



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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SCHOOL OF COMPUTING DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING - SPECIALIZATION

1.2.1. List of New Courses Introduced in 2022 -2023

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SCSA1504	BIG DATA ANALYTICS FOR AI	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce the concepts and phases of big data analytics.
- To study the tools required to manage and analyse big data.
- To explore the concept of knowledge representation
- To learn the ability of planning strategies
- To study the learning techniques and logistic regression

UNIT 1 INTRODUCTION TO BIG DATA

9 Hrs.

Introduction - Challenges of Conventional Systems, What is Business Analytics, Business Analytics lifecycle, Why Big Data Analytics, Defining Big data, Characteristics of Big Data(V's), Business Analytics phases: Data Acquisition- Data Cleaning - Data Manipulation - Data Analysis (Statistical and Analytical methods) to make sense of data - Data Visualization

UNIT 2 HADOOP MAPREDUCE

9 Hrs.

Introduction to HADOOP - Hadoop ecosystem components and uses, Hadoop Storage: HDFS, Concept of Hadoop Distributed file system, Design of HDFS, Configuration of HDFS. Hadoop Data Types, large-scale deep belief nets with map reduce - Functional-Concept of Mappers, Functional-Concept of Reducers, MapReduce Execution Framework, Partitioners and Combiners, Hadoop Clusters component: NameNode, Secondary NameNode, and DataNode, Data flow (Anatomy of File Write and Read) - detecting malicious domain using deep Learning at scale.

UNIT 3 KNOWLEDGE REPRESENTATION

9 Hrs.

Issues, predicate logic, resolution, representing knowledge using rules, forward versus backward reasoning, matching, control knowledge, weak slot and filler structure-semantic nets, frames, strong slot - learning curve analysis by logistic regression.

UNIT 4 GAME PLAYING

9 Hrs.

Mini-max search, alpha-beta cutoffs, planning system, goal stack planning, hierarchical planning, understanding as constraint satisfaction, waltz algorithm, natural language processing, syntactic processing - scalable multi- dimensional prediction model.

UNIT 5 LEARNING

9 Hrs.

Rote learning, learning by taking advice, learning in problem solving, learning from examples, winston's learning program, decision trees, perception, vision, speech recognition, navigation, manipulation, robot architecture - data analytics using scalable logistic regression - sentimental classification of bigdata using logistic regression

Max.45 Hours

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand the key issues in big data management

CO2: Acquire various analysing techniques, software tools in big data analytics

CO3: Analyse various AI approaches to solve problems.

CO4: Learn various classification techniques in big data analytics.

CO5: Design models for real world scenarios.

CO6: Design a case study and retrieve the patterns from large data to solve complex tasks.

TEXT/ REFERENCE BOOKS

1. Distributed Databases: Principles and Systems Paperback – 1 Jul 2017 by Stefano Ceri , Giuseppe Pelagatti , McGraw Hill Education, ISBN-10: 0070265119, ISBN-13: 978-0070265110, 2017.
2. Tom White “Hadoop: The Definitive Guide” Fourth Edition, O’reilly Media, 2015
3. Prajapati, V. Big data analytics with R and Hadoop. Packt Publishing Ltd, 2013
4. E.RichK.Knight, and B. Nair, Artificial Intelligence, 3rdEdition, TMH, 1 July 2017
5. RusselNorvig, Artificial Intelligence A modern Approach, 3 rd Edition, Pearson Education,2010

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice **20 Marks**

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks
80 Marks

SCSA1505	HIGH PERFORMANCE COMPUTING	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Parallel Processing.
- To introduce Optimization techniques for serial code.
- To introduce Parallel Computing Paradigms.
- To introduce Parallel Programming using OpenMP and MPI.

UNIT 1 PARALLEL PROCESSING

9 Hrs.

Introduction to Parallel Processing – Levels of Parallelism - SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand- driven Computation – Pipelining.

UNIT 2 OPTIMIZATION TECHNIQUES

9 Hrs.

Introduction to optimization techniques for serial code- scalar profiling-function and line based runtime profiling- hardware performance counters- common sense optimizations- simple measures, large impact-elimination of common sub expressions- avoiding branches- using simd instruction sets- the role of compilers – general optimization options- inlining - aliasing- computational accuracy-register optimizations- using compiler logs- dynamic memory management- loop kernels and iterators data access optimization: balance analysis and light speed estimates- storage order- case study: jacobi algorithm and dense matrix transpose.

UNIT 3 PARALLEL COMPUTERS

9 Hrs.

Introduction Parallel Computers : Taxonomy of parallel computing paradigms-Shared memory computers- Cache coherence- UMA - ccNUMA-Distributed-memory computers- Hierarchical systems- Networks-Basic performance characteristics- Buses- Switched and fat- tree networks- Mesh networks- Hybrids - Basics of parallelization -Why parallelize - Data Parallelism - Function Parallelism- Parallel Scalability- Factors that limit parallel execution- Scalability metrics- Simple scalability laws- parallel efficiency – serial performance Vs Strong scalability- Refined performance models-Choosing the right scaling baseline- Case Study: Load balance.

UNIT 4 PARALLEL PROGRAMMING

9 Hrs.

Distributed memory parallel programming with MPI : message passing - introduction to MPI – example - messages and point-to-point communication - collective communication – non blocking point-to-point communication- virtual topologies - Shared memory parallel programming with OpenMp : introduction to OpenMp - parallel execution - data scoping- OpenMp work sharing for loops- synchronization - reductions - loop scheduling -tasking – Any Case study. **UNIT 5 MPI PROGRAMMING 9 Hrs.**

MPI programming: MPI performance tools-communication parameters- Synchronization, serialization, contention- Reducing communication overhead- optimal domain decomposition- Aggregating messages – Nonblocking Vs Asynchronous communication- Collective Communication-Understanding intra-node point-to-point communication.

Max.45 Hours

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** Understand the concepts of Parallel Processing & Pipelining
- CO2:** Analyze Optimization techniques for serial code.
- CO3:** Understand Parallel Computing Paradigms.
- CO4:** Appreciate the concepts of Parallel Programming.
- CO5:** Identify the performance issues in Parallel Programming using OpenMP
- CO6:** Identify the performance issues in Parallel Programming using MPI.

TEXT /REFERENCE BOOKS

- 1.Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall / CRC Computational Science series, 2011.
- 2.Charles Severance, Kevin Dowd, High Performance Computing, O'Reilly Media, 2nd Edition, 1998.
- 3.Kai Hwang, Faye Alaye Briggs, Computer Architecture and Parallel Processing, McGraw Hill, 1984.

SCSA1506	HUMAN INTERACTION	COMPUTER	L	T	P	Credits	Total Marks
			3	0	0	3	100

COURSE OBJECTIVES

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT 1

9 Hrs.

The Components The Human : Human Memory – Thinking – Emotion – Individual Preferences – Psychology and Design of Interactive Systems. **The Computer :** Text Entry Devices – Pointing Devices – Display Devices – Devices for Virtual Reality and 3D interaction – Physical Controls, Sensors and Special Devices – Memory – Processing and Networks.

UNIT 2

9 Hrs.

HCI in the software process: Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in soft

ware process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design Rules: Introduction – Principles to support usability – Standards – Guidelines – Golden rules and heuristics – HCI patterns

UNIT 3

9 Hrs.

Models and Theories HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements - Communication and collaboration models- Face-toface communication – conversation – text based – group working; Task analysis – difference between other techniques – task decomposition – Knowledge based analysis – ER based techniques –uses

UNIT 4

9 Hrs.

Implementation support: Windowing system elements – using tool kits – user interface management; Evaluation techniques – goals – expert analysis – choosing a method; universal design principles – multimodal interaction; user support – requirements – Approaches – adaptive help systems – designing user support systems.

UNIT 5

9 Hrs.

Web Interface Design: Designing Web Interfaces – Drag and Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow – Case Studies.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course the student would be able to

- CO1:** Design effective dialog for HCI
- CO2:** Design effective HCI for individuals and persons with disabilities.
- CO3:** Assess the importance of user feedback.
- CO4:** Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- CO5:** Develop meaningful user interface.
- CO6:** Analyze and identify user models and the appropriate tools.

TEXT /REFERENCE BOOKS

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education, 2004 (Unit I, II and III).
2. Human Computer Interaction, Springer publications, 2018.
3. Brian Fling, Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009 (Unit -IV)

SCSA2503	BIG DATA ANALYTICS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To configure Big Data Ecosystem
- To work with No SQL Databases
- To process job scheduling
- To analyze and Interpret Data
- To visualize the data insights

LIST OF EXPERIMENTS

1. Data Pre-Processing: Building Good Training Sets
2. Manipulate the Twitter Data Set.
3. Evaluating the results of machine learning algorithms
4. Implement Regression and Correlation Techniques
5. Implement Classification Algorithms
6. No SQL (using Cassandra/MongoDB/Spark)
7. Hadoop – Map Reduce Programs / Commands / Job Scheduling
8. HDFS
9. YARN
10. Working with Pig and Hive
11. Visualization (using Tableau)

COURSE OUTCOMES

On completion of the course the student would be able to

- CO1:** Able to setup Hadoop in a Cloud / Cluster environment
- CO2:** Process and schedule the tasks in the Hadoop platform
- CO3:** To configure nosql databases in the big data ecosystem
- CO4:** Selection of right visualization method based on the intended audience
- CO5:** Creates a dashboard and story

SCSA1508	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	Credit	Total Marks
		3	*	0	3	100

Course Objectives:

- To understand basics of Cryptography and Network Security.
- To understand the concept of Public key cryptography.
- Apply methods for authentication, access control, intrusion detection and prevention.
- Identify and mitigate software security vulnerabilities in existing systems.

UNIT- 1 INTRODUCTION AND MATHEMATICAL FOUNDATIONS

9Hrs

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques. FINITE FIELDS AND NUMBER THEORY: - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms.

UNIT- 2 BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY

9Hrs

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)- Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT- 3 HASH FUNCTIONS, MACS AND DIGITAL SIGNATURE

9Hrs

Message Authentication and Hash Function: Authentication requirements - authentication functions message authentication code - hash functions - birthday attacks - security of hash functions and MACS._MD5 - SHA - HMAC _ CMAC - Digital signature and authentication protocols _ DSS _EIGamal_Schnorr.

UNIT- 4 SECURITY PRACTICE & SYSTEM SECURITY

9 Hrs

Authentication applications _ Kerberos _ X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls _ Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder _ Intrusion detection system _ Virus and related threats _ Countermeasures _ Firewalls design principles _ Trusted systems _ Practical implementation of cryptography and security.

UNIT- 5E-MAIL, IP & WEB SECURITY

9 Hrs

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME.IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management.Web Security: Secure socket layer and transport layer security - secure electronic transaction (SET) - System Security: Intruders - Viruses and related threads - firewall design principals _ trusted systems.

Course Outcomes:

CO1: Understand various Cryptographic Techniques.

CO2: Apply various public key cryptography techniques. **CO3:** Implement Hashing and Digital Signature techniques.

CO4: Understand the various Security Applications.

CO5: Implement system level security applications.

CO6: Describe the principles of the most widely used Internet security solutions.

TEXT / REFERENCE BOOKS

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006. REFERENCES:
2. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.LtdBehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2
4. Douglas Stinson, "Cryptography Theory and Practice", 2nd Edition, Chapman & Hall/CRC.

SCSA1603	BIG DATA ANALYTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

To become familiar with the fundamental concepts of BigData

- To be competent in identifying the challenges in handling large volumes of data
- To propose scalable solutions
- To understand the impact of Big Data in business intelligence, scientific discovery, and in day-to-day life
- To learn the tools and techniques for handling large datasets

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Big Data – Issues and Challenges in the traditional systems - Evolution of Big Data – Four V's of Big Data – Big Data Use Cases and characteristics – Intelligent Data Analysis – Data Analytic Tools – Big Data Storage Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error – Random Sampling.

UNIT 2 BIG DATA TOOLS I

9 Hrs.

Big Data Applications using Pig and Hive – Fundamentals of HBase and ZooKeeper – IBM InfoSphere Big Insights – Introduction to FLUME – KAFKA.

UNIT 3 BIG DATA TOOLS II

9 Hrs.

Introduction to NoSQL - MongoDB – Spark – Cassandra - Cassandra Data Model – Data Design – Cassandra Architecture – Read and Write Data – Clients – Integrate with Hadoop. Introduction - Importance of Effective Data Visualization - Introduction to Tableau - Choosing the Right Chart Type - Using the Color Effectively Reducing Clutter - Dashboard Creation and Formatting.

UNIT 4 HADOOP

9 Hrs.

Introduction to Hadoop – Hadoop Distributed File System – Analysing data with Hadoop – Scaling – Streaming – Clustering: Single Node and Multi Node – Working with Hadoop Commands – Working with Apache Oozie.

UNIT 5 MAP REDUCE

9 Hrs.

Algorithms using map reduce - Matrix-Vector – Multiplication – Word Count - Understanding inputs and outputs of MapReduce, Data Serialization – Introduction to YARN – MapReduce Vs YARN – YARN Architecture – Scheduling in YARN – Fair Scheduler – Capacity Scheduler.

COURSE OUTCOMES

On completion of the course the student will be able to

1. Configure the tools required for setting up Big Data Ecosystem.
 2. Understand conceptually how Big Data is stored and organized.
 3. Use appropriate models of analysis, assess the quality of input, derive insight from results, and investigate potential issues.
-
1. Interpret data findings effectively in visual formats.
 1. Explore the fundamentals of various big data applications.
 1. Implement the Algorithms for data analytics.

TEXT /REFERENCE BOOKS

1. Joshua N. Milligan, “Learning Tableau”, Packt Publishing,2015.
 2. Chuck Lam, “Hadoop in Action”, Manning Publications Co.,2018.
 3. Tom White, “Hadoop the Definitive Guide”, Oreilly, 4th Edition,2015.
 4. Eben Hewitt, “Cassandra: The Definitive Guide”, O’Reilly,2010.
 5. AnandRajaramanandJeffreyDavidUllman,“MiningofMassiveDatasets”,CambridgeUniversityPress,EditionI
, ISBN-10: 1107015359 | ISBN-13: 978-1107015357, 2011.
-
1. JimmyLinandChrisDyer,“Data-IntensiveTextProcessingwithMapReduce”,MorganandClaypoolPublishers,2010.
 1. Jonathan R. Owens, Brian Femiano, and Jon Lentz, “Hadoop Real World Solutions Cookbook”, Packt Publishing, ISBN-10: 1849519129 | ISBN-13: 978-1849519120,2013

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 Questions of 2 marks each-No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks
Marks

80

SCSA1513	TIME SERIES ANALYSIS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- Understand the basic concepts in time series analysis
- Attain knowledge of time series regression
- Gain knowledge of frequently used volatility models
- Understanding the problems arising when analyzing unit root processes
- Gain knowledge of ARIMA modelling of stationary and non stationary time series

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Time Series -Components of a Time Series-Understanding Problem Statements and Data Sets-Exploration and Preprocessing-Modelling Techniques and Evaluation

UNIT 2 STATISTICS BACKGROUND

9

Hrs.

Introduction- Graphical Displays-Numerical Description of Time Series Data (stationarity, auto covariance, autocorrelation)-Use of Data Transformations and Adjustments-General Approach to Time Series Modeling and Forecasting- Evaluation and Monitoring Forecasting Model Performance

UNIT 3 REGRESSION ANALYSIS

9 Hrs.

Introduction-Least Squares Estimation in Linear Regression-Prediction of New Observations-Model Adequacy Checking-Variable Selection Methods in Regression-Generalized and Weighted Least Squares-Regression Models for General Time Series Data

UNIT 4 EXPONENTIAL SMOOTHING METHODS

9

Hrs.

Introduction-First-Order Smoothing-Modeling Time Series Data-Second-Order Exponential Smoothing-Higher-Order Exponential Smoothing-Forecasting-Exponential Smoothing for Seasonal Data-Exponential Smoothers and ARIMA Mode

UNIT 5 AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODELS

9 Hrs.

Introduction-Linear Models for Stationary Time Series-Finite Order Moving Average Processes-Finite Order Autoregressive Processes-Mixed Autoregressive – Moving Average (ARMA)-Nonstationary Processes-Time Series Model Building-Forecasting ARIMA Processes-Seasonal Processes-Final Commentsde

Max. 45 Hours.

COURSE OUTCOMES

On completion of the course the student will be able to

CO 1: Apply the knowledge on real world time series and forecast problems

CO 2: Think critically and analyse problems

CO 3: Information and technology literacy

CO 4: Choose and apply the right smoothing method for the data.

