



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited "A++" Grade by NAAC | Category 1 University by UGC | Approved by AICTE
www.sathyabama.ac.in

**SCHOOL OF COMPUTING
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

Minutes of Meeting

Date: 22.1.2024

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 24th Jan, 2024 to introduce the new courses and updated the existing course with updated syllabus in the School of Computing for the Regulation 2019 and Regulation 2023.

- 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.

School of Computing

- Inclusion of Service now course as a professional Elective for academic year 2023- 2024
- Seeking approval for syllabus and course delivery plan of Design thinking and innovation – a common course for all programs of the engineering streams.
- Inclusion of Advanced Computer Networks offered by HCL as a Professional Elective
- NEN Ignite course to be offered as Professional Elective for the 5 Semester students
- Introduction of Mandatory Audit courses
- In each semester minimum one subject is made as lab heavy subject
- AR-VR subject is made as PBLA subject
- Introduction of Minor in AI-ML and Minor in Data Science to be offered
- Approval to replace SBAA1408 Economics for Engineers from semester 4 in all CSE specialization programs
- BE CSE with specialization in AI, BE CSE with specialization in AI and ML - SCSA3023 Advanced Neural Networks in semester 6
- BE CSE with specialization in Cyber Security – SCSA3078 Information Technology Security Evaluation in semester 6
- BE CSE with specialization in IoT – IoT for Healthcare in semester 6

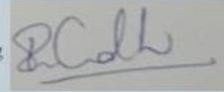
- BE CSE with specialization in Data Science –Applied Machine Learning in semester 6
- BE CSE with specialization in AI I to replace-SAIC4004 Engineering in community services with SCSA3012 Knowledge Management systems (In semester 3)

Dean Academics

- Approval for Regulations 2023 curriculum and Syllabus for all programs under the Schools of Computing, Mechanical, Law, Science and Humanities, Bio and Chemical Engineering, Electrical and Electronics, Building and Environment, Allied Health Sciences
- Inclusion of Mandatory Audit Courses (non-credit)
- Inclusion of interest specific Skill development courses/ Employability Enhancement courses with credits (semester 4,5,6 – 1 credit in each semester)
- Inclusion of Entrepreneurship as an Elective
- Approval for courses to be delivered as Lab heavy courses and Courses with Project Based Learning Approach
- Inclusion of External Learning component in the Curriculum.
- Weightages of Student Achievements in Technical competitions national/international level
- NPTEL Credit transfer for Professional electives
- Inclusion of policy for students to accrue additional credits
- Permission to pursue two academic programs simultaneously (one regular program + one online program)
- Inclusion of Community internships
- Credits for high impact publications

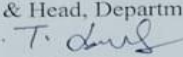
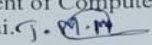
- Augmented and Virtual Reality as a project based learning course. The members reviewed the plan and approved to proceed with the course.
- The BOS Experts appreciated the content as well as the depth of the syllabi in the curriculum.

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

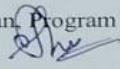
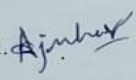


External Members:

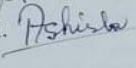
Academic Expert

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

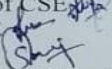
Industry Experts

- 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 - Specialization, Department of CSE 
- Dr R Sathyabama, Associate Professor, Department of CSE 
- Dr K Veena, Assistant Professor, Department of CSE 
- Dr S Sreeji, Assistant Professor, Department of CSE 
- Dr B Sathiyaprasad, Assistant Professor, Department of CSE 
- Ms V Subapriya, Assistant Professor, Department of CSE 
- Dr. Menaka, Assistant Professor, Department of CSE 
- Ms. Anbuselvi, Assistant Professor, Department of CSE 
- Dr. Shanmuga Prabha, Assistant Professor, Department of CSE 
- Dr. Sonia Rayen, Assistant Professor, Department of CSE 
- Dr. Nanthini N, Assistant Professor, Department of CSE 


Dean-S&T
Dr. T. SASIKALA
 Professor & Dean
 School of Computing
 Sathyabama Institute of Science
 Chennai - 600 119

List of Revised Courses

S.no	Course Code	Course Name	Page No.
1	SCSA3012	Knowledge Management Systems	7
3	SCSA1415	Machine Learning Essentials	11
4	SCSA2412	Machine Learning Lab	13
5	SCSADPROJ	Design Thinking and innovation	16
6	SCSA1211	Python Programming	19
7	SCSA3062	Augmented s Virtual Reality	23
8	SCSA4002	5G Networks	26
9	SCSA1513	Time series Analysis	29

1.2.1 New Course Introduced during 2023- 2024

CONTENTS

S.No.	Course Code	Name of the Course	Page No.
B.E Computer Science and Engineering with Specialization In Artificial Intelligence			
1	S11BLH11	Programming in C	21
2	SCSB1231	Data and Information Science	23
3	S11BLH21	Programming in Python	25
4	S731BLH22	Programming in C	27
B.E Computer Science and Engineering with Specialization In Data Science			
1	SCSB1232	Exploratory Data Analysis	29
B.E Computer Science and Engineering with Specialization In Artificial Intelligence and Machine Learning			
1	SCSB1251	Artificial Intelligence Search methods and Reasoning	31

SCSA3012 (Old)	KNOWLEDGE MANAGEMENT SYSTEM	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the basic rudiments of knowledge management
- To understand of the knowledge management system life cycle.
- To acquire the Knowledge Capturing Techniques
- To learn the coding tools and procedures
- To explore the faster decision making with knowledge transfer systems

UNIT 1 KNOWLEDGE MANAGEMENT

9 Hrs.

KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence – Experience – Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning.

UNIT 2 KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE

9 Hrs.

Challenges in Building KM Systems – Conventional Vrs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT 3 CAPTURING KNOWLEDGE

9 Hrs.

Evaluating the Expert – Developing a Relationship with Experts – Fuzzy Reasoning and the Quality of Knowledge – Knowledge Capturing Techniques, Brain Storming – Protocol Analysis – Consensus Decision Making – Repertory Grid-Concept Mapping– Black boarding.

UNIT 4 KNOWLEDGE CODIFICATION

9 Hrs.

Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developer's Skill Sets – System Testing and Deployment – Knowledge Testing –Approaches to Logical Testing, User Acceptance Testing– KM System Deployment Issues– User Training–Postimplementation.

UNIT 5 KNOWLEDGE TRANSFER AND SHARING

9 Hrs.

Transfer Methods – Role of the Internet – Knowledge Transfer in e-world – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers.

Max.45Hours

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1 : Understand the concept of knowledge and its types
- CO2 : Analyse the challenges in building Knowledge Management systems
- CO3 : Develop knowledge management capturing techniques
- CO4 : Test the coding tools for knowledge management systems.
- CO5 : Understand the architecture and development of knowledge systems
- CO6 : Develop models with Knowledge management system tools

TEXT/REFERENCE BOOKS

1. Elias.M. Award & Hassan M. Ghaziri – “Knowledge Management” Pearson Education 2000
2. Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, “Knowledge Engineering and Management”, Universities Press, 2001.
3. C.W. Holsapple, “Handbooks on Knowledge Management”, International Handbooks on Information Systems, Vol 1 and 2, 2003
- 4 Becerra-Fernandez, I.; Sabherwal, R.: Knowledge Management: Systems and Processes. M.E. Sharpe Inc., 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

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

20 Marks

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

80 Marks

SCSA 30 12 (Revised)	KNOWLEDGE MANAGEMENT SYSTEMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the basic rudiments of knowledge management
- To understand of the knowledge management system life cycle.
- To acquire the Knowledge Capturing Techniques
- To learn the coding tools and procedures
- To explore the faster decision making with knowledge transfer systems.

UNIT 1

9Hrs.

KNOWLEDGE MANAGEMENT: KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence – Experience – Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning.

UNIT 2

9Hrs.

KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE: Challenges in Building KM Systems – Conventional Vrs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT 3

9Hrs.

CAPTURING KNOWLEDGE: Evaluating the Expert – Developing a Relationship with Experts – Fuzzy Reasoning and the Quality of Knowledge – Knowledge Capturing Techniques, Brain Storming – Protocol Analysis – Consensus Decision Making – Repertory Grid-Concept Mapping-Blackboarding..

UNIT 4

9Hrs.

