Extracting Hidden Information -Disabling Hidden Information

UNIT 4 WATERMARKING 9 Hrs.

Introduction -History and Terminology - Basic Watermarking Principles - Watermarki Watermark Recovery with or without the Original Data - Watermark Extraction or Verification of Presence for a Given Watermark - Watermark Security and Keys - Evaluation and Benchmarking of Watermarking Systems

UNIT 5 CRYPTOGRAPHIC AND PSYCHO VISUAL ASPECTS 9 Hrs.

Cryptographic and psycho visual aspects – Choice of a workspace – Formatting the watermark bits – Merging the watermark and the cover – Optimization of the watermark receiver –Extension from still images to video- Fingerprinting: Introduction – Examples - Terminology and Requirements - Classification - Research History - Schemes - Digital Copyright and Watermarking- Conflict of Copyright Laws on the Internet

Max.45Hrs.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1 - Recognize the skill to make and implement a simple Steganographic technique.
CO2 - Distinguish between Watermarking and Steganography techniques.
CO3 - Implement suitable steganography method to develop a new project.
CO4 - Understand the existing digital watermarking techniques and formulate new ideas
CO5 - Learn about the cryptographic and psycho visual aspects - finger printing
CO6 - Have a detailed knowledge of the watermarking techniques and steganographic techniques in research projects.

TEXT / REFERENCE BOOKS

1. Stefan Katzenbelsser and Fabien A. P. Petitcolas , “Information Hiding Techniques for Steganography and Digital Watermarking”, Artech House Publishers, 2004.
2. Frank Y. Shih, “Digital Watermarking and Steganography: fundamentals and techniques”, CRC Press, 2007.
3. Jessica Fridrich, “Steganography in Digital Media: Principles - Algorithms - and Applications”, Cambridge University Press,2010.
4. Abbas Cheddad, Vdm Verlag and Dr. Muller, “Digital Image Steganography: Concepts - Algorithms and Applications”, Aktienge sells Chaft & Co. Kg, 2009.
5. Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich and Ton Kalker , “Digital Watermarking and Steganography”,Morgan Kaufmann Publishers, 2007.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice	**30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks	**70 Marks**

SCSB7032	SPEECH AND AUDIO SIGNAL PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the basic mechanism of speech production.
- To learn the basic concepts of time and frequency domain analysis of speech signal.
- To explain the various parametric representation of speech processing.

UNIT 1 SPEECH PRODUCTION 9 Hrs.

Mechanism of speech production - Acoustic phonetics - Digital models for speech signals - Representations of speech waveform: Sampling speech signals - basics of quantization - delta modulation - and Differential PCM - Auditory perception: psycho acoustics.

UNIT 2 TIME DOMAIN ANALYSIS 9 Hrs.

Time domain analysis of Speech signal – Methods for extracting the parameters Energy - Average Magnitude - Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

UNIT 3 FREQUENCY DOMAIN ANALYSIS 9 Hrs.

Sampling rates – Filter banks - Spectrogram - Pitch and formant extraction - Homomorphic speech processing: Cepstral analysis of Speech - Formant and Pitch Estimation - Audio compression methods and standards - Chroma features - PNCC - LSF - LAR - Sonogram - Tempogram.

UNIT 4 PARAMETRIC REPRESENTATION OF SPEECH 9 Hrs.

Basic Principles of linear predictive analysis – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method –Durbin's Recursive algorithm – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP - PLP and MFCC Coefficients.

UNIT 5 CASE STUDY 9 Hrs.

Automatic speech recognition – Text dependent and text independent speaker identification and verification – Speech synthesis – Audio segmentation – Music classification and information retrieval – Music emotion recognition.

Max.45Hrs.

COURSE OUTCOMES

On completion of this course, the students will be able to

CO1 - Acquired knowledge of speech mechanism and auditory perception in speech processing.
CO2 - Recognize the time and frequency domain analysis of speech.
CO3 - Learn various parameters like filtering techniques, extraction of speech modulation.
CO4 - Ability to develop systems for various applications of speech processing.
CO5 - Comprehend the automatic speech recognition.
CO6 - Implement the speech techniques in the real time applications.