CO 5: Apply of knowledge, skills, and responsibilities to new settings and progressively more complex problems

CO 6: Critically review and evaluate time series models and choose the best modelling approach

TEXT/REFERENCE BOOKS

1. Time Series Analysis Univariate and Multivariate Methods, 2nd Edition, W. W. Wei, 2006, Addison Wesley.
2. Time Series Analysis, J. Hamilton, 1994, Princeton University Press.
3. Time Series Analysis: Theory and Methods, P. Brockwell and R. Davis, 1991, Springer-Verlag.
4. Time Series Analysis and Its Applications with R Examples, Shumway, R. and Stoer, D., 2006, Springer.
5. Introductory Time Series with R (Use R!) 2009th Edition
6. Time Series Analysis and Its Applications: With R Examples (Springer Texts in Statistics) 3rd ed. 2011 Edition
7. Practical Time Series Forecasting with R: A Hands-On Guide [2nd Edition] (Practical Analytics) 2nd Edition by Galit Shmueli (Author), Kenneth C. Lichtendahl Jr (Author)

END SEMESTER EXAM QUESTION PAPER PATTERN

**Max. Marks : 100
Hrs.**

Exam Duration : 3

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks
Marks

80

SCSA2506	BIG DATA LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To learn to build and maintain reliable, scalable, distributed systems with Apache
- To apply Hadoop ecosystem components.
- To set up single and multi-node Hadoop Clusters.
- To solve Big Data problems using Map Reduce Technique.
- To design algorithms that uses Map Reduce Technique to apply on Unstructured and structured data.
- To learn NoSQL query.

LIST OF EXPERIMENTS

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on
2. Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
3. MapReduce application for word counting on Hadoop cluster
4. Lab on Manipulating files in HDFS pragmatically using the FileSystemAPI.Alternative
5. Hadoop File Systems: IBM GPFS, MapR-FS, Lustre, Amazon S3 etc
6. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
7. K-means clustering using map reduce
8. Page Rank Computation
9. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
10. Application of Recommendation Systems using Hadoop/mahout libraries

COURSE OUTCOMES

On completion of the course, student will be able to

1. Install and configure a Hadoop cluster.
2. Apply the MapReduce technique to solve many problems.
3. Manipulate files in HDFS.
4. Query a NoSQL database.
5. Apply the machine learning libraries for big data analysis.
6. Build Recommendation systems using Hadoop and Mahout libraries.

SCSA1509	IMAGE PROCESSING	L	T	P	Credit	Total Marks
		3	0	0	3	100

Course Outcomes:

- To have the ability to describe the basic principles and fundamental concept of Image processing
- To understand and analyze image processing problems and images in frequency domain using various transformation techniques
- To solve image processing problems and meet design specifications by designing algorithms • To evaluate image enhancement, restoration, segmentation and representation techniques
- To categories and interpret various image compression standards and techniques

UNIT 1 INTRODUCTION AND FUNDAMENTALS OF IMAGE PROCESSING 9 Hrs.

Digital Image processing and its origin, Applications of Image Processing, Steps implied in Image processing, Image processing Components. Visual perspective elements, Light and Electromagnetic spectrum, Image Sensing, Image Acquisition, Image Sampling and Image Quantization, Pixels, Introduction to Tools used in Image processing.

UNIT 2 TRANSFORMATION AND FILTERING IN SPATIAL AND FREQUENCY DOMAIN 9 Hrs.

History, Basics of Transformation intensity function, Histogram Processing, Spatial Filtering and its types, Combining enhancement methods, Fuzzy Techniques. Concepts, Sampling and the Fourier Transform of Sampled Function, DFT of one variable, DFT of two variables and its properties, Introduction to Filtering in the Frequency Domain, Image Smoothing and Image Sharpening in Frequency Domain, Selective Filtering.

UNIT 3 IMAGE RESTORATION, RECONSTRUCTION AND COLOR IMAGE PROCESSING 9 Hrs.

Image Degradation/Restoration Process model, Noise models, its restoration and periodic Noise reduction, Linear, Position- Invariant Degradation, Filtering and its types, Image Reconstruction. Fundamentals and Models of Colors, Pseudo Colors, Transformation of Colors, Color Smoothing and Sharpening, Color based image segmentation, Colored Image Noise and Compressing.

UNIT 4 WAVELETS, MULTIREOLUTION PROCESSING AND IMAGE COMPRESSION 9 Hrs.

Multiresolution Expansions, Wavelet Transforms in One Dimension and Two Dimension, Wavelet Packets. Image Compression Fundamentals, Basics of Compression Method, Image Watermarking.

UNIT 5 MORPHOLOGICAL IMAGE PROCESSING AND SEGMENTATION 9 Hrs.

Erosion and Dilation, Opening and Closing, Transformation, Morphological Algorithms, Morphology of Grey Scale Images. Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds, Uses of Motion in Segmentation

MAX. 45 Hrs.

Course Outcomes:

On completion of the course, student will be able to

CO1: Understanding of fundamental concepts & general terminologies in image processing

CO2: Analysing the various types of images, intensity transformations and spatial filtering.

CO3: Image reconstruction and modelling using various filtering techniques

CO4: Transformation of Image in various dimensions and signature storage

CO5: Evaluation of methodologies for image segmentation, restoration etc.

CO6: Apply image processing algorithms in practical applications.

TEXT / REFERENCE BOOKS

1. Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar, Fifth Edition, Tata McGraw Hill Publication, 2015.
2. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Third Edition, Pearson Education, 2008.
3. Digital Image Processing, S Sridhar, Oxford University Press, 2016.
4. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ, 1998.
5. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY, 1992.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSA1510	Mobile Application Development for IoT	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives:

- To Understand the Architectural Overview of IoT
- To Understand the IoT Reference Architecture and RealWorld Design Constraints
- To Understand the various IoT Protocols

UNIT I _OVERVIEW

9 Hrs.

IoT-An Architectural Overview_ Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT II BASIC DESIGN

9 Hrs.

Introduction _ Basics of embedded systems design _ Embedded OS - Design constraints for mobile applications, both hardware and software related _ Architecting mobile applications _ user interfaces for mobile applications _ touch events and gestures _ Achieving quality constraints _ performance, usability, security, availability and modifiability.

Unit III IoT MOBILE APPS

9 Hrs

IoT Mobile App Development Trends In 2020 - Role of Mobile Apps in revolutionizing the world of IoT - UX / UI design for IoT Mobile apps - challenges of UX/UI design for IoT applications - practice tips on design for IoT mobile apps _ IoT App Design Solutions

UNIT IV TECHNOLOGY I _ANDROID

9 Hrs.

Introduction _ Establishing the development environment _ Android architecture _ Activities and views _ Interacting with UI _ Persisting data using SQLite _ Packaging and deployment _ Interaction with server side applications _ Using Google Maps, GPS and Wifi_ Integration with social media applications.

UNIT V TECHNOLOGY II _ANDROID THINGS

9 Hrs.

Android things _ Installation of Android things _ Verification of Android things installation _ API in Android IoT

Setting up the Android things - Building your first IOT-Android application with Android Things
MAX:45Hrs

COURSE OUTCOMES

- CO1:** Able to understand the application areas of IOT
- CO2:** Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- CO3:** Able to understand building blocks of Internet of Things and characteristics.
- CO4:** Understand the concepts of mobile apps used in internet of things
- CO5:** Learn about android application development
- CO6:** Implement mobile application using Android things

TEXT REFERENCES BOOKS

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatios Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
2. Bernd Scholz-
642-19157-2, Springer
3. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

SCSA2504	IMAGE PROCESSING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To perform implementation and design for building basic algorithms in image processing
- To enhance the understanding ability in design and implementation of advance analysis of image processing • To understand image wavering and transformation techniques imposing on original image
- To acquire the ability to morph images using various techniques on the original image

SUGGESTED LIST OF EXPERIMENTS

1. Program to read, show, write, convert rgb to gray / black and white scale convert, histogram generate using, imread(), imshow(),imwrite(), rgb2gray(), imhist(), imadjust() and im2bw()) functions
2. Program on flow control constructs using if statement, switch statement and break statement
3. Program on Loops using for loop, while loop and Vectorize Loops over images
4. Program to perform Point Processing and Pixel Operations
5. Program to perform Image Arithmetic
6. Program to perform Logical operations on Digital Image
7. Program to perform Histogram Calculation and Equalization
8. Program to perform Geometric Transformation
9. Program to perform Image Restoration
10. Program to perform Spatial filters
11. Program to perform Frequency Domain Filtering
12. Program to perform Morphological operations
13. Program to perform Wavelet transform

COURSE OUTCOMES:

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

- CO1:** The process of obtain compliment image from original image
CO2: Implementation of smoothing and averaging filter operation on original image
CO3: Programming controls on image handling
CO4: Understanding on Image wavering and transformation technique
CO5: Advance analysis and basic algorithms handling on Image processing
CO6: Various image morphing techniques on the original image

SCSA2505	Mobile Application Development for IoT Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

Course Objectives:

- To learn how to develop Applications in android environment.
- To learn how to develop mobile app for IoT applications.
- To learn about interfacing with sensor in IoT devices

List of Experiments

1. Create a mobile application for (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
2. Develop an application to perform arithmetic operations.
3. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
4. Build an android app for measuring temperature, pressure and humidity using Raspberry pi.
5. Create an android for Temperature and Humidity Logger Using Raspberry Pi with mySQL.
6. Build an app for simple Led Control With Blynk and NodeMCU Esp8266 12E
7. Create an app for home Automation using ESP8266 & Blynk App – IoT
8. Build an app using NodeMCU for GPS Tracker Blynk App In IOT Platform
9. Build an app using NodeMCU to DHT Interface in Blynk app.
10. Create an app for finding movement detection in Blynk app.

Course Outcomes

- CO1:** To learn about different user interface components in android app development
- CO2:** To know about notification in android app
- CO3:** To learn interfacing with sensor in different IoT boards
- CO4:** To build a mobile app for IoT devices using android
- CO5:** To learn about different types of mobile apps platform for IoT application
- CO6:** To build an application for solving real world problem using different IoT platforms

SCSA1310	INTELLIGENT DATA ANALYTICS	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To acquire knowledge on Data science and its Foundations.
- To explore about the various data process and evaluation methods.
- To understand distinct analysis tools and practice ethical decision and actions.
- To implement methods for big data analytics

UNIT 1 INTRODUCTION

9 Hrs.

Business Intelligence vs Data Science vs Big Data Analytics; Data warehouse; Data mining: Introduction, Knowledge discovery from data, Data pre-processing, Classification, Clustering, Prediction, Association, Recent applications of data mining methods; Decision support system (DSS) and its components; Business intelligence

UNIT 2 PREDICTIVE ANALYTICS

9 Hrs.

Predictive Analytics- Simple linear regression- Multiple linear regressions - Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications

UNIT 3 WEB ANALYTICS

9 Hrs.

Web Analytics – Basics – Traditional Ways – Expectations – Data Collection – Clickstream Data – Weblogs – Beacons – JavaScript Tags –

Packet Sniffing – Outcome's data – Competitive data – Search Engine Data.

UNIT 4 PRIVACY AND DATA SCIENCE

9 Hrs.

Significance of Privacy and Ethics in Application of Data Science; Reidentification of Anonymous People with Big Data, Privacy-preserving data mining algorithms, Data Partitioning and Privacy; Recent research in privacy-preserving data mining

UNIT 5 ETHICS AND RECENT TRENDS

9 Hrs.

Data and Business Insights- Data Science Engineering: - Need of Data Science - Ethics – Doing good data science – Natural Language Processing – Machine Learning Model- Valuing Data privacy – Getting informed consent - The Five Cs – Diversity –Inclusion – Future Trends.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Analyze the key issues in data science and its associated applications in intelligent business and scientific computing CO2: Comprehend and apply the methods of big data analytics.

CO3: comprehend the fundamentals of privacy-preservation in data analytics CO4: Analyze privacy issues on data science applications

CO5: Think through the ethics incorporating privacy, data sharing and decision-making. CO6: Build interactive dashboards for Business.

TEXTBOOK AND REFERENCES

1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman, Mohamed Ali, Manning Publications Co., 1st edition, 2016.
2. Ethics and Data Science, D J Patil, Hilary Mason, Mike Loukides, O' Reilly, 1st edition, 2018.
3. Introduction to Machine Learning with Python-A Guide for Data Scientists, by Andreas C. Mueller, Sarah Guido, O'Reilly; 1st edition, October 2016.

SCSA1311	MACHINE LEARNING FUNDAMENTALS	L	T	P	Credits	Total Marks
		3		0	3	100

COURSE OBJECTIVES

- To understand the need for machine learning and its diverse application.
- To understand the concepts and algorithms of regression and classification models.
- To understand graph models and clustering techniques.
- To understand the ensemble models and its techniques.
- To understand and evaluate the machine learning models built using available techniques.

UNIT 1 INTRODUCTION TO MACHINE LEARNING

9 Hrs.

What is machine learning – Statistics vs. machine learning techniques – Supervised learning – Unsupervised learning – Semi-supervised learning –

Reinforcement learning - Basics: Probability Theory-Linear Algebra.

UNIT 2 DECISION THEORY

9 Hrs.

Statistical Decision Theory: Regression – Classification – Linear regression – Multivariate regression – Logistic regression – Classification predictive modeling – Binary classification – multi-class classification – multi-label classification

UNIT 3 DIMENSIONALITY REDUCTION

9 Hrs.

Dimensionality Reduction – Subset Selection – Shrinkage Methods – Linear Discriminant Analysis – Principal Component Analysis – Separating hyper planes.

UNIT 4 PARAMETRIC ESTIMATION

9 Hrs.

Parameter Estimation – Maximum Likelihood Estimation – Bayesian Parameter Estimation – Support vector Machine – Decision Tree – Naïve Bayes' –

Clustering methods – Partitional Clustering – Hierarchical clustering.

UNIT 5 ENSEMBLE METHODS

9 Hrs.

Ensemble models – Applications of Ensembling – Types and techniques of Ensembling – Evaluation measures – Hypothesis testing – Cross-validation and Hyper parameter optimization – Bootstrapping and Uncertainties

Max.45 Hrs.

COURSE OUTCOMES

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

CO1: Understand the concepts and types of models in machine learning

CO2: Reduce the dimension of the dataset using machine learning techniques CO3: Implement a classification model for any real scenario

CO4: Implement an unsupervised learning application using clustering techniques CO5: Implement the ensemble model

CO6: Implement model evaluations for built machine learning model.

TEXT /REFERENCE BOOKS:

1. Andreas Muller ,Introduction to Machine Learning with Python: A Guide for Data Scientists Paperback – 1 January 2016.
2. AndriyBurkov, The Hundred-Page Machine Learning Book, Publisher: AndriyBurkov, ISBN: 9781999579548, 1999579542, Edition 1,2019
3. Zhi-Hua Zhou, “Ensemble Methods: Foundations and Algorithms”, CRC Press, 2012
4. <https://machinelearningmastery.com/stacking-ensemble-machine-learning-with-python/>
5. <https://sebastianraschka.com/blog/2018/model-evaluation-selection-part4.html>

SCSA1313	ALGORITHMS FOR INTELLIGENT SYSTEMS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To introduce the concepts and techniques of building blocks of Artificial Intelligence and Soft Computing techniques and their difference from conventional techniques.
- To conceptualize Fuzzy Logic and its implementation for various real-world applications.
- To provide the understanding of Genetic Algorithms and its applications in developing solutions to real-world problems.
- To introduce the need and concept of hybrid soft computing algorithms.

Prerequisites: Data Structures & Algorithms, Fundamentals of Mathematics

UNIT 1 FUZZY LOGIC

9 Hrs.

Concepts of uncertainty and imprecision; Concepts, properties and operations on classical sets and fuzzy sets; Classical & fuzzy relations; Membership functions and its types; Fuzzification; Fuzzy rule-based systems; Defuzzification; Fuzzy propositions; Fuzzy extension principle; Fuzzy inference system; Recent applications.

UNIT 2 GENETIC ALGORITHMS

9 Hrs.

Difference between traditional algorithms and Genetic Algorithm (GA); Basic concepts of GA; Working principle; Encoding methods; Fitness function; GA Operators: Reproduction, Crossover, Mutation; Convergence of GA; Detailed algorithmic steps; Adjustment of parameters; Multicriteria optimization; Solution of typical problems using genetic algorithm; Recent applications.