KNOWLEDGE CODIFICATION: Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developer's Skill Sets – System Testing and Deployment – Knowledge Testing – Approaches to Logical Testing, User Acceptance Testing– KM System Deployment Issues–User Training–Postimplementation.

UNIT 5

9Hrs.

KNOWLEDGE TRANSFER AND SHARING: Transfer Methods – Role of the Internet – Knowledge Transfer in eworld – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers.

Max 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand the concept of knowledge and its types

CO2: Analyse the challenges in building Knowledge Management systems

CO3: Develop knowledge management capturing techniques

CO4: Test the coding tools for knowledge management systems.

CO5: Understand the architecture and development of knowledge systems

CO6: Develop models with Knowledge management system tools

TEXT /REFERENCE BOOKS

1. Elias.M. Award & Hassan M. Ghaziri – “Knowledge Management” Pearson Education 2000
2. Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, “Knowledge Engineering and Management”, Universities Press, 2001.
3. 3.C.W. Holsapple, “Handbooks on Knowledge Management”, International Handbooks on Information Systems, Vol 1 and 2, 2003
4. Becerra-Fernandez, I.; Sabherwal, R.: Knowledge Management: Systems and Processes. M.E. Sharpe Inc.,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

SCSA1405	MACHINE LEARNING ESSENTIALS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To introduce Machine Learning concepts
- To understand Linear regression and predictive models
- To understand classification and clustering techniques
- To understand the ensembling models and its techniques.
- To evaluate the model and compare the algorithms

UNIT 1 INTRODUCTION TO MACHINE LEARNING

9 Hrs.

What is machine learning – Types of Machine learning Techniques-security with deep learning - Reinforcement learning- Logistic Regression-hypothesis- Logistic regression models- Decision boundary- Cost Function- Dimensionality Reduction-Principal Component Analysis

UNIT 2 PREDICTIVE ANALYTICS

9 Hrs.

Linear regression - with one variable - with multiple variable - Multiple Linear Regression-Nonlinear Regression- Regression analysis-Predictive models - prediction using logistic regression.

UNIT 3 CLASSIFICATION AND CLUSTERING TECHNIQUES

9 Hrs.

Support vector Machine- Decision Tree-Naïve Bayes-Random Forest- Density-Based Clustering Methods- Hierarchical Based clustering methods-Partitioning methods- Grid based methods-K means clustering - pattern based with deep learning

UNIT 4 ENSEMBLING MODELS

9 Hrs.

Need of Ensembling - Applications of Ensembling - Types of Ensembling- Techniques of Ensembling- Bagging- Boosting – Stacking-Blending-AdaBoost-informatics with deep learning

UNIT 5 MODEL EVALUATION, MODEL SELECTION, AND ALGORITHM SELECTION

9 Hrs.

Statistical tests - validation Techniques-Cross validation -Nested Cross validation- Essential Model Evaluation Terms and Techniques - Bootstrapping and Uncertainties -Cross-validation and Hyperparameter Optimization - Algorithm Comparison - Testing the Difference of Proportions - Comparing Two Models with the McNemar Test - The F-test for Comparing Multiple Classifiers - Comparing Algorithms - optimizing deep learning hyper parameters by evolutionary algorithm.

Max.45Hours

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1 : Reduce the dimension of the dataset with machine learning techniques

CO2 : Implement the predictive analytics for any real scenario

CO3 : Implement applications with clustering and classification techniques

CO4 : Implement the ensembling 2model .

CO5 : Implement model evaluations and model comparisons.

CO6 : Design a case study on the business data and compare the performance of the classifiers and algorithms

TEXT/REFERENCE BOOKS

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

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

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

20 Marks

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

80 Marks

SCSA1415	MACHINE LEARNING ESSENTIALS	L	T	P	Credits	Total Marks
(Revised)		3	1	0	3	100

COURSE OBJECTIVES

- To introduce Machine Learning concepts.
- To understand Linear regression and predictive models.
- To understand classification and clustering techniques.
- To understand the ensembling of models and its techniques.
- To apply reinforcement learning techniques.

UNIT 1 INTRODUCTION TO MACHINE LEARNING

G Hrs.

What is machine learning – Examples of Machine Learning Applications -Types of Machine learning Techniques - Learning a class from Examples - Vapnik-Chervonenkis Dimension - Probably Approximately Correct Learning – Gradient Descent – Bias and Variance- Overfitting- Underfitting- Confusion Matrix.

UNIT 2 SUPERVISED LEARNING

G Hrs.

Linear regression-with one variable-with multiple variables--Multiple Linear regression-Non linear regression- Regression analysis-Predictive models - Prediction using Logistic Regression- Classification Models-KNN Classification- Naïve Bayes Classification- Decision Tree Classification- Support vector Machine- Random Forest- Classification vs Regression.

UNIT 3 UNSUPERVISED LEARNING

G Hrs.

Clustering-K Means Clustering-Supervised Learning after Clustering-Density Based Clustering Methods- Hierarchical Based clustering methods-Partitioning methods- Grid based methods. Dimensionality Reduction: Linear Discriminant Analysis -Principal Component Analysis.

UNIT 4 ENSEMBLING MODELS

G Hrs.

Need of Ensembling- Applications of Ensembling – Types of Ensembling : Basic Ensemble Techniques-Advanced Ensemble Techniques : Bagging, Boosting, Stacking, Blending - Techniques of Ensembling -AdaBoost.

UNIT 5 REINFORCEMENT LEARNING

G Hrs.

Introduction- RL Framework- Temporal Difference Learning -Active Reinforcement Learning- Markov Decision Process Model - Learning Expectations-Learning Algorithms-Q learning Algorithm-Case Study: Implementation of Q learning in automotive games.

Max.45 Hours

COURSE OUTCOMES

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

- CO1: Reduce the dimension of the dataset with machine learning techniques
CO2: Implement the predictive analytics for any real scenario
CO3: Implement applications with clustering and classification techniques
CO4: Implement the ensembling models.
CO5: Learn and apply reinforcement techniques.
CO6: Design a case study on the business/automotive data and compare the performance of the Classifiers and algorithms.

TEXT /REFERENCE BOOKS

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

SCSA2403	MACHINE LEARNING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES:

- To understand the fundamental concepts of Machine Learning.
- To develop logics and employ statistics for various Machine Learning algorithms.
- To gain practical knowledge of machine learning algorithms and methods
- Identify and apply the appropriate machine learning technique for classification, pattern recognition, and decision problems.
- To recognize the characteristics of ML and employ them to cater real-world problems.

LIST OF EXPERIMENTS

1. Analysis and implementation using Python /Jupyter Notebook/ Colab

i Compute the distance travelled by the robot from current position after a sequence of movement and original point.

ii Creation of scatter plot using sepal length and petal width to separate the Species classes

2. Computation of Statistical details and Complexity

i Calculate the Five Number Summary (Quartiles, IQR) for the attribute (age) of each employee at a Tea Factory.

ii Analyze the complexity of Heap sort, applied over different sized random lists.

3. Pre-processing and construction of a quality dataset

i Preprocess the given data to build good training sets (80%) and test sets (20%) by removing the missing values and imputing them with the mean value.

ii Examine the interrelations among the set of variables using Principal Component Analysis, display the PCA Components and generate Heatmap.

4. Analysis and Interpretation of data

i Manipulate the Twitter Data Set by removing the Punctuation, Numbers, Special Characters and word length<=3. Tokenize the Words and Stem.

ii Generate a word cloud for the Twitter dataset and retrieve the top 15 positive and negative tags

5. Build new models (Classification and Clustering)

i Find core samples of high density and expand clusters from them using DBSCAN Clustering.

ii Split the iris dataset into train and test data (80%-20%) and train or fit the data into the model using K Nearest Neighbor Algorithm.

6. Evaluate the Performance of Machine Learning algorithms

i Evaluate the performance of Machine Learning algorithms using Confusion Matrix, Accuracy, Sensitivity, Specificity, Precision and Recall.

ii Employ Linear Regression to check the linearity between the a) stock price and interest rate, b) stock price and unemployment rate.

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1 : Design and develop Python Program for simple Machine Learning tasks.

CO2 : Explain Complexity, Implementation and limitations of Machine Learning.

CO3 : Formulate the model for various Use cases by employing Supervised, Semi-Supervised and Unsupervised Machine learning algorithms.

CO4 : Interpretation of data by analyzing the Data set.

CO5 : Construct new models with efficient visualization techniques for real world problems.