TEXT / REFERENCE BOOKS

1. L. R. Rabiner and R. W. Schaffer, “Digital Processing of Speech signals”, Prentice Hall.
2. Ben Gold and Nelson Morganm “Speech and Audio Signal Processing - Processing and Perception of Speech and Music”, Wiley, India Edition, 2006.
3. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education, 2004.
4. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
5. Daniel Jurafsky and James H Martin, “Speech and Language Processing,An Introduction to Natural Language Processing,Computational Linguistics and Speech Recognition”,Pearson Education, 2002.
6. Meinard Muller, “Fundamentals of Music Processing – Audio, Analysis, Algorithms, Applications”, Springer International Publishing, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7033	IMAGE MINING AND REPOSITORY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To recognize the fundamentals of image retrieval and image databases.
- To introduce different features and extraction methods in image mining.
- To explain the various clustering and classification techniques in image mining.

UNIT 1 INTRODUCTION 9 Hrs.

Annotation based image retrieval - Content Based Image Retrieval (CBIR): CBIR architectures - Region-based retrieval - Semantic-based retrieval - Context-based retrieval - Relevance Feedback. Types of image databases; Image Features. Image Clustering - Classification - Matching - Indexing.

UNIT 2 IMAGE DATA BASE 9 Hrs.

Structured image databases - textured image database - image properties - Feature vector database - Image Features: colour based - colour models - texture based - shape based - spatial orientation. Edge and boundary based features.

UNIT 3 STATISTICAL METHODS 9 Hrs.

Statistical methods: mean - variance - covariance - coefficient of variation - mean vector - covariancematrix - correlation - regression - co-occurrence matrix - Eigen vector. Histogram bins

UNIT 4 CLUSTERING 9 Hrs.

Clustering: k-means algorithm - c-means algorithm - fuzzy c-means - kNN method - Branch and Bound method - Graph theoretic approach. Classification: Bayes classifier - Quadratic classifier.

UNIT 5 POINT-WISE MEASURES 9 Hrs.

Point-wise measures: Euclidean distance - Manhattan distance - Canberra distance; Distributional measures: Bhattacharyya distance - Mahalanobis distance - Kullback-Liebler distance - Chisquared distance - Chebychev. Measure of performance: Precision - recall; F measures.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Acquire knowledge about various image retrieval techniques.
CO2 - Analyze different image databases and its uses.
CO3 - Classify the different feature sets and its extraction methods.
CO4 - Implement various classification and clustering algorithms in research projects.
CO5 - Comprehend the point-wise measure and distributional measures.
CO6 - Evaluate different distance measures and performance measures.

TEXT / REFERENCE BOOKS

1. Keinosuke Fukunaga, “Introduction to Statistical Pattern Recognition”, 2nd Ed., Academic Press Inc., New York,1990.
2. Oge Marques and Borko Furht, “Content-Based Image and Video Image Retrieval “, Kluwar Academic Publisher, USA,2002.
3. Sagarmay Deb, “Multimedia Systems and Content-Based Image Retrieval”, IDEA Group Publishing, USA, 2004.
4. Jiawei Han, Micheline Kamber and Jian Pei,” Data Mining: Concepts and techniques”,3rd Ed., Elsevier, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7034	DIGITAL VIDEO PROCESSING	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To provide the students with a basic understanding of the theory behind various video processing tasks.
- To learn the most popular and successful algorithms to solve video processing problems.
- To implement the various video processing techniques in the real world applications.

UNIT 1 HUMAN VISUAL SYSTEM AND COLOR 9 Hrs.

Color Vision and Models - Contrast Sensitivity -Spatiotemporal Frequency Response - Stereo/Depth Perception. Analog Video: Progressive vs. Interlaced Scanning-Analog-Video Signal Formats -Analog-to-Digital Conversion. Digital Video: Spatial Resolution and Frame Rate - Color - Dynamic Range - and Bit-Depth. Digital Video Standards: 3D Video - 3D-Display Technologies - Stereoscopic Video - Multi-View Video. Digital Video Applications.

UNIT 2 MOTION MODELS 9 Hrs.

Estimation Criteria- 2D Apparent-Motion Estimation: Sparse Correspondence -Optical-Flow Estimation - Optical-Flow Equation and Normal Flow-Displaced Frame Difference. Motion Estimation algorithms: Global motion estimation-Block matching-Variable Size Block-Matching - Hierarchical Block-Matching - Phase-Correlation Method. 3D Motion and

Structure Estimation: Camera Calibration- Affine Reconstruction- Projective Reconstruction Euclidean Reconstruction

UNIT 3 IMAGE SEGMENTATION 9 Hrs.