UNIT 3 COLLECTIVE SYSTEMS

9 Hrs.

Ant colony optimization: Ant foraging behavior; Theoretical considerations; Convergence proofs; ACO algorithm; ACO and model-based search; Variations of ACO; Artificial bee colony (ABC) Optimization: Behaviour of real bees, ABC algorithm, Variations of ABC.

UNIT 4 EXPERT SYSTEMS

9 Hrs.

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition - Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

UNIT 5 SWARM INTELLIGENCE

9 Hrs.

Particle swarm optimization: Principles of bird flocking and fish schooling; Evolution of PSO; Operating principles, PSO algorithm, Neighborhood topologies, Convergence criteria, Variations of PSO; Overview of other bio-inspired algorithms: Harmony Search, Honey-Bee Optimization, Memetic Algorithms, Co-evolution.

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 : Apply Fuzzy Logic, the concept of fuzziness and fuzzy set theory in various systems.

CO2 : Apply Genetic Algorithms in problems with self-learning situations that seek global optimum.

CO3 : Apply evolutionary algorithms to optimize solutions for real-world problems.

CO4 : Develop optimized solutions using algorithms like ACO

CO5 : Apply swarm intelligence to develop solutions for real-world problems.

CO6 : Create solutions to real-world problems using Neural Network, Genetic Algorithms, Fuzzy Logic or their Hybrid systems.

TEXT/REFERENCE BOOKS

1. S. Rajasekaran and G. A. VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, PHI.
2. S. N. Sivanandam and S. N. Deepa, Principles of Soft Computing, 2nd ed., Wiley India.
3. J. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House.
4. D. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, AddisonWesley
5. G. Klir, B. Yuan, Fuzzy Sets and Fuzzy Logic: Theory and A: Theory and Applications, Pearson.
6. D. Floreano and C. Mattiussi, Bio-inspired Artificial Intelligence, MIT Press.
7. S. Olariu and A. Zomaya, Handbook of Bioinspired Algorithms and Applications, Chapman

SCSA2306	MACHINE LEARNING APPLICATIONS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- Apply machine learning algorithms to real world problems

SUGGESTED LIST OF EXPERIMENTS:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. Implement Simple Linear Regression
3. Implement Multivariate Linear Regression
4. Implement Logistic Regression
5. Implement Multivariate Logistic Regression
6. Data preprocessing for classification
7. Confusion matrix for a binary classifier.
8. Implement Support Vector Machines.
9. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
10. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
11. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
12. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
13. Implement k-Mean's algorithm to cluster a set of data stored in a .CSV file.
14. Implement Random Forest models for automatic classification
15. Implement Ensemble Model to perform classification.

COURSE OUTCOMES

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

CO1: Understand the implementation procedures for the machine learning algorithms.

CO2: Design python programs for various learning algorithms.

CO3: Apply appropriate data sets to the machine learning algorithms.

CO4: Identify and apply machine learning algorithms to solve real world problems. C

O5: Apply various clustering algorithms for various applications

CO6: Analyze various machine learning algorithms and their applications

SCSA2302	CODE OPTIMIZATION AND DEBUGGING	L	T	P	Credits	Total Marks
	- I	0	0	2	1	50

COURSE OBJECTIVES

- To improve the intermediate code by making it consume fewer resources
- To get the faster running machine code
- To improve the consistency of the code
- To enhance the readability of the code and easier code maintenance
- To improve the work flow of the code

LIST OF EXPERIMENTS

1. Implement Built in Function and Libraries using python
2. Implement Optimizing loop using python
3. Profiling CPU usage using python
4. Profiling memory usage using python
5. Implement query optimization in DBMS
6. Implement heuristics in query optimization in DBMS
7. Implement factorial of given number using memorization in data structure
8. Implement Divide and conquer method in data structure
9. Implement hybrid stable sorting algorithm in data structure
10. Implement linked list with improving the time complexity in data structure

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand importance of code optimization

CO2: Apply time complexity and space complexity of the algorithm for improving optimization. **CO3:** Analyse and appreciate variety of performance measures for various optimization problems

CO4: Learn efficient computational procedures to solve optimization problems

CO5: Be able to use programming languages to implement optimization algorithms

CO6: Be able reduce the execution time of code by applying proper coding

SCSA1314	SENSORS AND INTELLIGENT INSTRUMENTATION	L	T	P	Credits	Total Marks
		2	0	0	2	100

COURSE OBJECTIVES

- To learn the basic knowledge about sensors and instrumentation.
- To understand the different sensors used to measure various physical parameters.
- To understand the concepts of measurement technology.
- To learn the construction and working principles of different types of sensors.
- To analyze the sensor, instrument and measurement situation.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT 1 INTRODUCTION

9 Hrs.

Sensors: Definition, Classification of Sensors, Selection of Sensors, Performance Measures of Sensors, Sensor Calibration Techniques, Sensor Output Signal Types, Static and Dynamic Characteristics of Transducers.

UNIT 2 MOTION, PROXIMITY, RANGING, FORCE, MAGNETIC SENSORS

9 Hrs.

Motion Sensors, Potentiometers, Resolver, Encoders, Optical, Magnetic, Inductive, Capacitive, LVDT, RVDT, Accelerometer, GPS, Bluetooth, Range sensors, RF, Ultrasonic, Laser Range Sensor, Strain-Gage, Load Cell, Magnetic Sensors, Magneto Resistive, Hall Effect, Current Sensor.

UNIT 3 OPTICAL, PRESSURE, TEMPERATURE SENSORS, HEADING SENSORS

9 Hrs.

Photo Conductive Cell, Photo Voltaic, Photo Resistive, LDR, Fiber Optic Sensors, Pressure Sensors, Diaphragm, Piezoelectric, Tactile Sensors, Temperature – IC, Thermistor, Acoustic Sensors, Flow and Level Measurement, Radiation Sensors, Nano Sensors, Laser Sensors, Heading Sensor, Compass, Gyroscope, Inclometers.

UNIT 4 VIRTUAL INSTRUMENTATION

9 Hrs.

Graphical Programming Techniques, Data Types, Advantage of Virtual Instrumentation Techniques, Concept of while, for Loops, Arrays, Clusters and Graphs, Structures, Need of Software-Based Instruments for Industrial Automation.

UNIT 5 INTELLIGENT SENSORS

9 Hrs.

Structure of smart sensors, Application of smart sensors, Components of smart sensors, Characteristics of smart sensors, Self-testing, self-communicating, Self-calibration, Automatic robot control and automobile engine control.

Max. 45 Hrs.

COURSE OUTCOMES

CO1 - Identify the different types of sensors used in real-life applications.

CO2 - Evaluate the performance characteristics of different types of sensors.

CO3 - Use the sensors for converting a physical parameter into an electrical quantity.

CO4 - Comprehend intelligent instrumentation in industrial automation.

CO5 - Apply the various sensors for measurement of pressure, force and displacement.

CO6 - Deploy sensors in the industry for the measurement of temperature, flow level, vibration and accelerometer.

SCSA23 07	SENSORS AND INTELLIGENT INSTRUMENTATION LAB	L	T	P	Credit s	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To Understand the fundamentals and use of various Sensors.
- To understand the working principles of different types of sensors.
- To understand the circuits and Arduino.
- To Deploy various Sensors to measure certain physical parameters.
- To implement the various application using Arduino Software.

LIST OF EXPERIMENTS

1. Voltage and Current detection circuit.
2. Temperature and Pressure detection circuit.
3. Water Level detection circuit.
4. Detect Position using LVDT (Linear Variable Differential Transformers).
5. Detection of Wind Speed using Proximity sensors.
6. Calculating the distance using Distance Sensor (Ultrasonic).
7. Measuring Light Intensity.
8. To Sense the Humidity.
9. To detect the Rainfall using a Rain drop sensor.
10. Detection of Soil Moisture content.
11. Detection of Motion using the motion sensor.
12. Accelerometer sensor.

COURSE OUTCOMES

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

CO1: Remembering the concept of sensors, Arduino and Circuits.

CO2: Able to Identify the different types of sensors used in real-life applications.

CO3: Able to select various hardware devices used for every application.

CO4: Able to Implement various applications using Arduino software.

CO5: Ability to deploy sensors according to the application for the measurement of various parameters.

CO6: To implement various control mechanisms based on the

SCSA1 315	INTRODUCTION TO CRYPTOGRAPHY	L	T	P	Credits	Total Marks
		2	0	0	2	100

COURSE OBJECTIVES

- To Learn about modern Cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them
- To build a Pseudorandom permutation
- To Construct Basic cryptanalytic techniques
- To provide instruction on how to use the concepts of block ciphers and message authentication codes

UNIT 1 INTRODUCTION

9Hrs.

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.

UNIT 2 FORMAL NOTIONS OF ATTACKS

9Hrs.

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model

UNIT 3 RANDOM ORACLES

9Hrs.

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo-random Functions (PRF)

UNIT 4 BUILDING A PSEUDORANDOM PERMUTATION

9Hrs.

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

UNIT 5 MESSAGE AUTHENTICATION CODES

9Hrs.

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes: One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. Formally Analysing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand basic principles of cryptography and general cryptanalysis

CO2: Be acquainted with the concepts of symmetric encryption and authentication

CO3: Use the concept of public key encryption, digital signatures, and key establishment. CO4: Be able to compose, build and analyse simple cryptographic solutions.

CO5: Implement cryptographic schemes

CO6: Be able to use Message Authentication Codes

TEXT /REFERENCE BOOKS

1. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag.
2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)
3. ShaffiGoldwasser and MihirBellare, Lecture Notes on Cryptography, Available at <http://citeseerx.ist.psu.edu/>.
4. OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced Edition Available), Part 1 and Part 23

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration:3 Hrs.

PART A: 10 Questions carrying 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SCSA1 316	BITCOIN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Understand Bitcoin, their needed and why
- Explore the Security and Stability of Bitcoin and Cryptocurrencies
- Learn Bitcoin's Consensus Mechanism and reason about its Security
- Gain a detailed understanding of the World of Blockchain and Virtual Currencies

UNIT 1 Core of Bitcoin

9Hrs.

Introduction - History & Philosophy of Bitcoin - Bitcoin & Ethereum - Bitcoin Core Architecture- Cryptocurrencies - Transactions (Inputs & Outputs & Constraints) - Blockchain - Soft Fork and Hard Fork- Fork categorization - Signalling, & Protocol Overview - Bitcoin Scripting System -Economic Limits of Bitcoin and the Blockchain

UNIT 2 Security Models

9Hrs.

Security Models : Overview of Security Concerns - Bitcoin Threat Models, Bitcoin's Security Mode - Weakness , Speed - Security Trade-offs in Blockchain Protocols - Checkpoints, assume valid, minimum chain work - SPV and Light clients - Committed bloom filters - UTXO - The Onion Model of Blockchain Security- Byzantine Generals Problem - Consensus Algorithms

UNIT 3 Mining

9Hrs.

Block arrivals in the Bitcoin Blockchain - Fee Sniping - Selfish Mining - Poisson Distribution - Poisson Process - Bitcoin's Attack Vectors - Better Hash - No Reward Mining Overview - Pool overview - Pool Hopping - PPS As a Real-World Business Solution - Trustless Pools - Payment Channel Pay-outs - ASIC Boost - BCH Mining / Difficulty Adjustment - Tumble bit - Dust attack

UNIT 4 Consensus Approaches and Cryptography

9Hrs.

Overview - GHOST - Braiding - Bitcoin-NG: A Scalable Blockchain Protocol - Sidechains - Extension Blocks - Replay Protection - Wipeout Protection - 3 Seminal Events In Cryptography - Public Key Cryptography - Finite fields, Elliptic Curves, ECDSA, Schnorr - Bitcoin, Chance and Randomness - Broken Crypto Primitives - State of Cryptography - SNARKs - Bullet proofs - Commitment schemes -Diffie-Hellman Key Exchange - Ring Signatures - RSA

UNIT 5 Transactions

9Hrs.

Raw Bitcoin Protocol - Working with Transactions - Transaction Life Cycle - Transaction Format - Bitcoin Scripting: Transactions & Multisig - Signing transactions - Standardness - Zero-confirmation transactions - Compacted Transactions - Transaction Pools, Bitcoin Peer-to-Peer Network - Mempool - Wallet Development - Hierarchical Deterministic Wallets - Native Descriptor Wallets - Wallet key management

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Learn how the individual components of the Bitcoin protocol make the whole system works: transactions, script, blocks, and the peer-to-peer network

CO2: Understand How using Bitcoin works and different ways of storing Bitcoin keys. CO3: Define how mining can be re-designed in alternative Cryptocurrencies.

CO4: Explain cryptographic building blocks and reason about their security. CO5: Ability to Understand Bitcoin Transactions in Real World.

CO6: Exploit applications of Blockchain in Real World Scenario

TEXT / REFERENCE BOOKS

1. Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain” (2nd edition, 2017),Oreilly& Associates Inc, 978-1491954386 . <https://github.com/bitcoinbook/bitcoinbook>
2. Narayanan, et al., “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction” (2016), Princeton University Press, 978-0691171692 .https://www.lopp.net/pdf/princeton_bitcoin_book.pdf
3. Jimmy Song, “Programming Bitcoin: Learn How to Program Bitcoin from Scratch” (2020), Oreilly& Associates Inc, 978-1492031499. <https://github.com/jimmy song/programmingbitcoin>

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration:3 Hrs.

PART A: 10 Questions carrying 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SITA1 301	PROGRAMMING IN JAVA	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To introduce Object Oriented concepts in Java.
- To understand Packages, Interfaces and Multithreading Concepts.
- To understand lang, io packages.
- To understand the concepts involved internet application development.
- To understand the internet application design using swing controls.

UNIT 1 INTRODUCTION TO JAVA

9 Hrs.

Classes and Objects - Class Fundamentals - Declaring Objects - Methods - Constructors - Garbage Collection. Inheritance - Basics - Using Super - Method Overriding - Abstract Classes - Using final with inheritance. String Handling - String class - String buffer class.

UNIT 2 PACKAGES, INTERFACES AND THREADS

9 Hrs.

Introduction to Packages - User Defined Packages - Importing packages - Access protection - Interfaces - Exception Handling - Exception Types - Using try, catch, throw, throws and finally -Multithreading - Java Thread Model - Main thread - Creating multiple thread - Thread priorities - Synchronization.

UNIT 3 LANG AND IO PACKAGES

9 Hrs.

Java. lang package - Wrapper Classes- Simple type wrappers - Using clone () and the Cloneable Interface -IO Package - Introduction - Input Stream and Output Stream classes - Data Output Stream and Data Input Stream classes -FileInput Stream - File Output Stream. - Reader and Writer Classes - File Reader and File Writer.

UNIT 4 APPLET PROGRAMMING AND EVENT HANDLING

9 Hrs.

Applet Class - Applet basics - HTML APPLET tag - Passing parameters to applets -Delegation Event Model - Handling Mouse and Keyboard Events - Adapter Classes.

UNIT 5 SWINGS AND DATABASE CONNECTIVITY

9 Hrs.

Introduction - JApplet Class- JLabel Control - JTextField Control -JButton Control -JCheckbox Control- JRadioButton Control - J ComboBox Control - JtappedPane Control-J ScrollPane Control - JTable. Introduction -Establishing Connection - Creation of Data Tables - Entering Data into the Tables- Table Updating.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Develop application programs using java object-oriented concepts. CO2: Implement the interface, package and multithread concepts.

CO3: Implement various built-in packages and its applications. CO4: Develop web-based applications using applet programming. CO5: Implement Swing concepts in real time applications.

CO6: Design the internet applications frontend and connect with backend using database connectivity.

TEXT / REFERENCE BOOKS

1. Herbert Schildt , "The Complete Reference JAVA2", 5th Edition, Tata McGraw Hill, 2017.
2. Bruce Eckel , "Thinking in Java", Pearson Education, 4th Edition 2006.
3. Core Java Volume-I Fundamentals, 9th Edition, Cay Horstman and Grazy Cornell, Prentice Hall, 2013.
4. <https://docs.oracle.com/javase/tutorial/>.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration:3 Hrs.

PART A: 10 Questions carrying 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice, each

Marks

SITA2 302	PROGRAMMING IN JAVA LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To implement Object Oriented concepts in Java
- To implement Packages, Interfaces and Multithreading Concepts.
- To develop applications using lang and io packages.
- To design web-based application.
- To design GUI application design using swing controls.