CO6 : Evaluate and assess the performance of Machine Learning systems

SCSA2412 (Revised)	MACHINE LEARNING 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.

CO5: Apply various clustering algorithms for various applications

CO6: Analyze various machine learning algorithms and their applications

SCSA1319	DESIGN THINKING AND INNOVATIONS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To introduce the idea of Human-centered design and design thinking
- To understand the concept of empathy and its technique
- To understand observation phase and insight concepts in design thinking
- To leverage the use of prototype in design thinking
- To design business models using the design thinking innovation

UNIT 1 HUMAN-CENTERED DESIGN

9 Hrs.

Introduction to Human-centered Design – Applications of Human-centered Design – Design Process – Mindsets of Human centered designer – Principles and process of Design Thinking – Planning a Design Thinking Project.

UNIT 2 INTERVIEWING & EMPATHY-BUILDING TECHNIQUES

9 Hrs.

Introduction to Empathy – Practicing Empathy – Empathy vs. Sympathy – Methods for Empathetic design – Tips for Interviews – Empathy Interviews – Understanding and defining the problem.

UNIT 3 MAKING SENSE OF OBSERVATIONS & INSIGHTS

9 Hrs.

Observation Phase – Tips for observing – Insights definition – Problems with Insights – Case study: Insight problems in the history of aviation – Creativity process, principles and techniques – Evaluation of ideas

UNIT 4 DEVELOPING AND TESTING PROTOTYPES

9 Hrs.

Role of Prototype in design thinking – Types of prototyping – Guidelines for prototyping – Lean Startup Method for Prototype Development – Visualization and presentation techniques – Testing prototypes: Feedbacks and Maximize learning

UNIT 5 DEFINING & TESTING BUSINESS MODELS & BUSINESS CASES

9 Hrs.

Business Model Definition – Design thinking to design business model – Innovation in Business Model – Pursuing innovation in business – Business model innovations cases – Kano Model – Desirability Testing

Max.45Hours

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1 : Understand and apply human-centered design process and planning of design thinking project

CO2 : Use empathetic design in the interview process

CO3 : Identify need for observations and insights problems and come up with creative ideas in design thinking

CO4 : Understand, build and test the prototypes

CO5 : Use design thinking concepts to build successful business models

CO6 : Implement innovation techniques in business models

TEXT/REFERENCE BOOKS

1. Mueller-Roterberg, Christian. "Handbook of Design Thinking." Hochschule Ruhr West (2018)
2. Design Kit by IDEO.org. "The field guide to human centered design." (2015), ISBN: 978-0-9914063-1-9.
3. <https://www.interaction-design.org/literature/article/design-thinking-getting-started-with-empathy>
4. <https://www.interaction-design.org/literature/article/stage-4-in-the-design-thinking-process-prototype>
5. <https://www.interaction-design.org/literature/article/test-your-prototypes-how-to-gather-feedback-and-maximise-learning>
6. <https://uxplanet.org/what-are-insights-aa1f2d1b3b9c>
7. <https://labs.sogeti.com/using-design-thinking-to-design-business-models/>
8. <https://www.northeastern.edu/graduate/blog/implementing-business-model-innovation/>

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

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

20 Marks

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

80 Marks

SCSADPROJ	DESIGN THINKING AND INNOVATION	L	T	P	Credits	Total Marks
(Revised)		1	0	2	3	100

COURSE OBJECTIVES

- To introduce the concept of Design thinking to solve Real World Problems
- To understand the process of design thinking
- To identify and analyze societal issues
- To provide solution to the identified Real World Problem

UNIT 1 INTRODUCTION AND COGITATION

GHrs.

Introduction to design thinking- Johari Window - Persona - DCAFE and VAL. - Theory of prioritization - Brain storming - 25 brainstorming techniques

Case Study - Identification of Real-World Problems using brain storming and assigning priorities. (2 non-contact hours).

Discussion on case study.

Activities: Formation of team - Brain storming - Case study

UNIT 2 DESIGN THINKING PROCESS

GHrs.

Elements of great design - Human element of design thinking - Lateral thinking - HOTS - Out of box thinking - case study Problem Identification - Identification of a specific Real Word Problem after brain storming (3 non-contact hours). - Team Presentation on identified problem.

Activities: Specific Problem selection to proceed with the work - Team presentation on identified problems and various possible solutions.

UNIT 3 ENGINEERING DESIGN - PHASE 1

GHrs.

Identification of stake holders - Roles and responsibilities - Conduct of surveys and interviews for addressing Real World Problems - Literature Surveys - Data collection.

Surveys: Stake holder Survey - Literature Survey - Presentation on Stake holder's survey and Literature survey. (3 non-contact hours).

Activities: SWOT Analysis - Finalize the identified problem

UNIT 4 ENGINEERING DESIGN - PHASE 2

GHrs.

Difference between Creativity and Innovation - Examples of innovation - Overcoming obstacles - Decision making on implementation of identified problem - Identifying evaluation criteria - Functional decomposition.

Documentation: Functional decomposition diagram, Decision on implementation, Evaluation criteria. (3 non-contact hours).

Activities: Documentation

UNIT 5 ENGINEERING DESIGN - PHASE 3

GHrs.

Brain storming alternate solutions- Developing proof of concept

Project: Poster presentation and Proof of concept display (7 non-contact hours).

Activities: Development of POC.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO 1: Comprehend the various types of thinking skills.

CO 2: Explain the innovative and creative ideas.

CO 3: Apply engineering design process for the identified problem

CO 4: Analyze a suitable solution for socially relevant issues

CO 5: Develop working structure and concepts for the identified problem

CO 6: Design solutions for Real World Problem.

TEXT /REFERENCE BOOKS

1. How to have Creative Ideas, Edward de Bono, Vermilion publication, UK, 2007
2. The Art of Innovation, Tom Kelley & Jonathan Littman, Profile Books Ltd, UK, 2008
3. G.Pahl and W.Beitz (Translated by Ken Wallace et al,) „Engineering Design: A Systematic Approach, Second Edition, Springer, 2005.
4. George E. Dieter and Linda C. Schmidt, “Engineering Design”, Fourth Edition, McGraw Hill Higher Education, 2006.
5. Power Point Presentation material by Prof.D.K.Subramanian in the Workshop on Engineering Design at TCE, Madurai.
6. Foundation Skills in Integrated Product Development, NASSCOM, Edition 2015.

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

SCSA1204	PYTHON PROGRAMMING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand why Python is a useful scripting language for developers.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To build and package Python modules for reusability
- To build and package Python modules for reusability
- To learn how to use exception handling in Python applications for error handling.
- To design and program Python applications.

UNIT 1 INTRODUCTION

9 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in function - Conditional statements - Iterative statements- Input/output functions - Compound Data Types - Nested compound statements – Introduction to Object Oriented Concepts.

UNIT 2 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES

9 Hrs.

File Operations –Iterators - Exception handling - Regular Expressions- Creating Modules-Import Statement- Introduction to PIP Installing Packages via PIP-Using Python Packages.

UNIT 3 GUI PROGRAMMING

9 Hrs.

GUI Programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts – Colours- Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box).

UNIT 4 DATABASE AND NETWORK

9 Hrs.

Database (using NoSQL): Connector Module –Cursor – Statements - Exceptions in database. Network connectivity: Socket module - Client – Server – Email – URL Access.

UNIT 5 CASESTUDY

9 Hrs.

Web Programming using Python Image Processing – Facebook Analysis – Twitter Analysis

Max.45Hours

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1 : Web Programming using Python Image Processing – Facebook Analysis – Twitter Analysis

CO2 : Do the decision making and write functions in Python.

CO3 : Explain how to design GUI Applications in Python and evaluate different database operations.

CO4 : Design and develop Client Server network applications using Python

CO5 : Ability to design real life situational problems and think creatively about solutions of them.

CO6 : Apply the best features of mathematics, engineering and natural sciences to program real life problems

TEXT/REFERENCE BOOKS

1. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson, 2013
2. Python® Notes for Professionals by Stack Overflow Documentation. (<https://books.goalkicker.com/PythonBook/>)
3. Dr. Charles R. Severance, “Python for Everybody- Exploring Data Using Python 3”, 2016.
4. Paul Gries, Jennifer Campbell, Jason Montojo, “Practical Programming: An Introduction to Computer Science Using Python 3”, Pragmatic Bookshelf, 2nd Edition, 2014.
5. Magnus Lie Hetland, “Beginning Python: From Novice to Professional”, Apress

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

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

20 Marks

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

80 Marks

SCSA1211 (Revised)	PYTHON PROGRAMMING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand why Python is a useful scripting language for developers.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To build and package Python modules for reusability.
- To understand how to read and write files in Python.
- To learn how to use exception handling in Python applications for error handling.
- To design and program Python applications.