Thresholding - Clustering - Bayesian Methods - Graph-Based Methods -Active-Contour Models. Change Detection: Shot-Boundary Detection- Background Subtraction. Motion Segmentation: Dominant-Motion Segmentation- Multiple-Motion Segmentation. Motion Tracking: Graph-Based Spatiotemporal Segmentation and Tracking- Kanade Lucas Tomasi Tracking -Mean-Shift Tracking - Active-Contour Tracking- 2D mesh tracking.

UNIT 4 THEORY OF SPATIO-TEMPORAL FILTERING 9 Hrs.

Frequency Spectrum of Video- Motion-Adaptive Filtering -Motion-Compensated Filtering. Video-Format Conversion: Down-Conversion- De-Interlacing - Frame-Rate Conversion. Multi-Frame Noise Filtering: Motion-Adaptive Noise Filtering Motion-Compensated Noise Filtering. Multi-Frame Restoration: Multi-Frame Modeling- Multi Frame Wiener Restoration

UNIT 5 VIDEO-COMPRESSION APPROACHES 9 Hrs.

Intra-Frame Compression - Motion JPEG 2000 and Digital Cinema- 3D Transform Coding - Motion-Compensated Transform Coding. Early Video Compression Standards: ISO and ITU Standards-MPEG-1 Standard- MPEG-2 Standard-8.3 MPEG-4 AVC/ITU-T H.264 Standard: Input-Video Formats and Data Structure-Intra Prediction -Motion Compensation. High-Efficiency Video-Coding (HEVC) Standard: Video-Input Format and Data Structure – Coding Tree Units.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the fundamentals of video processing techniques.
CO2 - Classify the various the video filtering and video compression techniques.
CO3 - Recognize the basic video processing operations using the MATLAB.
CO4 - Demonstrate a complete video processing system to achieve a specific task and analyze and interpret the system.
CO5 - Learn about the intra frame compression and compression standards
CO6 - Implement the video compression techniques in research and real time projects.

TEXT / REFERENCE BOOKS

1. Murat Tekalp A, "Digital Video Processing", 2nd Edition,Prentice Hall,1995.
2. Bovik AL,"The Essential Guide to Video Processing", Academic Press, 2009.
3. Iain E. G. Richardson,"Video Codec Design" ,John Wiley and Sons, 2002.
4. Iain E. G. Richardson,"H.264 and MPEG-4 Video Compression: Video Coding for Next Generation Multimedia", Wiley, 2003.
5. Bovik AL, "Handbook of Image and Video Processing",2nd edition, Academic Press, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7035	FULL STACK WEB APPLICATION DEVELOPMENT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To comprehend fundamentals of TypeScript language.
- To acquire knowledge about the various languages to develop the web applications
- To classify the various database tools to utilize in the different types of research and real time projects.

UNIT 1 FUNDAMENTALS & TYPESCRIPT LANGUAGE 9 Hrs.

Server-Side Web Applications. Client-Side Web Applications. Single Page Application. About TypeScript. Creating TypeScript Projects. TypeScript Data Types. Variables. Expression and Operators. Functions. OOP in Typescript. Interfaces. Generics. Modules. Enums. Decorators. Enums. Iterators. Generators.

UNIT 2 ANGULAR 9 Hrs.

Introduction to Angular CLI. Creating an Angular Project - Components - Components Interaction. Dynamic Components - Angular Elements - Angular Forms - Template Driven Forms. Property - Style - Class and Event Binding - Two way Bindings. Reactive Forms - Form Group - Form Controls - About Angular Router. Router Configuration. Router State. Navigation Pages. Router Link. Query Parameters. URL matching. Matching Strategies. Services. Dependency Injection.

UNIT 3 NODE.js 9 Hrs.

Introduction to Node.js. Configuring Node.js environment. Node Package Manager NPM. Modules. Asynchronous Programming. Call Stack and Event Loop. Callback functions. Callback errors. Abstracting callbacks. Chaining callbacks. File System. Synchronous vs. asynchronous I/O. Path and directory operations. File Handle. File Synchronous API. File Asynchronous API. File Callback API. Timers. Scheduling Timers. Timers Promises API. Node.js Events. Event Emitter.

UNIT 4 EXPRESS.Js 9 Hrs.

Express.js. How Express.js Works. Configuring Express.js App Settings. Defining Routes. Starting the App. Express.js Application Structure - Configuration - Settings - Middleware - body-parser - cookie-parser - express-session - response-time - Template Engine - Jade - EJS - Parameters - Routing - router - route(path) - Router Class - Request Object - Response Object - Error Handling - RESTful.