CYCLE -1

1. Write a Java program using Classes and Objects.
2. Write a java Program using various types of Constructors.
3. Implement the concept of following kinds of Inheritance for Employee Application
 - a. Single Inheritance.
 - b. Multilevel Inheritance.
 - c. Hierarchical Inheritance.
4. Write a Java Program to access various members of super class using Super Keyword
5. Write a java program that illustrates the example for abstract class.
6. Write a java program to find area of various shapes using interface.
7. Write a java Program to create custom package to implement calculator operations.
8. Write a java program that describes the exception handling mechanism.
9. Write a java program that describes the user defined exception.
10. Write a program to create thread by extending Thread Class or by implementing Runnable Interface.
11. Write a java program to create copy of a given object using iClonable interface.

CYCLE2

12. Write a Java Program to implement Wrapper classes and their methods.
13. Write a java program for handling input and output operations using,
 - a. Input Stream and Output Stream classes
 - b. Reader and Writer Classes Data Output Stream
 - c. Data Input Stream classes.
14. Write a java program that describes the life cycle of an applet.
15. Write a java program to pass parameters to Applet and display the output.
16. Write a java program for event handling using awt controls
17. Write a Java program to handle Mouse and Key events
18. Create a Java Application Programming Interface by using swing controls
19. Write a java program for database connectivity using JDBC.

COURSE OUTCOMES:

On completion of the course the student will be able to

- CO1: Ability to implement application programs using java object-oriented concepts
- CO2: Able to implement interface, package and multithread concepts
- CO3: Understand various built-in packages and its applications
- CO4: Knowledge on designing web-based applications using applet programming
- CO5: Create applications using swing controls in real time applications.
- CO6: Able to connect frontend and backend using database connectivity.

.SCSA1317	PRIVACY AND SECURITY IN ONLINE SOCIAL MEDIA	L	T	P	Credits	Total marks
		3	0	0	3	100

COURSE OBJECTIVES

- To discuss about privacy in social networks
- To Study the different encryption system in social network
- To know the importance of K-Anonymity
- To Understand the types of attacks against individuals' privacy.
- To discuss the privacy preserving for users.

UNIT 1 ANALYSIS OF PRIVACY IN SOCIAL NETWORKS

9 Hrs.

Three-Layered Framework-Characteristics Used to Analyze Social Web Privacy-Privacy Issues Related to Social Web Users-Privacy Issues Related to Service Providers-Security and Privacy for Digital Facets-Identifiable Facets-Private Facets.

UNIT 2 ENCRYPTION FOR PEER-TO-PEER SOCIAL NETWORKS

9 Hrs.

Essential Criteria for the P2P Encryption Systems-Existing P2P OSN Architectures-Evaluations of Existing Encryption Schemes Based on Our Criteria- Broadcast Encryption-Predicate Encryption-Survey of Unethical Behaviour-Influencing factors.

UNIT 3 STEALING REALITY AND K-ANONYMITY

9 Hrs.

Stealing Reality- Social Attack Model- Social Learnability- k-Anonymity- k-Degree Anonymity- k-Neighbourhood Anonymity- k-Automorphism- k- Isomorphism-L-diversity- Attack Model and Privacy Guarantee- Insights from an ℓ -Diversified Graph- Anonymization Techniques.

UNIT 4 LINKS RECONSTRUCTION ATTACK AND BITCOIN SYSTEM

9 Hrs.

Privacy in Social Networks- Link Prediction- Feature Extraction- Communities Datasets- Electronic Currencies- Anonymity- The Bitcoin System- The Transaction Network- The User Network- Anonymity Analysis- Integrating Off-Network Information- The Bitcoin Faucet- Voluntary Disclosures- TCP/IP Layer Information- Context Discovery- Flow and Temporal Analyses.

UNIT 5 PRIVACY-PRESERVING DATA INTEGRATION USING DECOUPLED DATA

9 Hrs.

Use Case and the Threat Model- Use Case for Private Record Linkage- Use Case for Privacy-Preserving Record Linkage- Threat Model for Privacy- Preserving Record Linkage- Record Linkage- Privacy-Preserving Computation- Information and Privacy- Sensitivity and Identifiability- A Model for Privacy-Preserving Record Linkage- Decoupled Data Access Model- Social Security Numbers- Need for Chaffing.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand the concepts of privacy in social network. CO2: Apply the Different encryption techniques.

CO3: Know How to Steal and Attack social model CO4: Understand the importance of Bitcoin System.

CO5: Analyze the privacy preserving for decoupled data. CO6: Develop the use case model for privacy preserving.

TEXT / REFERENCE BOOKS

- 1. YanivAltshuler, Yuval Elovici, Armin B. CremersNadavAharony, Alex Pentland,” Security and Privacy in Social Networks”.**
- 2. Privacy and Security in Online Social Media course in NPTEL.**

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions carrying 2 marks each – No choice

20 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SCSA1 318	FORENSICS AND INCIDENT RESPONSE	L	T	P	Credit s	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To define an incident relating to Cyber Security.
- To recognize an Incident
- To analyze protocols on Crime Scene Investigations.
- To understand Computer Crime Scenarios.

UNIT 1 INCIDENT RESPONSE DEFINITIONS

9 Hrs.

Definitions of incident response and forensic analysis, relation of incident response to the rest of cyber security operations, incident response phases - preparation, identification, containment, eradication, recovery, follow-up, indicators of compromise (IOC)

UNIT 2 INCIDENT WORKFLOWS

9 Hrs.

Incident workflows, guidelines, incident handling forms, principles of malware analysis, log analysis, threat intelligence, vulnerability management, penetration testing, digital forensics, incident ticketing systems, incident documentation templates. Identification: Detection, incident triage, information gathering and reporting, incident classification, indicators of compromise (IOC)s.

UNIT 3 INCIDENT RESPONSE AND HANDLING PROCESS

9 Hrs.

Incident Response and Handling Process, Identification, Incident Recording, Initial Response, Communicating the Incident, Containment, formulating a Response Strategy, Incident Classification, Incident Investigation, Data Collection, Forensic Analysis, Evidence Protection, Notify External Agencies, Eradication, System Recovery, Incident Documentation, Incident Damage and Cause assessment, Review and Update the Response Policies

UNIT 4 TECHNICAL FORENSICS TOOLS AND TECHNIQUES

9 Hrs.

Hard disks, removable media and file systems, Windows forensics, duplication/imaging of forensic data, recovering deleted files and hidden or deleted partitions, steganography and image forensics, log analysis, password crackers, network device forensics, packet capture analysis, email tracking, mobile forensics, investigation of attacks, common tools (Encase, FTK, etc.)

UNIT 5 BUSINESS CASE STUDY AND LECTURE:

9 Hrs.

Lecture by invited experts from the cyber security industry, including law enforcement. Discussion normally focuses on the practicalities and challenges of incident response and the ways in which forensic analysis contributes to successful cybercrime prosecutions.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Acquire and analyse live response data from compromised systems. CO2: Analyse memory for evidence of a compromise.

CO3: Analyse file system and operating system artifacts CO4: Understand evidence tools of a compromise.

CO5: Evaluate and apply tools and common processes. **CO6:** Performing analysis of compromised systems

TEXT/ REFERENCE BOOKS

1. Jason T. Luttgens and Matthew Pepe," Incident Response & Computer Forensics, O'reilly, Third Edition" 2014
2. Eighton Johnson," Computer Incident Response and Forensics Team Management: Conducting a Successful Incident Response", 2014.
3. John Sammons," The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics", Elsevier, August 2011.
4. Cory Altheide and Harlan Carvey," Digital Forensics with Open-Source Tools", Imprint Press, 2011.
5. David Lilburn Watson and Andrew Jones," Digital Forensics Processing and Procedures",2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit with internal choice

SCSA2308	CRYPTOGRAPHY AND NETWORK SECURITY LAB	L	T	P	Credits	Total marks
		0	0	4	2	100

COURSE OBJECTIVES

- To Implement basic encryption and decryption Techniques.
- To Implement discrete logarithm problems.
- To understand the concepts of public key Encryption.
- To Implement various Identification Protocol.
- To Implement different Signature Scheme.

SUGGESTED LIST OF EXPERIMENTS

1. Perform the encryption and decryption using following techniques: I) shift cipher, ii) affine cipher and iii) vignere cipher
2. Implement the Euclidean algorithm for polynomials
3. Implement the following discrete logarithm problem: I) Baby-step giant-step algorithm and ii) Pohlig-Hellman algorithm
4. Implement the following modes of operations of block cipher: i) Electronic Code Book (ECB) Mode, ii) Cipher Block Chaining (CBC) Mode and iii) Cipher Feedback (CFB) Mode
5. Implement the following Public-key Encryption:
 - i) RSA, ii) ElGamal public-key encryption and iii) Merkle-Hellman knapsack encryption
6. Implement the unkeyed hash function based on MD4
7. Implement the following Advanced attacks on hash functions:
 - i) Birthday attacks, ii) Pseudo-collisions and compression function attacks and iii) Chaining attacks
8. Implement Feige-Fiat-Shamir identification protocol
9. Implement GQ identification protocol
10. Implement Schnorr identification protocol
11. Implement Rabin one-time signature scheme
12. Implement Merkle one-time signature scheme
13. Implement Authentication trees and one-time signatures
14. Implement GMR one-time signature scheme

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand the basic concepts of Encryption and Decryption Techniques.

CO2: Remembering the concepts of Polynomial.

CO3: Able to implement the public key encryption

CO4: Understand the concepts of attacks using hash methods

CO5: Apply the concepts of identification protocol

CO6: Able to apply and implement various signature scheme



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

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SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Minutes of Meeting

Date: 26.5.2022

Time: 10.00 AM

Mode: Physical

Venue : Senate Hall, VC Office

Agenda:

- Seeking approval for syllabus and course delivery plan of Design thinking and innovation – a common course in 3rd Semester for all programs of the engineering streams.
- Introducing new courses in the 3rd semester for the following specialization streams from the year 2021 onwards.
 - B.E Computer Science and Engineering With Specialization In **Artificial Intelligence And Machine Learning**
 - B.E Computer Science and Engineering With Specialization In **Artificial Intelligence& Robotics**
 - B.E Computer Science and Engineering With Specialization In **Blockchain Technology**
 - B.E Computer Science and Engineering With Specialization In **Cyber Security**
- Introducing new courses in the 5th semester for the following specialization streams from the year 2021 onwards.
 - B.E Computer Science and Engineering With Specialization In **Artificial Intelligence**
 - B.E Computer Science and Engineering With Specialization In **Data Science**
 - B.E Computer Science and Engineering With Specialization In **IoT**
- Updating the course contents of SCSA1319 Design Thinking and Innovations for the B.E Computer Science and Engineering With Specialization in **Artificial Intelligence , Data Science, IoT** from the batch 2021-2025 onwards.

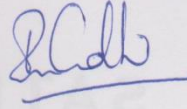
Minutes

- The BOS meeting was convened on 26th May, 2022 to introduce the new courses and updated the existing course with updated syllabus in the School of Computing for the Regulation 2019 and Regulation 2021.
- The Dean, Dr.T. Sasikala greeted and welcomed all the Board of Studies members. The HOD of CSE and the faculty members of the School of Computing attended the meeting and interacted with the expert members.
- Dr.T. Sasikala, the Dean, gave a brief overview of the school's history and the many courses available. The Dean went on to outline the syllabus revision process by listing the many processes that were taken in developing the new syllabus.
- The HOD presented the curriculum and syllabus designed for the regulations 2019.
- The new 3rd semester courses had been prepared for the following programmes and placed before the panel for their approval:
 - B.E. CSE with specialization in Artificial Intelligence and Machine Learning
 - B.E. CSE with specialization in Artificial Intelligence and Robotics
 - B.E. CSE with specialization in Blockchain Technology
 - B.E. CSE with specialization in Cyber Security

The new 5th semester courses had been prepared for the following programmes and placed before the panel for their approval:

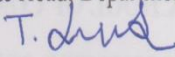
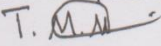
- B.E. CSE with specialization in Artificial Intelligence
- B.E. CSE with specialization in Data Science
- B.E. CSE with specialization in Internet of Things
- In order to improve students' problem-solving, analytical, and spatial thinking abilities, the SCSA1319 Design Thinking and Innovations theory course is converted into a practical course and placed before the panel for their approval.
- Suggestions were received from the experts during the BOS meeting held on December, 2021 and their valuable suggestions were considered while framing the syllabus.
- The contents of the syllabus for each subject was discussed in detail and taking into consideration the relevance to the latest technologies.
- Dr.T.G.Sambanthan commended the inclusion of lab-intensive courses in all semesters and gave advice on how to run the course effectively.
- Mr.Ajay suggested that industry experts be brought in and that special sessions be held to incorporate functional programming.
- A collective suggestion from the Alumni was to include new courses that would help students improve project based learning from 3rd semester onwards.
- All the external members appreciated the updates made in the above courses.

Convener: Dr. T.Sasikala, Dean School of Computing

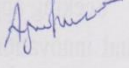


External Members:

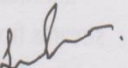
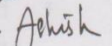
Academic Expert

- Dr.T.G. Sambanthan, Professor & Head, Department of Computer Science & Engineering NITTTR, Chennai. 
- Dr. T. T. Mirmalinee, Professor and Head, Department of Computer Science and Engineering, SSN College of Engineering, Chennai. 

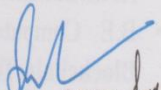
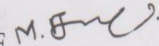
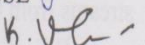
Industry Experts

- Dr.V. Sankaran, Program Manager, Engineering and R&D Services, HCL Technologies 
- Mr. Ajay Kumar, CTO, Cognibot Robotics, Chennai. 

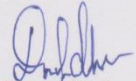
Alumni

- Mr. Johnson S, Project Test Manager, TCS , Chennai. 
- Mr. Ashish Chopra, Senior BDE, Freshworks, Chennai. 

Internal Members:

- Dr. S. Vigneshwari , HoD, Department of CSE 
- Dr R Sathyabama, Associate Professor, Department of CSE 
- Dr S Sreeji, Assistant Professor, Department of CSE 
- Mr B Sathiyaprasad, Assistant Professor, Department of CSE 
- Ms V Subapriya Assistant Professor, Department of CSE 
- Dr K Veena Assistant Professor, Department of CSE 




Dean -SoC

Dr. T. SASIKALA
Professor & Head
School of Computing
Sathyabama Institute of Science and Technology
Chennai - 600 076

SITA3007	COMPUTATIONAL INTELLIGENCE	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To know the scope of computational intelligence and the type of agents.
- To study the perceptron and learning techniques
- To explore the concept of fuzzy rules and systems
- To learn the steps in genetic algorithm
- To study the ant colony and swarm optimization algorithm

UNIT 1 ARTIFICIAL INTELLIGENCE 9 Hrs.

Introduction - Foundations of AI - History of AI - Intelligent agent - Types of agents - Structure - Problem solving agents - Uninformed and informed search strategies.

UNIT 2 ARTIFICIAL NEURAL NETWORKS 9 Hrs.

Basic concepts - Single layer Perceptron - Multilayer Perceptron - Supervised and Unsupervised learning -deep learning algorithms - Back propagation Networks - Performance Issues.

UNIT 3 FUZZY SYSTEMS 9 Hrs.

Introduction to fuzzy- Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy Functions - Decomposition - Fuzzy rules and inferences - Fuzzy decision making - deep learning architecture for Fuzzy logic.

UNIT 4 GENETIC ALGORITHMS 9Hrs.

Survival of the fittest - Fitness Computations - Cross over- Mutation - Reproduction - Rank method - Rank Space method.

UNIT 5 SWARM INTELLIGENCE 9 Hrs.

Particle swarm optimization - Global PSO- Local PSO - Ant colony Optimization - Simple Ant Colony - Ant System - feature selection of logistic regression. - Max, Min Ant System.

Max. 45 Hours

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** Understand the search strategies in AI
- CO2:** Analyse the performance issues of learning techniques
- CO3:** Solve a problem with fuzzy logic and rule out the inferences
- CO4:** Optimize continuous and discrete functions and multi objective problems
- CO5:** Design models for real world scenarios.
- CO6:** Design a case study and optimize the results

TEXT / REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, “ Artificial Intelligence A Modern Approach ”, 3rd Edition, Pearson Education, 2010
2. Elain Rich & Kevin Knight, Artificial Intelligence, Third edition,Tata McGraw

SITA3010	NATURAL LANGUAGE PROCESSING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To learn the fundamentals of natural processing
- To understand the way to measure one or more qualities of an algorithm or a system
- To gain knowledge of the linguistics concerned with the interactions between computers and human.
- To get acquainted with the algorithmic description of the main language levels that include morphology, syntax and semantics.

UNIT 1 OVERVIEW AND LANGUAGE MODELLING

9 Hrs.

Overview: Origins and challenges of NLP Language and grammar-Processing Indian Languages- NLP Applications Information Retrieval. Language Modeling: Various Grammar- based Language Models- Statistical Language Model.