UNIT 1 INTRODUCTION

9 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in function – Conditional statements - Iterative statements- Input/output functions - Compound Data Types - Nested compound statements

UNIT 2 OBJECT ORIENTED CONCEPT

9 Hrs.

Class – Objects – Constructors –Getters and Setters- Polymorphism – Encapsulation -Inheritance -Data Abstraction- Method Overloading-Method overriding-Data Hiding-Import Class

UNIT 3 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES

9 Hrs.

File Operations –Iterators - Exception handling - Regular Expressions- Creating Modules-Import Statement Introduction to PIP-Installing Packages via PIP-Using Python Packages.

UNIT 4 GUI PROGRAMMING

9 Hrs.

GUI Programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts – Colours - Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box.

UNIT 5 DATABASE AND NETWORK

9 Hrs.

Database (using NoSQL): Connector Module –Cursor – Statements - Exceptions in database. Network connectivity: Socket module - Client – Server –Email – URL Access.

Max. 45 Hrs.

COURSE OUTCOMES

On Completion of course student will be able to

CO1: Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.

CO2: Do the decision making and write functions in Python.

CO3: Explain how to design GUI Applications in Python and evaluate different database operations.

CO4: Design and develop Client Server network applications using Python.

CO5: Ability to design real life situational problems and think creatively about solutions of them.

CO6: Apply the best features of mathematics, engineering and natural sciences to program real life problems.

TEXT /REFERENCE BOOKS

1. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson, 2013.
2. Python Notes for Professionals by Stack Overflow Documentation (<https://books.goalkicker.com/PythonBook/>)
3. Dr. Charles R. Severance, “Python for Everybody- Exploring Data Using Python 3”, 2016.
4. Paul Gries, Jennifer Campbell, Jason Montojo, “Practical Programming: An Introduction to

- Computer Science using Python 3”, Pragmatic Bookshelf, 2nd Edition, 2014.
5. Magnus Lie Hetland, “Beginning Python: From Novice to Professional”, Apress.

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

SCSA3019	AUGMENTED AND VIRTUAL REALITY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To make students know the basic concept and framework of virtual reality.
- To teach students the principles and multidisciplinary features of virtual reality.
- To teach students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To teach students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools

UNIT 1 INTRODUCTION OF VIRTUAL REALITY 9 Hrs.

Fundamental Concept and Components of Virtual Reality- Primary Features and Present Development on Virtual Reality - VR systems - VR as a discipline-Basic features of VR systems-Architecture of VR systems-VR hardware - VR input hardware: tracking systems, motion capture systems, data gloves-VR output hardware: visual displays.

UNIT 2 I/O INTERFACE & TECHNIQUES IN VR 9 Hrs.

Multiple Modals of Input and Output Interface in Virtual Reality: Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices. Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp.

UNIT 3 VISUAL COMPUTATION IN VIRTUAL REALITY 9 Hrs.

Fundamentals of Computer Graphics-Software and Hardware Technology on Stereoscopic Display-Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering -Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc

UNIT 4 INTRODUCTION OF AUGMENTED REALITY 9 Hrs.

System Structure of Augmented Reality-Key Technology in AR-- AR software development - AR software. Camera parameters and camera calibration. Marker-based augmented reality. Pattern recognition. AR Toolkit

UNIT 5 APPLICATION OF VR IN DIGITAL ENTERTAINMENT 9 Hrs.

VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.3D user interfaces - Why 3D user interfaces. Major user tasks in VE. Interaction techniques for selection, manipulation and navigation.3DUI evaluation.

Max.45 Hours

COURSE OUTCOMES:

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

CO1: Design and implement the VR system.

CO2: Implement the Augmented Reality software.

CO3: Analyze and design the framework in VR using various software development tools in VR.

CO4: Design the multi modal user interface.

CO5: Describe the principles and features of VR and AR.

CO6: Recognize the technologies used to manage the large-scale VR environment in real time

TEXT / REFERENCE BOOKS

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3. Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

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

20 Marks

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

80 Marks

SCSA30G2(Revised)	AUGMENTED AND VIRTUAL REALITY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Learn the fundamentals of virtual and augmented reality.

- Identify the contrasts between AR/VR concepts and technologies.
- Recognize the core principles of Virtual Reality, such as presence and immersion.
- Examine the usability of AR/VR applications and their utilization of AR/VR features.
- Using the UNITY platform for business, design and prototype effective AR/VR apps.

UNIT 1

INTRODUCTION TO AUGMENTED REALITY AND VIRTUAL REALITY

9 Hrs.

A Brief History of Augmented Reality - Displays - Definition and Scope (Multimodal Displays, Spatial Display Model, and Visual Displays) - AR: Strong vs. Weak - AR Applications - AR Challenges. Scope and Definition - Types of VR - VR Characteristics - Basic VR Environments- VR Environment Limitations - Virtual Reality Hardware Requirements: Immersion vs. Presence.

UNIT 2

INTERACTION FOR AR/VR ENVIRONMENTS DESIGN

9 Hrs.

Identifying user needs is the first step in the interaction design process. - AR/VR design and analysis - Typical AR/VR Graphical Metaphors - Affordances in AR/VR - Human Data Processing - Design for Perception and cognition - User experience(UX) guidelines for AR/VR - UX obstacles for AR/VR - AR/VR prototypes - AR/VR prototype evaluation.

UNIT 3

INTRODUCTION TO UNITY

9 Hrs.

Overview of Unity: Windows, Interface, Navigation, Terminology, Game Objects, Hierarchy, Parenting Objects - Asset Store, Importing Plug-ins - Terrain Creation, Materials, Colors, and Transparency - Introduction to Monobehaviors: Awake, Start, and Update

UNIT 4

INTRODUCTION TO VUFORIA AND PHYSICS IN UNITY

9 Hrs.

Overview of Vuforia: Interface, Navigation, Terminology, Image Targeting, Custom Images - Introductory to Scripting: Definitions, Creating Objects, Accessing Components, Debugging, Lists, Loops - Overview of Physics in Unity

UNIT 5

EXPANDING ON SCRIPTING AND INTERACTIONS

9 Hrs.

Creating Trigger Events - Manipulating Components in Scripts - Programming Interactions between Objects and Tracked Images - Designing a simple User Interface in AR – Navigating World Space for Objects and User - Introduction to colliders and their use: OnCollisionEnter, OnCollisionExit, OnCollisionStay, OnTrigger vs OnCollision - Rigidbodies and how Colliders report to them – Case Study to building a real time application using AR and VR.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1: Describe the principles and features of VR and AR.
- CO2: Understand the design of AR and VR software.
- CO3: Design the multi model user interface using UNITY
- CO4: Understand the Vuforia and Scripting Physics
- CO5: Able to create real time application using AR and VR

TEXT / REFERENCE BOOKS

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
3. Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, 2nd Edition. Wiley-IEEE Press, 2003/2006.
5. Schmalstieg, D., & Hollerer, T. (2016). Augmented reality: principles and practice. Addison-Wesley Professional

END EMESTER 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, each carrying 16 marks

80

Marks

SCSA4002 (old)	5G NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To gain in depth knowledge of wireless networks for the future communication systems.
- To study the concepts of wireless networks for the future communication systems.
- To discuss 5G networks and its applications.

UNIT 1 MULTI-GIGABIT WIRELESS NETWORKS

9 Hrs.

Next generation (5G) wireless technologies- Upper Gigahertz and Terahertz wireless communications: Millimeter wavenetworking - Directionality and beam forming- Mobility and signal blockage - IEEE 802.11ad (60 GHz WLAN) MAC and PHY overview: Visible light communication- High-speed networking using LEDs - IEEE 802.15.7 PHY and MAC overview Sensing through visible light- Visible light indoor localization and positioning.

UNIT 2 INDOOR LOCALIZATION AND RF SENSING**9 Hrs.**

Smartphone localization - WiFi fingerprinting - protocols and challenges - Non-WiFi localization - Device-free sensing with radio frequency - Mining wireless PHY channel state information - Device-free localization and indoor human tracking - Activity and gesture recognition through RF.