UNIT 5 MONGODB 9 Hrs.

Introduction to MongoDB. Documents. Collections. Subcollections. Database. Data Types. Dates. Arrays. Embedded Documents. CRUD Operations. Batch Insert. Insert Validation. Querying The Documents. Cursors. Indexing. Unique Indexes. Sparse Indexes. Special Index and Collection Types. Full-Text Indexes. Geospatial Indexing. Aggregation framework.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Recognize the basic programming skills of Javascript.
CO2 - Implement a front-end web application using Angular.
CO3 - Able to create modules to organise the server.
CO4 - Design the MongoDB database for various applications.
CO5 - Learn and apply the CRUD operations in MangoDB.
CO6 - Distinguish the complex and relational data in MongoDB using Mongoose

TEXT / REFERENCE BOOKS

1. Adam Freeman,"Essential TypeScript", Apress, 2019.
2. Mark Clow,"Angular Projects", Apress, 2018.
3. Azat Mardan,"Pro Express.js", Apress,2015
4. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, Tim Hawkins, "MongoDB in Action", Manning Publication,2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**

SCSB7036	SENSORS AND SENSING TECHNIQUES	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To get knowledge on the sensor characteristics and the fundamental principles of sensing
- To learn characteristics of interface electronic circuits
- To get familiar with motion-related sensors.

UNIT 1 PRINCIPLES OF SENSING 9 Hrs.

Data acquisition – Sensor characteristics: Transfer function – Calibration – Accuracy – Calibration error - Nonlinearity – Saturation – Repeatability – Reliability – Uncertainty. Physical principles of sensing: electric charges - fields - potentials – capacitance – magnetism – resistance – piezoelectric effect –– sound waves –Temperature and thermal properties of materials - heat transfer – light – dynamic models of sensor elements.

UNIT 2 OPTICAL COMPONENTS AND INTERFACE ELECTRONICS 9 Hrs.

Optical Components of sensors: Radiometry – Photometry – Windows - mirrors – lenses – Fresnel Lenses - fiber optics – concentrators. Interface electronic circuits: Input characteristics – amplifiers – light-to-voltage converters – Excitation circuits – Analog-to-Digital converters – Direct digitization – Capacitance-to-voltage converters – Bridge circuits – data transmission – noise in sensors and circuits – calibration – Batteries for low power sensors.

UNIT 3 MOTION RELATED SENSORS 9 Hrs.

Occupancy and motion detectors: Ultrasonic – microwave motion – capacitive occupancy – triboelectric – optoelectronic motion – optical presence sensors – Pressure-gradient sensors. Velocity and acceleration: Accelerometer characteristics – capacitive accelerometers – piezo resistive accelerometers – piezoelectric accelerometers – thermal accelerometers – Gyroscopes – piezoelectric cables –gravitational sensors.

UNIT 4 FLOW SENSORS AND LIGHT DETECTORS 9 Hrs.

Flow sensors: Basics of flow dynamics - Pressure gradient technique - Ultrasonic - Electromagnetic - Breeze - Drag Force sensors - Dust and smoke detectors. Light Detectors: Photodiodes – phototransistor – photo resistors – Cooled detectors – Image sensors – Thermal detectors: Bolometers - Active far-infrared sensors – optical design – gas flame detectors.

UNIT 5 TEMPERATURE AND CHEMICAL SENSORS 9 Hrs.

Temperature Sensors: coupling with objects – temperature reference points – thermo resistive sensors – thermoelectric contact sensors – acoustic temperature sensors – piezoelectric temperature sensors. Chemical sensors: characteristics – classes of chemical sensors – biochemical sensors – multi sensor arrays – electronic noses and tongues. Humidity and moisture sensors.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehend the characteristics of sensors.
CO2 – identify the optical components of sensors.
CO3 - Recognize appropriate motion-related sensors.
CO4 - Use the flow sensors for an application.
CO5 - Learn the thermoelectric sensor and piezoelectric sensor.
CO6 - Realize appropriate temperature and chemical sensors.

TEXT / REFERENCE BOOKS

1. Jacob Fraden, "Handbook of Modern Sensors: Physics - Designs - and Applications",4th Edition , Springer, 2010.
2. Ian Sinclair , "Sensors and Transducers" ,3rd Edition, Elsevier , 2011.
3. John Vetelino and AravindReghu,"Introduction to sensors", CRC Press, 2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: 5 Questions of 6 Marks each – No choice **30 Marks**
PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks **70 Marks**