UNIT 2 WORD LEVEL ANALYSIS

9Hrs.

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT 3 SYNTACTIC ANALYSIS

9 Hrs.

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT 4 INFORMATION RETRIEVAL AND LEXICAL RESOURCES

9 Hrs.

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net-Stemmers-POS Tagger- Research Corpora.

UNIT 5 DISCOURSE ANALYSIS AND LEXICAL RESOURCES

9 Hrs. Discourse

segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Max.45 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand NLP problems and survey the literature about that problem

CO2: Understand language modeling

CO3: Describe automated natural language generation and machine translation

CO4: Learn the natural language generation.

CO5: Analyze and compare the use of different statistical approaches for different types of NLP applications.

CO6: Ability to select a suitable language modelling technique based on the structure of the language.

TEXT / REFERENCE BOOKS

1. Richard M Reese, —Natural Language Processing with Java, OReilly Media, 2015.
2. Natural language processing in AI-Brojo Kishore Mishra,Rahavendrakumar, Apple academy press, 1st edition,2020.
3. Nitin Indurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition,Chapman and Hall/CRC Press, 2010.
4. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language

SCSA1605	ROBOTICS AUTOMATION AND SIMULATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- ☐ To learn the fundamental concepts of Robotics automation process
- ☐ To introduce basic concepts of various dynamics processes
- ☐ To understand the effect of various power sources and sensors.
- ☐ To impart knowledge on the manipulators, grippers and robot dynamics
- ☐ To implement a real time Robot with the support of available programming languages

UNIT 1 BASIC CONCEPTS 9 Hrs.

Origin & various generation of Robots - Robot definition - Robotics system components - Robot classification
Coordinate frames - Asimov's laws of robotics - degree of freedom - dynamic stabilization of robots.- work volume. Need for Automation - types of automation - fixed, programmable and flexible automation.

UNIT 2 POWER SOURCES AND SENSORS 9 Hrs.

Hydraulic, pneumatic and electric drives - determination of HP of motor and gearing ratio - variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging - laser - acoustic - magnetic, fiber optic and tactile sensors.

UNIT 3 MANIPULATORS, ACTUATORS, GRIPPERS and ROBOT DYNAMICS 9 Hrs.

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits - end effectors - various types of grippers - design considerations. Introduction to Robot Dynamics - Lagrange formulation - Newton Euler formulation - Properties of robot dynamic equations.

UNIT 4 KINEMATICS AND PATH PLANNING 9 Hrs.

Forward Kinematics – DenavitHartenberg Representation. multiple solution jacobian work envelop, Inverse Kinematics - Geometric approach. Hill climbing techniques.

UNIT 5 PROGRAMMING LANGUAGES AND APPLICATIONS 9 Hrs.

Robot programming - Fixed instruction, sequence control, General programming language, Specific programming languages. Robots for welding, painting and assembly - Remote Controlled robots - robots in manufacturing and non-manufacturing applications - Robots for nuclear and chemical plants.

Max. 45 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Comprehend the concepts of Robotics automation process

CO2: Criticize the laws of robotics and identify the types.

CO3: Integrate different types of sensors for industrial applications

CO4: Apply the AI techniques in Automation process to make the Robot as intelligent.
CO5: Simulate Real time Automated Robot for Industrial applications.
CO6: Create an AI based Robot for any real time applications.

TEXT / REFERENCE BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., “Industrial Robotics”, McGraw-Hill Singapore, 2011.
2. Ghosh, “Control in Robotics and Automation: Sensor Based Integration”, Allied Publishers, Chennai, 1998.
3. Deb.S.R., “Robotics technology and flexible Automation”, John Wiley, USA 2017.
4. Asfahl C.R., “Robots and Manufacturing Automation”, John Wiley, USA 2013.
5. Klafter R.D., Chimielewski T.A., Negin M., “Robotic Engineering - An integrated approach”, Prentice Hall of India, New Delhi, 1994.
6. McKerrow P.J. “Introduction to Robotics”, Addison Wesley, USA, 1991.
7. Bruno Siciliano, OussamaKhatib, Springer Handbook of Robotics, Springer publishing company, 2016 ISBN:9783319325507

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100 Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice 20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

SCSA1606	PREDICTIVE AND ADVANCED ANALYTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- ☐ To learn the concepts and applications of data mining
- ☐ To understand and prepare the data
- ☐ To study the model development techniques.
- ☐ To explore the Automated Models for Categorical and Continuous targets
- ☐ To analyse the performance in different models

UNIT 1 INTRODUCTION TO DATA MINING INTRODUCTION 9 Hrs.

what is Data Mining? Concepts of Data mining, Technologies Used, Data Mining Process, KDD Process Model, CRISP – DM, Mining on various kinds of data, Applications of Data Mining, Challenges of Data Mining.

UNIT 2 DATA UNDERSTANDING AND PREPARATION 9 Hrs.

Introduction, Reading data from various sources, Data visualization, Distributions and summary statistics, Relationships among variables, Extent of Missing Data. Segmentation, Outlier detection, Automated Data Preparation, Combining data files, Aggregate Data, Duplicate Removal, Sampling DATA, Data Caching, Partitioning data, Missing Values.

UNIT 3 MODEL DEVELOPMENT & TECHNIQUES 9 Hrs.

Data Partitioning- Model selection, Model Development Techniques, Neural networks, Decision trees, Logistic regression, Discriminant analysis, Support vector machine, Bayesian Networks, Linear Regression, Cox Regression, Association rules.

UNIT 4 MODEL EVALUATION AND DEPLOYMENT 9 Hrs.

Introduction, Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, MetaLevel Modeling

UNIT 5 DEPLOYING MODEL 9 Hrs.

Assessing Model Performance, Updating a Model, Bias, Variance, and model complexity, Bias-variance trade off, Optimism of the training error rate, Estimate of In-sample prediction error

COURSE OUTCOMES

Upon completion of the course the students will be able to

CO1: Understand the process of formulating business objectives, data selection/collection

CO2: Successfully design, build, evaluate models

CO3: Implement predictive models for various business application.

CO4: Compare the underlying predictive modeling techniques.

CO5: Select appropriate predictive modeling approaches to identify cases to progress with.

CO6: Deploy model and assess the performance

TEXT / REFERENCE BOOKS

1. Predictive & Advanced Analytics (IBM ICE Publication).
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman , The Elements of Statistical Learning-Data Mining, Inference, and Prediction ,Second Edition , Springer Verlag, 2009.
3. C.M.Bishop –Pattern Recognition and Machine Learning, Springer, 2006
4. L.Wasserman-All of statistics

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice
from each unit with internal choice, each carrying 16 marks

20 Marks PART B : 2 Questions
80 Marks

SCSA2603	ROBOTICS AUTOMATION AND SIMULATION LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- ☐ To introduce different types of robotics and demonstrate them to identify different parts and components.
- ☐ To learn the fundamentals of Robot program to perform various operations
- ☐ To model and simulate a Robot with pick and place operations.
- ☐ To Map the simulated robot into real world applications
- ☐ To Design a simple robot to recognize the individual components to assemble industrial applications.

LIST OF EXPERIMENTS

1. Determination of maximum and minimum position of links.
2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
3. Estimation of accuracy, repeatability and resolution.
4. Robot programming and simulation for pick and place
5. Robot programming and simulation for Color identification
6. Robot programming and simulation for Shape identification
7. Robot programming and simulation for machining (cutting, welding)
8. Robot programming and simulation for writing practice
9. Robot programming and simulation for any industrial process (Packaging, Assembly)
10. Robot programming and simulation for multi process.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Comprehend the concept of Robotics programming

CO2: Criticize basic concepts about Robot operations

CO3: Apply and implement various Robot operations through simulation

CO4: Analyze Robot programs for industrial applications

CO5: Design a Robot to perform machining operations.

CO6: Create a AI Robot to perform the task navigation, sense and calculate their reaction.

SCSA2604	NATURAL LANGUAGE PROCESSING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Understanding the morphological of a word by analysing it.
- Learn how to generate words from root
- Tag the different parts of speech.
- Perform sentiment analysis for the data.
- To understand the concept of chunking.

SUGGESTED LIST OF EXPERIMENTS

1. Word Analysis
2. Word Generation
3. Text classification
4. Semantic Analysis
5. Sentiment Analysis
6. Parts of Speech tagging
7. Chunking

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** To use appropriate tools for word and text analysis.
- CO2:** Examine and acquire a broad understanding of text data.
- CO3:** Analyze the semantics of a text document.
- CO4:** Perform sentiment analyzes on a document.
- CO5:** Tag the different parts of speech.
- CO6:** Implement an NLP project in a business environment

SITA3005	SOCIAL NETWORK ANALYSIS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behavior in social web and related communities.
- To learn mining in social network communities.
- To learn visualization of social networks.

UNIT 1 INTRODUCTION

9Hrs.

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web Social Network Analysis: Social Networks Perspective - Analysis of Network Data –Key concepts and measurements in network analysis-Interpretation of Network Data - Social Network Analysis in the Social and Behavioral Sciences - Metrics in social network analysis.

UNIT 2 SOCIAL NETWORK ANALYSIS SOFTWARE, TOOLS AND LIBRARIES

9Hrs.

Modelling and aggregating social network data: Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data –(Advanced representations) Multi-Relational characterization of dynamic social network communities -Social network analysis software - Tools - Libraries.

UNIT 3 CLIQUES, CLUSTERS AND COMPONENTS

9Hrs.

Components and Sub graphs: Sub graphs - Ego Networks, Triads, and Cliques, Hierarchical Clustering, Triads, Network Density and conflict. Density: Egocentric and Sociocentric - Digression on Absolute Density - Community structure and Density, Centrality : Local and Global - Centralization and Graph Centres, Cliques and their intersections, Components and Citation Circles - Positions, Sets and Clusters.

UNIT 4 PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES

9Hrs.

Development of Social Network Analysis - Understanding and predicting human behavior for social communities - User data management - policy, legal, and technical challenges. Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT 5 VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

9Hrs.

Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Modeling and aggregating social network data -Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks.

COURSE OUTCOMES

On completion of the course the student will be able to

1. An ability to identify metrics used in network analysis.
2. An ability to classify the network related data's.
3. Identify the aim of graph in computational models.
4. Apply the knowledge in predicting the user behaviors.
5. Visualization of a social network using tools.
6. Ability to analyze metrics in social network analysis.

TEXT/REFERENCE BOOKS

1. Jeffrey C Johnson, Martin G Everett, Stephen P Borgatti - Analyzing Social Networks –sage publication- 2013.
2. GuandongXu ,Yanchun Zhang and Lin Li,-Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.
3. Dion Goh and Schubert Foo,-Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.

SCSA1611	DATA VISUALIZATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the basic concepts of Data visualization.
- To develop skills for data visualization and analysis.
- To learn the various clustering techniques and predictive modeling techniques for data visualization.
- To understand the concepts of visualization of volumetric data.
- To learn the various tools used in effective visualization of data.

UNIT 1 INTRODUCTION TO DATA VISUALIZATION 9 Hrs.

Data Visualization: Basic Concepts- Data preparation- Stages in data mining - Principles of Perception, Color, Design, And Evaluation, Text Data Visualization, Interactivity and Animation, Temporal Data Visualization- Exploratory Data Analysis.

UNIT 2 DATA VISUALIZATION METHODS 9 Hrs.

Univariate Data Visualization: Bar Chart, Histograms, Frequency Polygram, Box Plots, Dot Plots - Bivariate Data Visualization - Multivariate Data Visualization: Histogram Matrix, Scatter plots Matrix, Multiple Box Plot and Trellis Plot -Visualizing Groups - Dynamic Techniques-Text and narrative Visualization.

UNIT 3 CLUSTERING AND PREDICTIVE MODELING 9 Hrs.

Distance Measures - Agglomerative Hierarchical Clustering - Partition Based Clustering - Fuzzy Clustering. Predictive Modeling- Scatter Plots - ROC Charts - Lift Charts.

UNIT 4 VISUALIZATION OF VOLUMETRIC DATA 9 Hrs.

Vector Fields – Processes and Simulations – Visualizations of Maps – Geographic Information –GIS Systems – Collaborative Visualizations – Evaluating Visualizations.

UNIT 5 VISUALIZATION TOOLS AND APPLICATIONS 9 Hrs.

Visualization Tools: Google Chart, Google Map API, MS Excel, Power Bi and D3(Data Driven Documents)- Designing Information Dashboards -Applications: Science, Medicine and Bioinformatics.

Max. 45 Hours

COURSE OUTCOMES

On completion of the course the student will be able to

CO 1: Explain the data visualization concepts.

CO 2: Plot various data visualization graphs.

CO 3: Apply the appropriate clustering technique to the given data.

CO 4: Apply visualization techniques for various data analysis tasks.

CO 5: Use the different tools for effective data visualization.

CO 6: Designing information dashboards.

TEXT/REFERENCE BOOKS

1. Glenn J Myatt, Wayne P. Johnson, “Making sense of Data - A practical guide to data visualization, advanced mining methods and applications”, 1st Edition, Wiley, 2009.
2. Tom Soukup and Ian Davidson, “Visual Data Mining: Techniques and Tools for Data Visualization and Mining”, 1st Edition, John Wiley & Sons, 2002.
3. George and Roger L. Berger (2002), Statistical Inference, 2nd edition. Interactive Data Visualization for the Web, Scott Murray, O'Reilly (2013)
4. R for Data Science: Visualize, Model, Transform, Tidy, and Import Data Hadley Wickham (Author), Garrett Grolemund (Author) O'Reilly Media; 1 edition
5. **The R Book, 2nd Edition Michael J. Crawley.**
6. Beautiful Visualization By Julie Steele, Noah Iliinsky Publisher: O'Reilly Media.
7. **Beginning Google Maps API 3 by Gabriel Svennerberg.**

.END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam

Duration: 3 Hrs.

PART A: 10 question of 2 marks each – No choice

20 Marks

PART B: 2 questions from each unit of internal choice, each carrying 16 marks

80 Marks

SCSA2607	DATA VISUALIZATION LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Learn to use Open Source data visualization tools
- Understand the techniques used in visualization.
- To create data visualizations with the available data.
- To think critically about each design decision
- To build and evaluate visual systems.

LIST OF EXPERIMENTS

Creating Visual Representations using MS Excel , Power BI, D3 (Data Driven Documents)

1. Study various charts and usages. Prepare the report for the same.
2. Plotting the Graph: Bar chart, Pie Chart, Histogram etc.,.
3. Load the data set (excel and .csv) into the software and find the central tendency of the different columns.
4. Draw line chart for the selected columns and report the understanding of the data.
5. Draw Box plot and report the Q1, Q2, Q3 ranges and identify the outliers.
6. Plot different charts and format the chart using colours, mentioning legends etc.,
7. Load data set and choose any one of the numeric column. Apply forecasting technique.
8. Create dynamic charts.
9. Implement filters.
10. Create an interactive dashboard for the given data set.
11. Create the dashboard and collate the different sheets.
12. Create story board and collate the dashboards.
13. Prepare, analyse and present geographic data.
14. Develop reactive webpages for narrative data storytelling.

Case Study:

- Students performance dashboards
- Creating sales dashboard
- Social media usage dashboards

COURSE OUTCOMES

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

1. Transform data into visually appealing graphics
2. Using visualisation, perform exploratory data analysis.
3. Create effective visual systems for efficient communication.
4. Evaluate the effectiveness of visualization designs
5. Model and test color palettes based on perception theories for visualisation.
6. Use vision and awareness information to determine alternatives to visualization design.

SCSA1 607	IoT AND MULTIMEDIA TECHNOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand IoT and Multimedia communication
- To learn guaranteed service model.
- To learn communication protocols that is frequently used in IoT ecosystems.
- To explore the study of Embedded internet
- To study about application of real time multimedia network applications.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Multimedia Big Data Computing for IoT-Energy Conservation in Multimedia Big Data Computing and the Internet of Things-A Challenge- An Architecture for the Real time Data Stream Monitoring in IoT-Deep Learning for Multimedia Data in IoT.

UNIT 2 GUARANTEED SERVICE MODEL

9 Hrs.

Switched Networks and Shared media Networks _ Circuit Switching, Packet Switching and Virtual Circuits _ Flow Control and Congestion Control _Best Effort Service Model and Its Limitations _Qos Metrics _Diffserv and Intserv Networks _ Queuing Techniques _ WFQ and Its Variants _ RED _Qos Aware Routing _ Call Admission Control _ RSVP _ Policing and Traffic Shaping Algorithms _ Multicast Routing _ IGMP, Protocol Independent Multicast _ PIM SM and PIM DM Variants.