UNIT 3 LOW-POWER NETWORKING FILTERS**9 Hrs.**

Backscatter communication - Radio Frequency Identification (RFID) technology overview - Energy harvesting tags and applications - Internet-of-Things (IoT) - IoT protocol overview - CoAP and MQTT - IPv6 networking in low-power PANs (6LoWPAN).

UNIT 4 FUTURE MOBILE NETWORKS**9 Hrs.**

Drone networking - Multi-UAV networks, architectures and civilian applications - Communication challenges and protocols for micro UAVs - Connected and autonomous cars - Wireless technologies for Vehicle-to-Infrastructure (V2I) and Vehicle-to-Vehicle (V2V) communications - Automotive surrounding sensing with GHz and THz signals.

UNIT 5 QUALITY OF SERVICE**9 Hrs.**

QoS Challenges in Wireless IP Networks - QoS in 3GPP - QoS Architecture, Management and Classes - QoS Attributes - Management of End-to-End IP QoS - EPS Bearers and QoS in LTE networks.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Understand the fundamental concepts of 5G networks.

CO2 - Describe the 5G architecture and operation model.

CO3 - Analyze the protocol support of 5G network.

CO4 - Design IoT based applications with 5G network.

CO5 - Describe the future mobile networks. CO6 - Implement 5G network with simulation.

TEXT / REFERENCE BOOKS

1. Wireless Communications: Principles and Practice, by Theodore S. Rappaport, Prentice Hall., 2014
2. 802.11n: A Survival Guide, by Matthew Gast, O'Reilly Media.
3. 802.11ac: A Survival Guide, by Matthew Gast, O'Reilly Media.
4. Wireless Networking Complete, by Pei Zheng et al., Morgan Kaufmann.
5. Zhang, Yin, Chen, Min, "Cloud Based 5G Wireless Networks", Springer, 2016
6. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", Wiley 2015

SCSA4002 (Revised)	5G NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To gain in depth knowledge of wireless networks for the future communication systems.
- To study the concepts of wireless networks for the future communication systems.
- To discuss 5G networks and its applications.

UNIT 1 MULTI-GIGABIT WIRELESS NETWORKS**6 Hrs.**

Next generation (5G) wireless technologies- Upper Gigahertz and Terahertz wireless communications: Millimeter wave networking - Directionality and beam forming- Mobility and signal blockage - IEEE 802.11ad (60 GHz WLAN) MAC and PHY overview: Visible light communication- High-speed networking using LEDs - IEEE

UNIT 2 INDOOR LOCALIZATION AND RF SENSING**6 Hrs.**

Smartphone localization - WiFi fingerprinting - protocols and challenges - Non-WiFi localization - Device-free sensing with radio frequency - Mining wireless PHY channel state information- Device- free localization and indoor human tracking - Activity and gesture recognition through RF.

UNIT 3 LOW-POWER NETWORKING FILTERS**6 Hrs.**

Backscatter communication - Radio Frequency Identification (RFID) technology overview - Energy harvesting tags and applications- Internet-of-Things (IoT) - IoT protocol overview - CoAP and MQTT - IPv6 networking in low-power PANs (6LoWPAN).

UNIT 4 FUTURE MOBILE NETWORKS**6 Hrs.**

Drone networking - Multi-UAV networks, architectures and civilian applications-Communication challenges and protocols for micro UAVs- Connected and autonomous cars - Wireless technologies for Vehicle-to-Infrastructure (V2I) and Vehicle-to- Vehicle (V2V) communications - Automotive surrounding sensing with GHz and THz signals.

UNIT 5 QUALITY OF SERVICE**6 Hrs.**

QoS Challenges in Wireless IP Networks - QoS in 3GPP - QoS Architecture, Management and Classes -QoS Attributes - Management of End-to-End IP QoS - EPS Bearers and QoS in LTE networks.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- C01 - Understand the fundamental concepts of 5G networks.
- C02 - Describe the 5G architecture and operation model.
- C03 - Analyze the protocol support of 5G network.
- C04 - Design IoT based applications with 5G network.
- C05 - Describe the future mobile networks.
- C06 - Implement 5G network with simulation.

- 1 Wireless Communications: Principles and Practice, by Theodore S. Rappaport, Prentice Hall., 2014
- 2 802.11n: A Survival Guide, by Matthew Gast, O'Reilly Media.
- 3 802.11ac: A Survival Guide, by Matthew Gast, O'Reilly Media.
- 4 Wireless Networking Complete, by Pei Zheng et al., Morgan Kaufmann.
- 5 Zhang, Yin, Chen, Min, "Cloud Based 5G Wireless Networks", Springer, 2016

TEXT / REFERENCE BOOKS**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, each carrying 16 marks****80 Marks**

SCSA1513 (old)	TIME SERIES ANALYSIS	L	T	P	Credits	Total Marks
-------------------	----------------------	---	---	---	---------	-------------

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 Model**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 Comment slide

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 analyze 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 EXAMINATION QUESTION PAPER PATTERN**Max.Marks:100****Exam Duration: 3Hrs**

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

20 Marks

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

80 Marks

SCSA1513 (Revised)	TIME SERIES ANALYSIS	L	T	P	Credits	Total Marks
		3	1	0	3	100

COURSE OBJECTIVES

- Understand the basic concepts in time series analysis
- Attain knowledge of time series regression
- Gain knowledge of frequently used time series models
- Understanding the problems arising when analyzing stationary processes
- Gain knowledge of ARIMA modeling of stationary time series

Unit I: Introduction to Data Analysis 9 Hrs

Introduction – collection, classification and tabulation of data – Concept of primary and secondary data –Data - quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio –Data visualization - Bar diagram, Pie chart, histogram, frequency curve and frequency polygon –Ogives

Unit II: Introduction to Time series 9 Hrs

Introduction to Time series – Applications of Time Series in various fields-Components of a time series- Decomposition of time series - Trend - Measure of trend collection –Types of Trends .

Unit III: Analysis of Time Series 9 Hrs

Methods in Time Series– Graphical method, Semi Average method, Moving Average method and Least Square method – Measurement of Seasonal Variation – Simple Average method, Ratio to Trend method and Ratio to Moving Average method.

Unit VI: Bivariate data 9Hrs

Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), principle of least squares and fitting of polynomials and exponential curves - Introduction to Linear regression – Multiple regression.

Unit V: Auto Regressive Integrated Moving Average (ARIMA) Model 9 Hrs

Meaning of Stationary process – Auto Regressive models, Moving Averages models, ARMA models, ARIMA models –Error measures in forecasting. (Unit V is only theory)

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1: Apply the knowledge on real world time series and forecast problems
- CO2: Think critically and analyse problems
- CO3: Information and technology literacy
- CO4: Choose and apply the right smoothing method for the data.
- CO5: Apply of knowledge, skills, and responsibilities to new settings and progressively more complex problems
- CO6: Critically review and evaluate time series models and choose the best modeling approach

TEXT/REFERENCE BOOKS

1. Statistical Methods, S.P.Gupta, 2002, Thirty first Revised Edition, Sultan Chand Educational Publishers, New Delhi.
2. Statistics for Management, P.N.Arora and S.Arora, 2010, Fifth Revised Edition, S Chand and Company, New Delhi.
3. Forecasting Methods and Applications, Spyros Makridakis et al., 2003, second edition, John Wiley & sons, New York.
4. Time Series Analysis, J.Hamilton, 1994, Princeton University Press.
5. Time Series Analysis: Theory and Methods, P.Brockwell and R.Davis, 1991, Springer-Verlag.
6. Time Series Analysis and Its Applications: With R Examples (Springer Texts in Statistics) 3rd Edition, 2011.

END SEMESTER EXAM 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

B.E Computer Science and Engineering with Specialization in Artificial Intelligence

S11BLH11(New syllabus)	PROGRAMMING IN C	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- To understand the concepts of variables, operators, control structures and arrays.
- To gain knowledge on functions, structures and union in C.
- To explore the concepts of pointers and files to create real world applications using C.