UNIT 3 MULTIMEDIA TRANSPORT

9 Hrs.

End To End Solutions _ Laissez Faire Approach _ Multimedia over TCP _ Significance of UDP _ Multimedia Streaming _ Audio and Video Streaming _ Accessing Audio And Video from a Web Server And Media Server _ Removing Jitter at the Receiver _ Recovering from Packet Loss _ Forward Error Correction and Interleaving _ Interactive And Non-Interactive Multimedia _ Transcoding _ RTSP _ RTP/RTCP.

UNIT 4 EVOLUTION OF EMBEDDED INTERNET

9 Hrs.

Introduction-Mobile Crowdsensing-Perspective Protocol stack for wireless-WSNs and IoT-M2M Communications and Embedded Internet-Nano networks and IoT-Principles for FI Architecture-Physical Layer-Aware Network Architecture- Information-Centric Networking-Streaming of Scalable video for FI Media Search and Retrieval in FI-FI Self-Management Scenarios

UNIT 5 APPLICATION ENVIRONMENT

9 Hrs.

Recent advancements in multimedia big data computing for IoT applications in Precision Agriculture-Network based applications of multimedia big data computing in IoT Environment- H.322 Standard _ Protocol Stack And Call Setup _ Session Initiation Protocol

_ Components, Messages And Operation_ Supporting Protocols For SIP _ Media Gateway Access Protocol, Resource Reservation Protocol, Session Description Protocol _ Hardware Standards _Scibus and S.100 _ Case Study _ Video Conferencing _ Military Surveillance _ Interactive TV _ Video On Demand _ Smart Phone.

MAX. 45 Hrs.

COURSE OUTCOMES:

CO1: Understand the IoT technique

CO2: Deploy the right multimedia communication models.

CO3: Apply QoS to multimedia network applications at the end system level with efficient scheduling and routing techniques.

CO4: Understand Embedded Internet

CO5: Learn about different protocols used in multimedia in IoT

CO6: Develop the real-time multimedia network applications.

TEXT / REFERENCES BOOKS:

1. Sudeep Tanwar, Tyagi, Neeraj Kumar, "Multimedia Big Data Computing for IoT Applications". Mario Marques da Silva, "Multimedia Communications and Networking", CRC Press, 2012.
2. K. R. Rao, Zoran S. Bojkovic, Bojan M. Bakmaz, "Wireless Multimedia Communication Systems: Design, Analysis and Implementation", CRC Press, 2017.
3. Jim Kurose, Keith Ross, "Computer Networking: A Top Down Approach", Pearson Education, 2017.
K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "Introduction to Multimedia Communications Applications, Middleware, Networking", John Wiley and Sons, 2009
Fred Halsal, "Multimedia Communications: Applications, Protocols and Standards", Pearson Education, 2002.
4. William Stallings, "High speed networks and Internets: Performance and Quality of Service", Pearson Education,
- 5.

6END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 Questions of 2 marks each-No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 16 marks **80 Marks**

SCSA1608	IoT IN BIG DATA ANALYTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

Course Objectives:

- To understand data analytics for IoT applications
- To discuss the classification algorithms for big data analytics • To elaborate various prediction and clustering algorithms
- To analyse real time IoT applications

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to data analytics for IoT, IoT Applications, Type of sensor, Attributes and Data types, Data pre-processing, , Statistical descriptions of Data, Handling missing Data, Data sampling

UNIT 2 INTRODUCTION TO BIG DATA

9 Hrs.

Big Data and its Importance – Four V's of Big Data – Drivers for Big Data Technologies Hadoop's Parallel World –

Data discovery – Open source technology for Big Data Analytics – cloud and Big Data – Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and TransFirewall Analytics - Information Management.

UNIT 3 CLASSIFICATION

9 Hrs.

Definition of Classification, Decision tree Induction, Attribute Selection measures, Issues: Over-fitting, tree pruning methods, missing values, continuous classes, Classification and Regression Trees (CART), Bayesian Classification: Bayes Theorem, Naïve Bayes classifier, Bayesian Networks, Linear classifiers, Least squares, SVM classifiers, Lazy Learners (or Learning from Your Neighbors)

UNIT 4 PREDICTION AND CLUSTERING

9 Hrs.

Prediction: Definition of Prediction Linear regression, Non-linear regression, Logistic regression

Clustering: Clustering types: Partitioning Methods, Hierarchical Methods, Distance Measures in Algorithmic Methods, Density Based Clustering.

UNIT 5 PERFORMANCE EVALUATION

9 Hrs.

Performance Measures: Precision, recall, F-measure, confusion matrix, cross-validation, bootstrap.

Case Studies: Health Care Analytics, Tele medicine, Smart Campus, Intelligent Gym, Weather Prediction, time series modeling

MAX. 45 Hrs.

COURSE OUTCOMES:

CO1: Analyse various data produced by IoT Applications

CO2: Describe big data technologies

CO3: Develop classification algorithms for data analysis
CO4: Implement prediction and classification algorithms
CO5: Evaluate algorithms using measures

CO6: Design solutions for the real time problems

TEXT / REFERENCE BOOKS

1. Michael Minelli, Michele Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1

stEdition, IBM Corporation, 2012

3. Ian H. Witten, Eibe Frank Data Mining: Practical Machine Learning Tools and Techniques, Elsevier/(Morgan Kaufman), ISBN:9789380501864
4. Introduction to Data Mining (2005) By Pang-Ning Tan, Michael Steinbach, Vipin Kumar Addison Wesley ISBN: 0-321-32136- 7
5. [Research-Papers]: Some of the relevant research papers that contain recent results and developments in data analytics field

SCSA1609	Java Programming for IoT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of structure of Java language
- To identify the various OOPs properties with Java.
- To understand the various exceptions and multithreading used in Java.
- To analyse various events handling methods and layout models.
- To make students aware of various socket programing methods to communicate with IoT devices.

UNIT 1 JAVA BASICS & IoT

9 Hrs.

Concepts of OOP, Features of Java, How Java is different from C++, Environmental setup, Basic syntax, Objects and classes, Basic Data Types, Variable Types, Modifier Types, Basic operators, Loop Control, Decision Making, Strings and Arrays, Methods, I/O. Java support with IoT.

UNIT 2 JAVA OBJECT ORIENTED

9 Hrs.

Inheritance, Overriding, Polymorphism, Abstraction, Encapsulation, Interfaces, Packages, Exploring java.util package.

UNIT _3 EXCEPTIONS HANDLING AND THREADING

9 Hrs.

Exception Hierarchy, Exception Methods, Catching Exceptions, Multiple catch Clauses, Uncaught Exceptions Java's Built-in Exception. Creating, Implementing and Extending thread, thread priorities, synchronization suspending, resuming and stopping Threads, Multi-threading.

UNIT- 4 JAVA DEVELOPMENT ENVIRONMENT FOR IOT

9 Hrs.

Introduction to Java SE 8 - NetBeans IDE and Raspberry Pi- -Embedded Applications- Java ME 8 Platform Overview- Java ME Configurations- CDC and CLDC- . Building Java ME IMlets Programs- IMlet- IMlets Components-Creating and Deploying IMlets-Java ME 8 Security-MIDP Architecture-Embedded Permissions Overview-QTA Installation Status. CLDC Overview : CLDC 8 Architecture:CLDC Library Updates-Vector Casting- Hashtable-Stack-Streams-InputStream- OutputStream-ByteArrayStream-Data Streams- Character Streams-CLDC Thread Management-Controlling Timers

UNIT- V APPLICATION MANAGEMENT WITH IOT

9 Hrs.

Application Management System - Different ways of Using Java Runtime on Raspberry Pi Board- Command Line Interface to Raspberry Pi- AMS-CLI Commands- Creating notifications with PushRegistry: PushRegistry-Registering a Connection- Listing and Receiving Connections-Push registry Permissions-SMS-Based Activation-Alarm Registration

Max. 45 Hrs.

COURSE OUTCOMES

On Completion of the course, student will be able to

CO1 - Understand the fundamentals of Java programs and its structure

CO2 - Recognize the support of object oriented programming

with Java language **CO3** - Apply the concepts of Exceptions

and multithreading for different applications **CO4** - Analyze

various IoT application using Java Development Environment

CO5 - Evaluate the working models of IoT application using Java ME

CO6 - Create IoT solutions using Java

TEXT / REFERENCE BOOKS

1. Herbert Schildt , "The Complete Reference JAVA2", 5 th Edition, Tata McGraw Hill, 2017.
 2. Bruce Eckel , "Thinking in Java", Pearson Education, 4 th Edition 2006.
 3. Core Java Volume-I Fundamentals, 9th Edition, Cay Horstman and Grazy Cornell, Prentice Hall, 2013.
 4. <https://docs.oracle.com/javase/tutorial/>. 5. <https://www.tutorialspoint.com/java/>.
 5. Stephen Chin, Raspberry Pi with Java: Programming the Internet of Things (IoT) (Oracle Press) 1st Edition, McGraw-Hill Education 2015
- UNIT 1 JAVA
BASICS & IoT

SCSA2605	Java programming for IoT Lab	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To implement Object Oriented concepts in Java.
- To implement Packages, Interfaces and Multithreading Concepts.
- To develop applications using lang and io packages.
- To design web based application.
- To design IoT based applications using Java

List Of Experiments:

1. Using Classes and Objects.
2. Inheritance
 - 2.1. Single Inheritance.
 - 2.2. Multilevel Inheritance.
 - 2.3. Hierarchical Inheritance.
3. Packages and Interfaces
 - 3.1. Import package.*;
 - 3.2. Import package.classname;
 - 3.3. Fully Qualified name.
4. Input and Output
 - 4.1 Input Stream and Output Stream classes
 - 4.2 Reader and Writer Classes
 - 4.3 Data Output Stream and Data Input Stream classes.
5. Design a Calculator using J2ME
6. Configure GPIO input and Output pin.
7. Develop the application to read environment temperature using Temperature sensor and display it.
8. Write a program for reading sensor values from a Light sensor which is wired to Arduino board, and Arduino board connected via USB cable to Raspberry Pi
9. Build an application to measure the distance between objects using the Ultrasonic sensor.
10. Building a Raspberry Pi Project Using Motion sensor or PIR sensor to identify the presence of object.

COURSE OUTCOMES:

On completion of the course the student will be able to

- CO1:** Ability to implement application programs using java object oriented concepts
- CO2:** Able to implement interface, package and multithread concepts
- CO3:** Understand various built in packages and its applications
- CO4:** Knowledge on designing IoT applications using java programming
- CO5:** Learn about Interfacing of sensor in IoT boards.
- CO6:** Create real time IoT applications.

SCSA2606	IoT IN BIG DATA ANALYTICS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES:

- To implement various big data tools
- To analyse different classification algorithms • To use the visualization tools
- To experiment with the real time applications

LIST OF EXPERIMENTS:

1. Install, configure and run Hadoop and HDFS
2. Implement word count/ frequency programs using MapReduce
3. Implement MapReduce program that processes a weather dataset
4. Collect sensor data from any real time application and apply preprocessing techniques
5. Collect sensor data and do Prediction using linear regression
6. Collect sensor data and Implement Support Vector Machine
7. Collect sensor data and Implement Decision tree classification technique
8. Collect sensor data and Implement clustering algorithm
9. Visualize data using visualization techniques
10. Model Time series data
11. Implement an application that stores big data in Hbase/ MongoDB/ Pig
12. Implement an application for predicting air pollution level using gas sensors.

COURSE OUTCOMES:

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

- CO1:** Process big data using Hadoop framework
- CO2:** Apply pre-processing techniques
- CO3:** Perform data analysis using machine learning methods
- CO4:** Visualize data using visualization techniques
- CO5:** Use Hbase/ MongoDB/Pig for big data processing
- CO6:** Build a Prediction model for different dataset.

SCSA3015	DEEP LEARNING	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To present the mathematical, statistical and computational basis of neural networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Introduction to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

UNIT 2 DEEP NETWORK

9 Hrs.

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

UNIT 3 DIMENSIONALITY REDUCTION

9 Hrs.

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.

UNIT 4 OPTIMIZATION AND GENERALIZATION

9 Hrs.

Optimization in deep learning– non-convex optimization for deep networks- Stochastic Optimization- Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT 5 CASE STUDY AND APPLICATIONS

9 Hrs.

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection-BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions. **Max.45 Hours**

COURSES OUTCOMES

On completion of the course the student will be able to

CO1: Understand basics of deep learning

CO2: Implement various deep learning models

CO3: Realign high dimensional data using reduction techniques **CO4:** Analyze optimization and generalization in deep learning **CO5:** Explore the deep learning applications

CO6: Design and creation of data models

TEXT/REFERENCE BOOKS

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

SITA3008	INTERNET OF THINGS	L	T	P	Cre dits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Internet of Things
- To identify the various elements of an IoT System.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.
- To identify types of data analytics and data visualization tools.
- To make students aware of security concerns and challenges while implementing IoT solutions.

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 & Actuators - Edge Networking (WSN) – Gateways - IoT Communication Model – WPAN & 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.

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UNIT 4 DATA ANALYTICS AND IOT PLATFORM

9 Hrs.

Big Data Analytics, Apache Hadoop, Using Hadoop MapReduce 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 - To learn and understand the technology and current trends in Internet of things.

CO2 - To understand the various elements of IoT system and hardware devices.

CO3 - To learn the programming languages and platforms for building IoT applications.

CO4 - To understand the cloud computing and its relevance for developing IoT applications.

CO5 - To design and implement IoT applications that manages big data with data analytics and visualization tools.

CO6 - To implement hands-on projects using an appropriate software and hardware devices in various applications.

TEXT / REFERENCE BOOKS

1. The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi.
2. Architecting the Internet of Things, Springer publications. Author(s): Dieter Uckelmann, Mark Harrison, Florian Michahelles.

SCSA1406	INTRODUCTION TO ROBOTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- The objective of this course is to impart knowledge about industrial robots for their control and design.
- Learn to design a robot with minimum operations
- Understand various robotic controls and sensors

UNIT 1 INTRODUCTION TO ROBOTICS

7 Hrs.

Types and components of a robot, Classification of robots, closed-loop and open- loop control systems - Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.

UNIT 2 ROBOT KINEMATICS AND DYNAMICS

9 Hrs.

DenavitHartenberg parameters, Forward Kinematics, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation

UNIT 3 SENSORS AND VISION SYSTEM

9 Hrs.

Controller software and sensor inputs, basic sensor-based controls, demining operations. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/Similarity/Affine/Projective transformations Vision applications in robotics.

UNIT 4 ROBOT CONTROL

9 Hrs.

Basics of control: Transfer functions, Control laws: P, PD, PID Non-linear and advanced controls

UNIT 5 ROBOT ACTUATION SYSTEMS

11 Hrs.

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators - Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 : Perform kinematic and dynamic analyses with simulation.

CO2 : Design control laws for a robot.

CO3 : Integrate mechanical and electrical hardware for a real prototype of robotic device.

CO4 : Select a robotic system for given application.

CO5 : Identifying Robot actuation system operations

CO6 : Apply steps of designing simple robots for applications

TEXT/REFERENCE BOOKS

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 2006.

SBAA1408	ECONOMICS FOR ENGINEERS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To enable students to understand the fundamental micro and macro-economic concepts applicable to engineering;
- To learn the techniques of estimation, planning and policies in economic decision making.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction to Economics - Concept of Engineering Economics – Law of Demand & Law of Supply – Determinants of Demand & Supply – Elasticity of demand - Concept of Utility – Law of diminishing marginal utility – Equi-Marginal Utility – consumer's Surplus analysis – Indifference Curve Approach – Budget Line – Consumer's Equilibrium

UNIT 2 PRODUCTION, COST ANALYSIS AND PRICING

9 Hrs.

Production function – returns to scale – production optimization – least cost input – Isoquants – Managerial uses of production function. Cost concepts – cost function – Determinants of cost – Short run and long run cost curves – Cost output decisions – Estimation of cost - Pricing under different market structures – price discrimination – pricing methods in practice.

UNIT 3 MONEY, BANKING AND TRADE

9 Hrs.

Money- nature and functions – Inflation and Deflation – Kinds of Banking – commercial banks – Central banking – Credit instrument - Monetary Policy – International trade – Balance of trade and Balance of Payments – taxation – Direct and Indirect taxes – GST- Impact and Incidence of tax- Concept of National Income – Features with reference to developing countries.

UNIT 4 PLAN AND POLICIES FOR ECONOMIC GROWTH IN INDIA

9 Hrs.

Brief overview of post-independence period – plans – Five years plans and its role on Economic growth - Role of Industry in economic development - Industrial Policies in India – New Economic Reforms - New industrial Policy – MSME - concept of unemployment - concept of poverty - concept of urbanization.

UNIT 5 ESTIMATION

9 Hrs.

Estimation of Material – Labor and Overhead Cost – Allocation of Overheads – Estimation for different types of jobs - Use of relevant Indian Standard Specifications - Bar bending Schedules – Mass haul Diagrams – Estimating Earthwork and Foundations – Estimating Concrete and Masonry – Finishes – Interiors – MEP works – BIM and quantity take-offs.

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses

CO2: Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.

CO3: Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

CO4: Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.

CO5: Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.

CO6: Be able to understand how competitive bidding works and how to submit a competitive bid proposal.

TEXT/REFERENCE BOOKS

1. V. Mote, S. Paul, G. Gupta (2004), Managerial Economics, Tata McGraw Hill
2. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
3. Paul A Samuelson and William D Nardhaus, Economics, McGraw Hill International Edition
4. M Chakravarty, Estimating, Costing Specifications & Valuation Relevant Indian Standard Specifications.
5. Dutta, B.N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers, 2016
6. Barthwal R R, Industrial Economics – An Introductory Text Book, New Age International Pvt Ltd, 2000.
7. PanneerSelvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.
8. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012

SAIC4003	UNIVERSAL HUMAN VALUES	L	T	P	Credits	Total Marks
		2	1	0	3	100

COURSE OBJECTIVES

- To develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence
- To understand (or developing clarity) the harmony in the human being, family, society and nature/existence
- To strengthen self-reflection
- To develop commitment and courage to act

MODULE 1: COURSE INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

MODULE 2: UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

MODULE 3: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN- HUMAN RELATIONSHIP

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in

relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss scenarios. Elicit examples from students' lives.

MODULE 4: UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO-EXISTENCE

17. Understanding the harmony in the Nature

18. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and value in nature

19. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

20. Holistic perception of harmony at all levels of existence.

Practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

MODULE5: IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

21. Natural acceptance of human values

22. Definitiveness of Ethical Human Conduct

23. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

24. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

25. Case studies of typical holistic technologies, management models and production systems

26. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

27. Sum up.

Practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions at the conduct as an engineer or scientist etc.

TOTAL: 28 LECTURES AND 14 PRACTICE SESSIONS

COURSE OUTCOMES

By the end of the course, students are expected

- To become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind
- They would have better critical ability
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society)
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

TEXT BOOK

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

ASSESSMENT:

Assessment by faculty mentor	: 10 marks
Self-assessment	: 10 marks
Assessment by peers	: 10 marks
Socially relevant project/Group Activities/Assignments:	20 marks
Semester End Examination	: 50 marks

SCSA2407	IOT AND ROBOTICS LAB	L	T	P	Credits	Total Marks
		0	0	2	1	100

COURSE OBJECTIVES

- To identify the different technologies and different platforms in IoT
- To understand how to use sensors and actuators for design of IoT.
- To identify the components used for Robot design
- To understand how to integrate sensors and actuation of a robot.

SUGGESTED LIST OF EXPERIMENTS

1. Monitor the soil moisture level using Raspberry pi.
2. Monitor the surrounding air's quality using Arduino & sensors connected to a Raspberry Pi.
3. Implement Raspberry Pi as a local server by installing Apache, PHP, and MySQL.
4. Interface PIR sensor with ESP8266 WIFI module on NodeMCU platform.
5. Posting temperature and humidity of the environment to Thing speak cloud service using NodeMCU.
6. Study components of a real robot and its DH parameters.
7. Forward kinematics and validate using a software (RoboAnalyser or any other frees ofware g46tool).
8. Inverse kinematics of the real robot and validation using any software.
9. Use of open-source computer vision programming tool OpenCV.
10. Image Processing using OpenCV.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 :** Remember the concept of IoT components for implementing real time application
- CO2 :** Understand basic concepts about the hardware kits Arduino& Raspberry Pi and supported software.
- CO3 :** Remember the concept of Robotics design
- CO4 :** Understand programming structure for implement Robot operations
- CO5 :** Apply and implement various Robot enabled image processing applications
- CO6 :** Design simple robots for primitive applications

SCSA2408	DL WITH TENSOR FLOW AND KERAS	L	T	P	Credits	Total Marks
		0	0	4	2	100

Course Objectives

- To understand complexity of Deep Learning algorithms and their limitations.
- Capable of confidently applying common Deep Learning algorithms in practice and implementing their own;
- Capable of performing experiments in Deep Learning using real-world data.

SUGGESTED LIST OF EXPERIMENTS:

1. Install TensorFlow and tf.keras
 1. What Are Keras and tf.keras?
 2. How to Install TensorFlow
 3. How to Confirm TensorFlow Is Installed
2. Deep Learning Model Life-Cycle
 1. The 5-Step Model Life-Cycle
 2. Sequential Model API (Simple)
 3. Functional Model API (Advanced)
3. How to Develop Deep Learning Models
 1. Develop Multilayer Perceptron Models
 2. Develop Convolutional Neural Network Models
 3. Develop Recurrent Neural Network Models
4. How to Use Advanced Model Features
 1. How to Visualize a Deep Learning Model
 2. How to Plot Model Learning Curves
 3. How to Save and Load Your Model
5. How to Get Better Model Performance
 1. How to Reduce Overfitting With Dropout
 2. How to Accelerate Training With Batch Normalization
 3. How to Halt Training at the Right Time With Early Stopping
6. How to classify images using the following Convolutional Neural Networks models pre-trained on the ImageNet dataset with Python and the Keras deep learning library
 1. AlexNet
 2. VGGNet
 3. ResNet
 4. Inception

Course Outcomes

On completion of the course the student will be able to

- CO1: Understand the concepts of TensorFlow, its main functions, operations and the execution pipeline
- CO2: Build deep learning models in TensorFlow and interpret the results
- CO3: Troubleshoot and improve deep learning models
- CO4: Build own deep learning project
- CO5: Differentiate between machine learning, deep learning and artificial intelligence
- CO6: Apply Deep learning concepts and provide solutions for

SCSA2402	CODE OPTIMIZATION AND DEBUGGING- II	L	T	P	Credits	Total Marks
		0	0	2	1	50

COURSE OBJECTIVES

- To analyze the programming logic and apply the appropriate design approach
- To optimize the speed of the program by using proper utilization of available memory
- To make use of performance tools for tracking the application.
- To have a capacity to analyze and design software systems, components to meet desired needs
- To have a working ability and grasping attitude to design and conduct object-oriented analysis

LIST OF EXPERIMENTS

1. Implement minimum heap allocation in java
2. Implement string builder in java
3. Implement concurrency control using java
4. Checking the current log level using java
5. Implement Garbage collection using java
6. Implement grid line in object oriented analysis and design
7. Implement grid with two sets of diagonal lines in object oriented analysis and design
8. Implement concurrency in object oriented analysis and design
9. Implement design optimization for removing non usable associations in object oriented analysis and design
10. Implement sparing and storing derived attributes associations in object oriented analysis and design

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand the impact of performance hits during application runtime.

CO2: Implement optimal functions for improving the performance

CO3: Analyze the proper utilization of memory for code

CO4: Design experiments using UML, as well as to analyze and evaluate their models

CO5: Discussing and understanding analysis and design heuristics that are involved in the course

CO6: Students will learn and understand how to map one style of diagrammatic notations into another.

SCSA1404	FOUNDATION OF ARTIFICIAL INTELLIGENCE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the various characteristics of intelligent agents
- To learn the different search strategies in AI.
- To understand the knowledge in solving AI problems.
- To learn the concepts of learning and communication in AI.
- To know about the various applications of AI.

UNIT 1 INTRODUCTION AND PROBLEM SOLVING

9Hrs.

Introduction – Foundations of AI – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information.

UNIT 2 INFORMED SEARCH AND GAME PLAYING

9Hrs.

Informed search – Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem – Local Search in continuous space – Genetic algorithm – Optimal decisions in games - Pruning - Imperfect decisions – Alpha-Beta pruning – Games that include an element of chance.

UNIT 3 KNOWLEDGE AND REASONING

9Hrs.

Knowledge based agent – The Wumpus world environment – Propositional logic – Inference rules – First-order logic – Syntax and semantics – Situation calculus – Building a knowledge base – Electronic circuit domain – Ontological Engineering – Forward and backward chaining – Resolution – Truth maintenance system-Mental Events and Mental Objects.

UNIT 4 ACTING LOGICALLY

9Hrs.

Planning – Representation of planning – Partial order planning – Planning and acting in real world – Acting under uncertainty – Bayes's rules – Semantics of Belief networks – Inference in Belief networks – Making simple decisions – Making complex decisions.

UNIT 5 APPLICATIONS

9Hrs.

AI applications – Language Models – Information Retrieval- Information Extraction –Fields of Natural Language Processing, Chatbots and its types ,Artificially Intelligent Chatbots, Introduction to Chatbot Applications(Retrieval based- Conversation based)-Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

Max.45 Hours

COURSE OUTCOMES

CO1: An ability to identify, analyze the search algorithm for the AI problems.

CO2: Represent a problem using first order logic.

CO3: Provide the knowledge-based agent to solve the problem.

CO4: Understand the Informed search strategies.

CO5: Apply the baye's rule to solve the problem for societal concern.

CO6: Design user centric applications that use AI concepts

TEXT / REFERENCE BOOKS

1. Stuart J.Russel, Peter Norvig, "Artificial Intelligence A Modern Approach ", 3rdEdition, Pearson Education, 2009.
2. Elaine Rich, Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009.
3. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., First Edition, 2008.
4. Artificial Intelligence: Foundations of Computational Agents, 2nd Edition,David L. Poole and Alan K.Mackworth,2010
5. Introduction to Artificial Intelligence ,Ertel, Wolfgang, 1stEdition ,2017

SCSA1410	CYBER THREATS FOR IOT AND CLOUD	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of IoT and its applications.
- To identify the various security issues in IoT platforms
- To learn about role of cloud computing in IoT.
- To Provide knowledge and overview about security in cloud.
- To make students aware of various security techniques in cloud.

Unit 1 IoT and Applications

9 Hrs.

Introduction & Application to Internet of Things: The Internet of Things, Importance of IoT, Towards the IoT Universe IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, IoT Smart X Application: Smart Cities, Smart Energy & Smart Grid, Smart Mobility & transport, Smart Home, Smart Building & Infrastructure, Smart Factory & Manufacturing.

Unit 2 Privacy, Security & Governance

9 Hrs.

IoT Security Requirements -Data Confidentiality -Data Encryption -Data Authentication -Secured Access Control -IoT-Vulnerabilities - Secret-Key, Authentication/Authorization for Smart Devices - Constrained System Resources -Device Heterogeneity -Fixed Firmware. IoT Attacks -Side-channel Attacks

-Reconnaissance -Spoofing -Sniffing -Neighbour -Discovery -Rogue Devices-Man-in-Middle attack.

Unit3 IoT and Cloud

9 Hrs.

Connecting IoT to Cloud: Introduction to cloud computing, Difference between Cloud Computing and IoT, Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT. Living on the Edge, Connecting IoT to cloud, Cloud Storage for IoT. Cloud-to-Device Connectivity, Challenge in integration of IoT with Cloud.

Unit 4 Cloud Security

9 Hrs.

Cloud Computing Software Security Fundamentals: Cloud Information Security Objectives, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements. Cloud Computing Risk Issues: Privacy and Compliance Risks, Threats to Infrastructure, Data, and Access Control, Cloud Service Provider Risks.

Unit 5 Security Techniques

9 Hrs.

Cloud Computing Security Challenges: Security Policy Implementation, Virtualization Security Management, VM Security Recommendations, VM-Specific Security Techniques. Cloud Computing Security Architecture: Architectural Considerations, Identity Management and Access Control, Autonomic Security.

Max. 45 Hrs.

COURSE OUTCOMES:

On completion of the course the student will be able to

CO1: Analyse the IoT model and different platforms

CO2: Recognize the IoT security and vulnerability threats. CO3: Understand the next evolution of cloud computing CO4: Analyse the connectivity of IoT to cloud computing CO5: Evaluate the risk issues and threats in cloud computing

CO6: Analyse the security techniques and access control methods

TEXT/REFERENCE BOOKS:

1. Arshdeepbahga and Vijay Madiseti,” Internet of Things”, Global paperback edition, 2016.
2. Kris Jamsa, Cloud Computing, Jones & Bartlett,2012.
3. WiemTounsi,” Cyber-Vigilance and Digital Trust: Cyber Security in the Era of Cloud Computing and IoT”, Wiley,2019.
4. Russell Dean Vines and Ronald L. Krutz, Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Wiley India Pvt Ltd, 2010.
5. Barrie Sosinsky, Cloud Computing Bible, Wiley India,2011.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration:3 Hrs.

PART A: 10 Questions carrying 2 marks each - No choice

20 Marks

SCSA1411	BLOCKCHAIN ARCHITECTURE DESIGN AND USE CASES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To learn blockchain basics and primitives along with architecture
- To understand how to consensus, work along with design goals.
- To build Hyperledger fabric A & B.
- To apply use cases like KYC, Financial blockchains.
- To create privacy and security policy and cryptography schemes

UNIT 1 Introduction to Blockchain

9Hrs.

Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain to Blockchain, Basic consensus mechanisms.

UNIT 2 Consensus

9Hrs.

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 3 Hyperledger Fabric

9Hrs.

Hyperledger Fabric (A):

Decomposing the consensus process, Hyperledger fabric components, Chaincode
Design and Implementation Hyperledger Fabric (B):

Beyond Chaincode: fabric SDK and Front End (b) Hyperledger composer tool

UNIT 4 Use Cases 1 & 2

9Hrs.

Use case 1: Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii)Capital markets, (iv) Insurance

Use case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc

UNIT 5 Use Case 3

9Hrs.

Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems Blockchain Cryptography, Privacy and Security on Blockchain

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Describe basics of blockchain and hash functions. CO2: Able to know about consensus along with protocols.

CO3: Define Hyperledger fabric components and design policies. CO4: Design use cases related to trade/supply chain finance

CO5: Ability to design real life situational problems like insurance, KYC, etc. CO6: Apply privacy and security policies and cryptography systems.

TEXT /REFERENCE BOOKS

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly
3. Hyperledger Fabric - <https://www.hyperledger.org/projects/fabric>
4. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits
<https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html>

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration:3 Hrs.

PART A: 10 Questions carrying 2 marks each - No choice

20 Marks

SCSA1412	INTRODUCTION TO ETHEREUM AND SOLIDITY PROGRAMMING LANGUAGE	L	T	P	Credits	Total Marks
		3	0	0		

COURSE OBJECTIVES

- To impart strong understanding about the Ethereum technologies
- To understand how Block chain and Ethereum works
- To gain the knowledge on basics and advanced level of solidity programming language
- To design and develop a smart contract and distributed application using solidity programming language

UNIT1 INTRODUCTION TO ETHEREUM

9Hrs.

Blockchain Basics and its Components -Birth of Ethereum-Block chain and Ethereum Architecture-Ethereum for Newbies -Ethereum Ecosystem- Ethereum Clients - Working of Ethereum: Bitcoin - Ether-Ethereum Mining-Ethereum Storage: Hardware Wallets, Desktop Wallets, Mobile Wallets, Web Wallets, Paper Wallets.

UNIT2 FEATURES AND APPLICATIONS OF ETHEREUM

9Hrs.

Ethereum Features: Cryptocurrency - Smart Contracts - Ethereum Virtual Machine - Decentralized Application - Autonomous Organization - Application of Ethereum.

UNIT3 INTRODUCTION TO SOLIDITY PROGRAMMING LANGUAGE

9Hrs.

Solidity-Setup of Environment-Syntax: Pragma, Contract, Importing Files, Reserve Keywords, Comments, Types, Variables, Variable Scope, Operators, Loops, Decision Making, String, Arrays, Enums, Structs, Mapping, Conversion, Ether units, Special Variables, Style Guide-Solidity Function: Functions, Function Modifiers, View function, Pure function, Fallback function, Function Overloading, Mathematical Functions, Cryptographic Functions.

UNIT4 SOLIDITY PROGRAMMING LANGUAGE

**ADVANCED
9Hrs.**

Contracts-Inheritance-Constructors-Abstract Contracts-Interfaces-Libraries-Assemble-Events-Error Handling-A Simple Smart Contract using solidity programming language: Storage and Sub-currency example.