UNIT 1 BITS AND BYTES IN COMPUTING

12 Hrs.

Computers: Hardware – Software – Processor – Memory – I/O devices – Interface – Programming Languages – Evolution from COBOL, FORTRAN to C, Python – Need

Algorithms: Role in problem solving – Analysis – Design – Flowcharts: Role in problem solving – Symbols – Design – Pseudo code: Role in problem solving – Design – Program: Role in problem solving – Design Practice: Describe a

simple real world problem in your domain of interest and describe it in the form of problem statement, input, output and provide its solution in terms of algorithm, flowchart, pseudo code and program.

UNIT 2 C: MATH BEHIND CODING

12 Hrs.

C: Structure of program – Character set – Tokens – Keywords – Identifiers – Constants – Variables – Data types – Strings – Operators and its types – Functions – Header Files

Algorithmic Strategies: Iteration and Recursion – Efficiency – Role of time and space consumption while building an algorithm – Complexities

Practical:

- Describe a simple real world problem in your domain of interest and provide a computing and non-computing solution for the same. Calculate the time and space consumed in both solutions. Compare and contrast the pros and cons in both solutions.
- Write an algorithm, flowchart, pseudo code followed by a simple C code to do find the Factorial and Fibonacci series using both iteration and recursion.
- Input the number of days taken to cultivate both rice and wheat in turns in an agricultural land from the user. Write a C program to display the days as years, months and days using simple operators.
- You have a circular plot for building playground and a rectangular plot for building an apartment. Get the input from the user for both plots and write a C program to calculate the area and perimeter of both plots.

UNIT 3 C: MAGIC BEHIND INSTANT OUTPUTS

12 Hrs.

Advanced Coding Concepts: Decision Making using branching statements and its types – Decision making using looping statements and its types – Switch statements – Break – Continue – Goto – Jump statements.

Case Study: Fun with Code – Printing Alphabets / Flags of Countries / Flying Alphabet Screensaver. Practical:

- Describe a problem statement in your domain of interest whose solution involves repetition of same steps and provide code as solution involving for, while and do while loops.
 - Describe a problem statement in your domain of interest whose solution involves decision making and provide code as solution involving if-else, nested if-else and ladder if-else.
 - Develop a simple scientific calculator using Switch case statement.
 - A Cartesian co-ordinate system has four quadrants. Write a C program to find the quadrant of the co-ordinate points given by the user using both if-else and nested if-else control structure.
 - Given a rose flower to you, dismantle the petals of the flower from inside, if you notice - it follows the sequence of Fibonacci. Now, try to arrange the word "PIZZA" in several ways without repeating and calculate number of ways it can be done using factorial concept. Write a C program to find both Fibonacci and factorial by getting the mentioned input.
1. Product of two large prime numbers is used as encryption key in encryption algorithms. Write a C program to display all the prime numbers between 1 to 100 and give the first two largest numbers as the output.

UNIT 4 STORING GROUP OF HOMOGENOUS ELEMENTS: ARRAYS 12 Hrs.

Diving into Arrays: Definition – Syntax – Types – Representation: Row and Column Order – Dynamic Arrays.

Idea behind Functions: Declaration – Definition – Types – Calling – Arguments – Prototypes – Call by Value – Call by Reference – Pointers – Amalgamation of Pointers with Arrays and Strings.

Case Study: Fun with Code – Simple Game Development using Arrays and Functions. Practical:

- Describe a problem statement in your domain of interest where you need to work with group of same type of data. Provide a solution in terms of C program to store and manage the data effectively.
- You're playing UNO cards, suddenly a person is getting rev card. Write a C program to reverse the round by storing the number of players in array.
- Write a C program for Vehicle Regulation System where odd number ending vehicles can use the road on odd days and even number ending vehicles can use the road on even days using two separate arrays to store and display the odd and even numbers.
- Write a C program to do the following applications in array:

- a. (i). Get set of positive and negative integers from user, replace positive integers by 0 in the array.
 - b. (ii). Reverse the floating point numbers stored in the array.
 - c. (iii). Return the smallest value and largest value position in the array.
 - d. (iv). Search the number '5' in array and replace it with '10'
- Write C program to do the following string handling applications.
 - a. (i). Get favourite actor and actress name, concatenate it and display
 - b. (ii). Display your name in uppercase, lowercase and as fname and lname.
 - c. (iii). Count the frequency of "the" in any sentence and delete it from sentence.
 - d. (iv). Check whether the given string is a palindrome or not.
- Write a C program for counting the total number of duplicate elements in an array, print all the unique elements in the same array as two different functions.
- Write a C program to sort the elements in an array in both ascending and descending order using two different functions.
- Write a C program to find the largest and smallest number in an array using recursion and to convert the output into a binary number.
- Write a C program to swap two numbers using two functions, one using pointers and the other one without using pointers.

UNIT 5 STORING GROUP OF HETEROGENOUS ELEMENTS: STRUCTURE

12 Hrs.

Outset of Structure and Union: Structure definition and declaration – Structures fusion with Arrays – Pointers – Functions – Union initiation, Definition and declaration – Memory allocation- Static and dynamic
Working with Files: File handling functions – Read – Write – Other operations – Different file types Case Study: Report on using file functions to create score board for any game, importing it to program Practical:

- Describe a problem statement in your domain of interest where you need to work with group of different type of data. Provide a solution in terms of C program to store and manage the data effectively.
- Write a C program to get the details of the student (roll no, name, date of birth, state, 10th percentage and 12th percentage) using structure. Calculate the age of the student and display the eligibility status for his admission.
 - a. Eligibility criteria: more than 60 percent in 10th and 12th, age>=17, state==TN.
- Write a menu driven C program for library management system with ten entries:
 - a. (i). Add Book (ii). Add Author (iii). Add Category (iv). Book Cos (v). Display - Book by Author, Book by Category, Book under cost
- Write a C program to create an employee Union with employee details (id, name, salary) Accept the details of 'n' employees, rearrange the data in ascending order of employee name, id and salary as three different functions and display it.

Complex Practice Problems

- Design a C program by creating your own header file for any function of your choice and display the output by calling the header file.
- Create TIC-TAC-TOE game using C Language.
- Given a situation, you are going to ATM to withdraw money. Write a C program, get the money requested from the user as input and display the number of possible bank notes for the requested money. Note: Give input as number ending in 0's or 5's.
- Develop a C program for managing Car Rental process with various modules for registration as new user, login, get id proof, keep track of cars available and cars given for rental.
- Create SUDOKU game using C Language.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Interpret the difference between components of problem solving such as algorithm, flowchart, pseudo

code and source code.

CO2 - Build simple solutions for any given problem statement using various components of problem solving techniques and measure its efficiency in terms of time and space.

CO3 - Examine the roots and foundation of C programming's key concepts like Data types, Operators. **CO4** - Design applications using different core concepts such as Arrays and Functions in C language. **CO5** - Formulate real time solutions through programs using Structure and Union in C language.

CO6 - Develop various applications for solving real time societal problems.

TEXT / REFERENCE BOOKS

1. Yashavant Kanetkar, "Let us C", BPB Publications, Fourteenth Edition, 2019.
2. R.G.Dromey, "How to Solve it by Computer", Pearson Education, 2008..
3. Balagurusamy, "Programming in ANSI C", McGraw Hill Publications, Eighth Edition, 2019.
4. Greg Perry, Dean Miller "C Programming Absolute Beginner's Guide", Third Edition, 2013.

SCSB1231	DATA AND INFORMATION SCIENCE	L	T	P	EL	Credits	Total Marks
(New syllabus)		3	0	0	0	3	100

COURSE OBJECTIVES

- Learn how to process raw data into formats necessary for analysis
- Conquer in-depth knowledge of data science concepts through motivating real-world case studies.
- Understand the methods and principles of data handling and big data.

UNIT 1 DATA ACQUISITION

9 Hrs.

Data Acquisition–Sources of acquiring the data - Internal systems and External systems- Web APIs, Data preprocessing- Exploratory Data Analysis (EDA)- Basic tools (plots, graphs and summary statistics) of EDA -Open Data Sources, Data APIs, Web Scrapping -Relational Database access (queries) to process/access data.

UNIT 2 DATA PREPROCESSING AND PREPARATION

9 Hrs.

Data Munging, Wrangling - Data Visualization Basics -Plyr packages - Cast/Melt. Tableau: Creating Visualizations in Tableau- Data hierarchies, filters, groups, sets, calculated fields-Map based visualizations-Build interactive dashboards-Data Stories.