UNIT5 CASESTUDY

9Hrs.

Smart Contract-Simple Bank Smart Contract Development-Voting Exercise-Token Exercise.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1: Gain strong knowledge about the architecture of Ethereum and their features
- CO2: Build compelling blockchain applications using the Ethereum Blockchain
- CO3: Explain the performance of Ethereum virtual machine

CO4: Ability to develop a small application using solidity programming language
CO5: Strong knowledge in advanced level of solidity programming language

CO6: Ability to develop and design the smart contract application using solidity programming language

TEXT /REFERENCE BOOKS

1. MayukhMukhopadhyay, “Ethereum Smart Contract Development: Build blockchain based decentralized application using solidity”, Packt> (Mumbai) 2018.
2. Andreas M. Antonopoulos, Gavin Wood Ph.D., “Mastering Ethereum: Building Smart Contracts DApps”, O'REILLY 2019.
3. Ritesh Modi, “Solidity Programming Essentials: A Beginners Guide to build smart contracts for Ethereum and Blockchain”, Packt>(Mumbai) 2018.
4. Chris Dannen, “Introducing Ethereum and Solidity: Foundation of Cryptocurrency and Blockchain Programming for Beginners”, Apress 2017.
5. Solidity – Official Website of Solidity and Documentation: <https://docs.soliditylang.org/en/v0.8.4/>

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration:3 Hrs.

PART A: 10 Questions carrying 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 16 marks

80 Marks

SCSA2409	IOT AND CLOUD SECURITY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To provide the knowledge of simulation tools for security in IoT.
- To familiarize students with different tools for cyber security.
- To provide knowledge of deployment of tools for secure data storage.
- To capable of using different access control techniques for security in cloud.
- To implement the intrusion detection techniques for security in cloud.

LIST OF EXPERIMENTS

1. Make a study of anyone simulation tool based on parameters of data security.
2. Implement the formation of virtual modes using OMNET++.
3. Implement the networking attack using OMNET++.
4. Implement WEP and EAP security protocol using OMNET++.
5. Implement secure efficient data routing in IoT using OMNET++.
6. Demonstrate the web application firewall to stop attacks.
7. Implement access management in cloud environment.
8. Implement secure user management in cloud.
9. Implement identity management in cloud environment.
10. Demonstrate the intrusion detection system using any tool

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1: Learn the simulation tool for implementing security in IoT and cloud CO2: Learn the implementation of security protocols using OMNET++. CO3: Learn the different types of attacks in IoT environment.

CO4: Learn the tool for secure data storage and management. CO5: Learn about secure data access in cloud environment.

CO6: Use different open-source tools for cloud security and analysis.

SCSA2410	ETHEREUM AND SOLIDITY PROGRAMMING LANGUAGE LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To understand the basic knowledge of solidity programming language
- To get familiarized with smart contract
- To gain the knowledge of secure payment
- To know how to work in Ethereum platform
- To implement the smart contract for various application

LIST OF EXPERIMENTS

1. Program to implement simple counter smart contract using solidity programming language
2. Program to implement variables, datatypes and structs in smart contract
3. Program to implement data structures inside smart contract using solidity programming language (Array and Mapping)
4. Program to check the given number is even or not using conditionals and looping inside smart contract using Solidity Programming Language
5. Program to implement smart contract for simple marketplace
6. Program to build a code cryptocurrency payment in smart contract for hotel rooms
7. Program to perform the operation in multiple smart contracts inside solidity using inheritance and factories
8. Program to create a shipping contract by using the blockchain development kit for Ethereum

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand the basics & advanced features of Solidity & Ethereum Virtual Machine
CO2: Ability to analyse and develop algorithms for smart contract

CO3: Able to do the secure payment between the owner and the customer

CO4: Able to work with multiple smart contracts for various real time applications
CO5: Familiar to Develop their own decentralized blockchain applications

CO6: Develop Ethereum smart contract using Solidity

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

**Exam
Duration: 3
Hrs.**

CAE: Evaluation of Regular Lab class

15 Marks

Model practical exam

10 Marks

25 Marks

ESE: End Semester Practical Exam

25 Marks

SCSA1413	SECURED NETWORK PROTOCOLS AND STANDARDS	L	T	P	Credits	Total marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of different layers of protocols.
- To identify the various protocols in cyber security.
- To understand the various attacks and intrusion detection system.
- To Provide knowledge and overview about cyber physical system and IoT.
- To make students aware of various cyber risk assessment and threats.

UNIT 1 INTRODUCTION

9 Hrs.

Introduction (overview of network security issues, cryptographic algorithms, authentication techniques) - Layer 2/3 security - Authentication systems, Key establishment protocols, Kerberos- Secure communication at the data link and network layers (IPSEC and IKE) - Secure communication at the transport and application layers (SSL/TLS, email security, PGP) - Vulnerabilities of Internet protocols

UNIT 2 PROTOCOLS

9 Hrs.

Secure Sockets Layer (SSL) - SSL Protocol Stack - SSL Record Protocol Operation IP Security (IPsec) - IP Security (IPsec) architecture - Benefits of IPsec Hypertext Transfer Protocol Secure (HTTPS) Kerberos - Drawbacks and limitations - Kerberos Vulnerabilities Transport Layer Security (TLS).

UNIT 3 ATTACKS AND THREATS

9 Hrs.

Denial of service (DoS) attacks and defences - Firewalls, IP spoofing prevention - Routing protocols security and router security - Domain name server (DNS) security - Traffic monitoring, Intrusion detection, Honeypots - Wireless networks security - Spam, Phishing, and Pharming - Malware propagation and containment, Botnets - Anonymity and privacy on the Web.

UNIT 4 SECURITY IN NEXT GENERATION SYSTEM

9 Hrs.

Internet Security Protocols and Standards - TCP Attacks, DNS Vulnerabilities, SSL/TLS, DDoS - Next Generation System Designs and Challenges - Cyber-Physical System Overview and Security - Internet of Things and Smart Grid Security - Data & Infrastructure Security in Cloud/Edge Computing.

UNIT 5 CYBER RISK ASSESSMENT

9 Hrs.

Blockchain and Decentralized Applications- Hash cash and other Consensus Protocols Blockchain Security- Smart Contracts - Scalability and Privacy challenges, Security Economics and Risk Modelling - Cyber-Risk Assessment - Threat Information Sharing - Cyber-insurance

Max. 45 Hrs.

COURSE OUTCOMES:

On completion of the course, the student can able to

CO1: Analyse the security issues and authentication algorithms. CO2: Express the various protocols in different layers.

CO3: Explain the use of different attacks and security mechanism in current networking scenario. **CO4:** Analyse the security issues in IoT and smart grid applications.

CO5: Evaluate the security methods using blockchain. **CO6:** An Ability to analyse the cyber risk assessment.

TEXT / REFERENCE BOOKS

1. Uyless D. Black," Computer Networks: Protocols, Standards and Interface 2nd Edition", 2nd Edition, 2015
2. James F Kurose and Keith W. Ross, "Computer Networking - A Top-Down Approach", Addison-Wesley, Fifth Edition, 2010.
3. L. Peterson and B. Davie, "Computer Networks: A Systems Approach", Elsevier Inc., Fifth Edition, 2011.
4. William Stallins," Network Security Essentials: Applications and Standards", Pearson Publication,2016.
5. YassineMaleh," Security and Privacy Management, Techniques, and Protocols", Morocco,2018

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 16 marks

80 Marks

SCSA1414	CYBER FORENSICS	L	T	P	Credits	Total marks
		3	0	0	2	100

COURSE OBJECTIVES

- To discuss about Cyber forensics, Information Security Investigations
- To Understanding information and Methods of storing data
- To know the importance Computer Forensic and Fundamentals
- To Understand the Types of Computer Forensics Tools and Technology
- To discuss the Types of Computer Forensics Systems.

UNIT 1 DIGITAL INVESTIGATION

9 Hrs.

Digital Evidence and Computer Crime - History and Terminology of Computer Crime Investigation - Technology and Law - The Investigative Process - Investigative Reconstruction - Modus Operandi, Motive and Technology -Digital Evidence in the Courtroom.

UNIT 2 UNDERSTANDING INFORMATION

9 Hrs.

Methods of storing data: number systems, character codes, record structures, file formats and file signatures - Word processing and graphic file formats - Structure and Analysis of Optical Media Disk Formats - Recognition of file formats and internal buffers - Extraction of forensic artifacts understanding the dimensions of other latest storage devices SSD Devices

UNIT 3 COMPUTER BASICS FOR DIGITAL INVESTIGATORS

9 Hrs.

Computer Forensic Fundamentals - Applying Forensic Science to computers - Computer Forensic Services - Benefits of Professional Forensic Methodology -Steps taken by computer forensic specialists.

UNIT 4 TYPES OF COMPUTER FORENSICS

9 Hrs.

Tools and Technology -Tools and Types of Military Computer Forensics Technology -Tools and Types of Law Enforcement Computer Forensic Technology -Tools and Types of Business Computer Forensic Technology

UNIT 5 ADVANCED CYBER FORENSICS

9 Hrs.

Windows Forensics: Registry Analysis - Browser Usage - Hibernation File Analysis - Crash Dump Analysis - File System Analysis. Network Forensics - Understanding Protocols with Wireshark. Memory Forensics: File system artifacts including \$MFT, shell bags, paged memory and advanced registry artifacts - Related tools Bulk Extractor and YARA. Virtual Machine Forensics, Cloud Forensics: Cloud Storage Forensic Analysis - Evidence Source Identification and Preservation Collection of evidence from cloud storage devices - Examination and analysis of collected data

Max. 45Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to CO1: Understand the concepts of Cyber forensics CO2: Apply the Computer Forensics Technology. CO3: Know How to Investigate Computer Forensic

CO4: Understand the importance of Business Computer Forensic Technology

CO5: Analyse the Advanced Cyber Forensics windows, memory, Virtual machine Forensics CO6: Develop the usecase model for Cloud Storage Forensic Analysis.

SCSA2411	- CYBER FORENSICS LAB	L	T	P	Credits	Total marks
		0	0	4	2	100

COURSE OBJECTIVES

- Understand the concepts of open source tools
- Identify and report the forensic on disk level
- Implement forensic concepts in network level
- Analyze Virtual machine forensic
- Analyze various cloud forensic

SUGGESTED LIST OF EXPERIMENTS

1. Case Studies of Open source Forensic Tools
2. Disk Forensics
 - a. Identify digital evidences
 - b. Acquire the evidence
 - c. Authenticate the evidence
 - d. Preserve the evidence
 - e. Analyze the evidence
 - f. Report the findings
3. Network Forensics:
 - a. Intrusion detection
 - b. Logging
 - c. Correlating intrusion detection and logging
4. Device Forensics
 - a. Mobile phone
 - b. Digital Music
 - c. Printer Forensics
 - d. Scanner Forensics
5. Credit Card Forensics
6. Telecommunications Forensics
7. Forensic Analysis of a Virtual Machine
8. Forensic analysis of Cloud storage and data remnants

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1: Understand the concepts of various levels of forensics.
- CO2: Remembering the concepts of disk forensics.
- CO3: Implement the concepts of forensics in network.
- CO4: Understand the concepts of forensics in devices.
- CO5: Apply the concepts for finding virtual machine forensics.
- CO6: Implement cloud data forensics.



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

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SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Minutes of Meeting

Date: 19.12.2022

Time: 10.00 AM

Mode: Physical

Venue: Senate Hall , VC Office

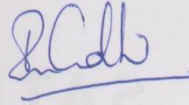
Agenda:

- Introducing new courses in the 4th semester for the following specialization streams from the year 2021 onwards.
 - B.E Computer Science and Engineering With Specialization In **Artificial Intelligence And Machine Learning**
 - B.E Computer Science and Engineering With Specialization In **Artificial Intelligence & Robotics**
 - B.E Computer Science and Engineering With Specialization In **Blockchain Technology**
 - B.E Computer Science and Engineering With Specialization In **Cyber Security**
- Introducing new courses in the 6th semester for the following specialization streams from the year 2021 onwards.
 - B.E Computer Science and Engineering With Specialization In **Artificial Intelligence**
 - B.E Computer Science and Engineering With Specialization In **Data Science**
 - B.E Computer Science and Engineering With Specialization In **IoT**
- Approval to update the course content of core subject SCSA1204 Python Programming for all the B.E Computer Science and Engineering specialization programmes.
- Approval to update the course content of open elective subject SCSA3016 Augmented & Virtual Reality for all the B.E Computer Science and Engineering specialization programmes.
- Approval to update the course content of core subject SCSA1405 Machine Learning Essentials for the following CSE specialization programmes:
 - B.E Computer Science and Engineering With Specialization In Artificial Intelligence
 - B.E Computer Science and Engineering With Specialization In Data Science
 - B.E Computer Science and Engineering With Specialization In IoT

Minutes

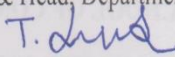
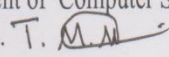
- The BOS meeting was convened on 19th Dec, 2022 to introduce the new courses and to update the existing course with updated syllabus in the School of Computing for the Regulation 2019 and Regulation 2021.
- The Dean, Dr.T.Sasikala greeted and welcomed all the Board of Studies members. The HOD of CSE and the faculty members of the School of Computing attended the meeting and interacted with the expert members.
- Dr.T.Sasikala, the Dean, gave a brief overview of the school's history and the many courses available. The Dean went on to outline the syllabus revision process by listing the many processes that were taken in developing the new syllabus.
- The HOD presented the curriculum and syllabus designed for the Regulations 2019 and Regulation 2021.
- The new 4th semester courses had been prepared for the following programmes and placed before the panel for their approval:
 - B.E. CSE with specialization in Artificial Intelligence and Machine Learning
 - B.E. CSE with specialization in Artificial Intelligence and Robotics
 - B.E. CSE with specialization in Blockchain Technology
 - B.E. CSE with specialization in Cyber Security
- The new 6th semester courses had been prepared for the following programmes and placed before the panel for their approval:
 - B.E. CSE with specialization in Artificial Intelligence
 - B.E. CSE with specialization in Data Science
 - B.E. CSE with specialization in Internet of Things
- Suggestions were received from the experts during the BOS meeting held on 26th May, 2022 and their valuable suggestions were considered while framing the syllabus.
- In order to prepare students for future technologies and give them a thorough grasp of what is happening and what the future road map of the IT sector may entail, the School of Computing, in partnership with HCL Technologies, updated the content of the following courses.
 - SCSA1204 Python Programming
 - SCSA3016 Augmented & Virtual Reality
 - SCSA1405 Machine Learning Essentials
- The contents of the syllabus for each subject was discussed in detail and taking into consideration the relevance to the latest technologies.
- Dr.T.G.Sambanthan commended the inclusion of lab-intensive courses in all semesters and gave advice on how to run the course effectively.
- Mr.Ajay suggested that industry experts be brought in and that special sessions be held to incorporate functional programming.
- A collective suggestion from the Alumni was to include new courses that would help students improve project based learning from 3rd semester onwards.
- All the external members appreciated the updates made in the courses.

Convener: Dr. T.Sasikala, Dean School of Computing

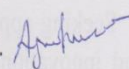


External Members:

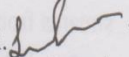
Academic Expert

- Dr.T.G. Sambanthan, Professor & Head, Department of Computer Science & Engineering NITTTTR, Chennai. 
- Dr. T. T. Mirnalinee, Professor and Head, Department of Computer Science and Engineering, SSN College of Engineering, Chennai. 

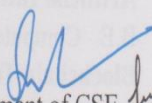
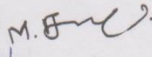
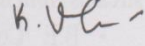
Industry Experts

- Dr.V. Sankaran, Program Manager, Engineering and R&D Services, HCL Technologies 
- Mr. Ajay Kumar, CTO, Cognibot Robotics, Chennai. 

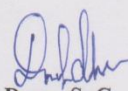
Alumni

- Mr. Johnson S, Project Test Manager, TCS , Chennai. 
- Mr. Ashish Chopra, Senior BDE, Freshworks, Chennai. 

Internal Members:

- Dr. S. Vigneshwari , HoD, Department of CSE 
- Dr R Sathyabama, Associate Professor, Department of CSE 
- Dr S Sreeji, Assistant Professor, Department of CSE 
- Mr B Sathiyaprasad, Assistant Professor, Department of CSE 
- Ms V Subapriya Assistant Professor, Department of CSE 
- Dr K Veena Assistant Professor, Department of CSE 




Dean -SoC

Dr. T. SASIKALA
Professor & Head
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