UNIT 3 DATA QUALITY AND TRANSFORMATION

9 Hrs.

Data imputation -Data Transformation (minmax, log transform, z-score transform etc.). - Binning, Classing and Standardization. - Outlier/Noise& Anomalies.

UNIT 4 HANDLING TEXT DATA

9 Hrs.

Bag-of-words- Regular Expressions - Sentence Splitting and Tokenization - Punctuations and Stop words, Incorrect spellings -Properties of words and Word cloud - Lemmatization and Term-Document TxD computation -Sentiment Analysis (Case Study).

UNIT 5PRINCIPLES OF BIG DATA

9 Hrs.

Introduction to Big Data - Challenges of processing Big Data (Volume, Velocity and Variety perspective) - Use Cases.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1** - Explore the fundamental concepts of Data science.
- CO2** - Identify and execute the basic data format.
- CO3** - Understand basics of Data Preprocessing and Data Visualization.
- CO4** - Improve the Data quality through various transformations.
- CO5** - Implement the methods of handling text data.
- CO6** - Analyze and understand the basics of Big Data.

TEXT / REFERENCE BOOKS

1. Data Science at the Command Line, Jeroen Janssens, O'Reilly, 2015, ISBN 978-1-491-94785-2.
2. Python for Data Analysis, Wes McKinney, O'Reilly, 2018, ISBN-13: 978-1-491-95766.
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly. 2014.
4. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.

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 of internal choice; each carrying 16 marks

80 Marks

S11BLH21(New syllabus)	PROGRAMMING IN PYTHON	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To learn about data structures lists, tuples, and dictionaries in Python.
- To build packages with Python modules for reusability and handle user/custom exceptions.
- To create real world GUI applications, establish Database connectivity and Networking.

UNIT I-INTRODUCTION TO PYTHON

12 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in function – Conditional statements - Iterative statements- Input/output functions - Python Database Communication - data analysis and visualization using python.

Practical:

- Implement built-in functions and trace the type of data items.
- Implement concepts of Conditional and Iterative Statements.
- Use the built-in csv module to read and write from a CSV file in Python.
- Perform data analysis and visualization on a given dataset using Python libraries like pandas, numpy, matplotlib and display charts, graphs, and plots.

UNIT 2 OBJECT ORIENTED CONCEPTS

12 Hrs.

Class – Objects – Constructors – Polymorphism – Encapsulation -Inheritance -Data Abstraction- Method Overloading-Method Overriding-Database Access-Data Hiding-Import Class.

Practical:

- Execute concepts on Polymorphism, Encapsulation.
- Implement Data Abstraction and Inheritance.
- Differentiate Method Overloading and Overriding.
- Create a class called "Person" with attributes "name" and "age." Make the "age" attribute private and implement a getter method to access it.
- Create a module called "math_operations.py" with a class called "Calculator." Import the "Calculator" class into another script and use its methods to perform mathematical operations.

UNIT 3FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES

12 Hrs.

File Operations –Iterators - Exception handling - Regular Expressions- Functions and modules-Import Statement Introduction to PIP-Installing Packages via PIP-Using Python Packages.

Practical:

- Create a text file called "numbers.txt" and write the numbers from 1 to 10 in words, each on a separate line.
- Implement a custom iterator that generates a sequence of Fibonacci numbers and print the first 10 numbers.
- Create a try-except block to catch a File Not Found Error and print a message when a file is not found.
- Write a Python program that handles a Zero Division Error and prints a custom error message to the console.
- Create a module called "greetings.py" with a function called "hello" that prints "Hello, World!" Import the module into another script and use the "hello" function.
- Install the "numpy" package using PIP. Import the package and create a NumPy array with random values.

UNIT 4 GUI PROGRAMMING

12 Hrs.

GUI Programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts – Colors - Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box).

Practical:

- Design a GUI form with a vertical box layout that includes labels and entry fields for user registration information.
- Create a GUI window with a grid layout that contains buttons representing a 3x3 game board.

- Create a canvas in your GUI program and draw simple shapes such as rectangles, circles, and lines.
- Create a GUI form program that includes various widgets and implement event handling Concepts also add Create a drop-down menu that allows users to select different font styles for text display.

UNIT 5 DATABASE AND NETWORK

12 Hrs.

Database (using NoSQL): Connector Module –Cursor – Statements - Exceptions in database. Network connectivity: Socket module - Client – Server –Email – URL Access.

Practical:

- Connect to the NoSQL database using a Python connector module, such as "pymongo" for MongoDB or "cassandra-driver" for Cassandra.
- Use a cursor to iterate over the records in a collection/table and print specific fields/attributes.
- Implement error handling for specific scenarios, such as duplicate key violation or record not found, in the NoSQL database.
- Implement either a TCP/IP or UDP client-server application using the socket module for sending and receiving messages.
- Write a program using the smtplib module to send an email from a specified email address to another recipient.

Max. 60 Hrs.

COURSE OUTCOMES

On Completion of the course, student will able to

CO1 - Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.

CO2 - Do the decision making and write functions in Python.

CO3 - Explain how to design GUI Applications in Python and evaluate different database operations.

CO4 - Design and develop Client Server network applications using Python.

CO5 - Ability to design real life situational problems and think creatively about solutions of them.

CO6 - Apply the best features of mathematics, engineering and natural sciences to program real life problems.

TEXT / REFERENCE BOOKS

1. Y. Daniel Liang, "Introduction to Programming Using Python", Pearson,2013.
2. Python Notes for Professionals by Stack Overflow Documentation (<https://books.goalkicker.com/PythonBook/>)
3. Dr. Charles R. Severance, "Python for Everybody- Exploring Data Using Python 3", 2016.
4. Paul Gries, Jennifer Campbell, Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Pragmatic Bookshelf, 2nd Edition,2014.

B.E Computer Science and Engineering with Specialization In Data Science

SCSB1232(	EXPLORATORY DATA ANALYSIS	L	T	P	EL	Credits	Total Marks
New		3	0	0	0	3	100
Syllabus)							

COURSE OBJECTIVES

- To focus on the significance of data and software tools.
- To emphasize the relationship between variables and gain knowledge about univariate data analysis.
- To explore multivariate data analysis and visualize the data.

UNIT I

INTRODUCTION

9 Hrs.

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data - Comparing EDA with classical and Bayesian analysis – Software tools for EDA – Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT 2THE EXPLORATORY PERSPECTIVE

9 Hrs.

Introduction: Overview – Sources of Data – Process for Making Sense of Data - Describing Data: Observations and Variables – Types of Variables – Central Tendency – Distribution of the Data – Confidence Intervals – Hypothesis Tests - Distributions of Single Variables.

Displaying Data: The Stem and Leaf – Summarizing Data – Resistant Statistics and Number Summaries - The Box and Whisker -Understanding Data: Skewness – Outliers – Gaps and Multiple Peaks.

UNIT 3

RELATIONSHIPS BETWEEN VARIABLES

9 Hrs.

Preparing Data Tables: Cleaning - Displaying Relationships =The Scatter Plot –Summarizing Relationships – Fitting A Line – Smoothing the Data – Median and Hinge Traces –Examining Residuals – Understanding Relationships: Outliers – Nonlinear Monotonic Relationships.

UNIT 4

REEXPRESSION AND UNIVARIATE ANALYSIS

9 Hrs.

Choosing Re-expressions: Nonlinear Monotonic Functions – Nonmonotonic Functions. Introduction to Single variable: Distribution Variables – Numerical Summaries of Level and Spread -Scaling and Standardizing – Inequality - Univariate data: measures of center and spread, transformations.

UNIT 5

MULTIVARIATE ANALYSIS AND VISUALIZATION

9 Hrs.

Introducing a Third Variable – Causal Explanations – Three-Variable Contingency Tables and Beyond - Bivariate Analysis – Multivariate Analysis – Casual Analysis.

Basics of Matplotlib, Plotting with Pandas and Seaborn, Other Python Visualization Tools.

Max. 45 Hrs.

COURSE OUTCOMES

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

- CO1** - Understand about the significance of exploratory data analysis.
- CO2** - Analyze the data statistically.
- CO3** - Summarize data and understanding their relationship.

- CO4** - Perform univariate data exploration and analysis.
- CO5** - Apply multivariate data exploration and analysis.
- CO6** - Perform data exploration and visualization techniques.

TEXT / REFERENCE BOOKS

1. Glenn J. Myatt, Wayne P. Johnson – Making Sense Of Data | A Practical Guide To Exploratory Data Analysis And Data Mining, Second Edition, 2014.
2. Frederick Hartwig, Brian E. Dearing , Exploratory Data Analysis, 1979.
3. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.
4. Jake Vander Plas, “Python Data Science Handbook: Essential Tools for Working with Data”, First Edition, O Reilly, 2017.
5. Catherine Marsh, Jane Elliott, Exploring Data: An Introduction to Data Analysis for Social Scientists, Wiley Publications, 2nd Edition, 2008.

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 of internal choice; each carrying 16 marks

80 Marks

B.E Computer Science and Engineering with Specialization in Artificial Intelligence and Machine Learning

SB1251	ARTIFICIAL INTELLIGENCE SEARCH METHODS AND REASONING	L	T	P	EL	Credits	Total Marks
(New Syllabus)		3	0	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 BASIC SCIENCE BEHIND AI

9 Hrs.

Intelligence – Memory – Computation – Learning – AI's Foundation and History – Intelligent Agents: Features – Behaviour in the environment – Rationality – Nature and its Structure – Case Study: AI Programming Languages History: LISP – Prolog –Python.

UNIT 2 SEARCHING TOWARDS SOLUTION

9 Hrs.

Searching Strategies: Informed Search: BFS – DFS – Depth Bounded DFS – Uninformed Search: Heuristic Functions – Hill Climbing Search – Best First Search – Local Maxima – Solution Space Search – Adversarial Search – Constraint Satisfaction Problem – Case Study: N-Queens Problem

UNIT 3 KNOWLEDGE: ROLE AND REPRESENTATION

9 Hrs.

Knowledge – Definition and Management – Types: Declarative and Procedural Knowledge – Knowledge Engineering behind Logical Agents: Propositional Logic – First Order Logic – Inference: Forward and Backward Chaining – Ontological Engineering –Case Study: Ontology based knowledge representation

UNIT 4 APPROACHES BEHIND PLANNING AND REASONING

9 Hrs.

Algorithm for Planning as State Space Search – Analysis of Planning Approach – Reasoning: Bayes Rule – Bayesian Network and its approximation – Hidden Markov Model – Kalman Filters – Decision Networks – Case Study: Wumpus World Problem

UNIT 5 DECODING AND LEARNING INTELLIGENCE

9 Hrs.

Learning Algorithms: Classification and Regression with Linear Model – Non-Parametric Models – Ensemble Learning –Explanation Based Learning – Learning with Hidden Variables – AI Real Time Applications – Case Study: Nature Inspired Computation

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- 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 bayes 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", 3rd Edition, 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., 1st Edition, 2008.
4. David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, 2nd Edition, 2010.
5. Ertel, Wolfgang, Introduction to Artificial Intelligence, 1st Edition, 2017

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

PART A: 10 questions of 2 marks each –No choice 20 Marks

PART B: 2 questions from each unit of internal choice; each carrying 16 marks 80 Marks

List of New Courses

S. No.	Course Code	Course Name	Page No.
B.E Computer Science and Engineering with Specialization in Artificial Intelligence			
1	SBAA4002	Principles of Management and Professional Ethics	3
2	SCSA1701	Cyber Physical Systems	5
3	SCSA1703	Computer Vision	7
4	SCSA2701	Cyber Physical System Lab	9
5	S731APROJ1	Project Work (Phase 1)	
6	S11BLH11	Programming in C	10
B.E Computer Science and Engineering with Specialization in Data Science			
7	SCSA1704	Data Management in Cloud	14
8	SCS3007	Introduction to Visual Computing	16
9	SCSA2702	Data Management in Cloud Lab	18
10	S733PROJ1	Project Work (Phase 1)	
B.E Computer Science and Engineering with Specialization in IoT			
11	SITA1501	Wireless Sensor Networks and Architecture	19
12	S732APROJ1	Project Work(Phase 1)	
B.E Computer Science and Engineering with Specialization in Artificial Intelligence and Machine Learning			
13	SCSA1514	Data modeling and Predictive Analytics	21
14	SCSA2507	Human Computer Interaction Lab	23
15	S611APT1	Professional Training - I	
B.E Computer Science and Engineering with Specialization in Artificial Intelligence& Robotics			
16	SCSA1515	Intelligence of Biological System	24
17	SCSA1516	Signal and Image Processing	26
18	SCSA2508	Robotic Programming using python Lab	28

19	S612APT1	Professional Training - I	
B.E Computer Science and Engineering with Specialization in Block Chain Technology			
20	SCSA1517	Ethics law and policy	29
21	SCSA1518	Enterprise Block Chain Platforms	31
22	SCSA2509	Network Security Lab	33
23	S613APT1	Professional Training 1	
B.E Computer Science and Engineering with Specialization in Cyber Security			
24	SCSA1519	Ethical Hacking	34
25	SCSA2510	Ethical Hacking- Lab	36
26	SCSA2511	Database Security Lab	37
27	S614APT1	Professional Training -1	

SBAA4002	PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To get a clear understanding of management functions in an organization.

UNIT 1 MANAGEMENT THEORIES

9 Hrs.

Definition of management, science or art, manager vs entrepreneur; Types of managers - managerial roles and skills; Evolution of management-scientific, human relations, system and contingency approaches; Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management.

UNIT 2 PLANNING, DECISION MAKING AND ORGANISING

9 Hrs.

Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Decision making steps & processes. Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and Decentralization, job design.

UNIT 3 STAFFING AND LEADING

9 Hrs.

Human resource management, HR Planning, Recruitment selection, training & development, performance management, career planning and management, Directing individual and group behaviour, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT 4 CONTROLLING AND REPORTING

9 Hrs.

Controlling, system and process of controlling, budgetary and non-budget control technique, use of computer and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting

UNIT 5 VALUES AND ETHICS

9 Hrs.

Human Values – Natural acceptance - Ethics – Definition- Objectives - Virtues – Challenges in the work place - Engineering ethics - Scope - Moral issues and judgment- Moral development theories – Engineers as responsible experimenters - Codes of ethics - Industrial standards- Global Issues: Environmental ethics -Computer ethics - Ethics and codes of business conduct in MNC.

Max.45 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Describe the evolution and development of management concepts

CO2: Understand the functions of management

CO3: Apply the concepts and develop key competencies for managing human resources

CO4: Analyze appropriate management techniques for Controlling and Reporting.

CO5: Evaluate the various aspects of decision making and demonstrate critical thinking

CO6: Elaborate the importance of the ethical dimension in workplace

TEXT / REFERENCE BOOKS

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 11th ed., 2012.
2. Harold Koontz and Heinz Weihrich , 'Essentials of Management' Tata Mcgraw Hill, 10th edition, 2015.
3. Nagaraazan. R. S, 'A text book on human values and ethics', Newage International Publishers, New Delhi, 2018.
4. Stoner James A. F., Freeman. R. E and Gilbert. R. D, 'Management', Pearson Education, 6th edition, 2018
5. Griffin, R. W., 'Management', South-Western College Publication 11th Edition, 2012.
6. Gregory. G. D, Gerry. M. C and Alan. E, 'Strategic Management: Text And Cases' Mcgraw Hill, 8th Edition, 2018.
7. Tripathy. P. C & Reddy. P. N, 'Principles of Management', Tata McGraw Hill, 5th edition, 2012.
8. Gupta C.B., 'Management Theory and Practice', Sultan Chand and Sons, New Delhi 19th Revised and enlarged edition , 2017
9. Tulsian. P.C & Pandey. V, 'Business Organisation & Management', Pearson Education, 2011.
10. Joseph L. Massie, 'Essentials of Management', Pearson Education, 4th edition, 2016
11. Harris Pritchard and Rabins, 'Engineering Ethics' Cengage Learning, New Delhi. 4th edition, 2014.

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

SCSA1701	CYBER PHYSICAL SYSTEMS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts
- To develop an exposition of the challenges in implementing a cyber-physical system
- To analyze the functional behaviour of CPS based on standard modeling formalisms.
- To design CPS requirements based on operating system and hardware architecture constraints.
- To understand the concepts involved in Cyber Physical Systems Security

UNIT 1 INTRODUCTION TO INDUSTRY 4.0 & CYBER PHYSICAL SYSTEM 9 Hrs.

Industry 4.0 - Globalization and Emerging Issues, The Fourth Revolution - Smart and Connected Business Perspective, Basics of Industrial IoT - Industrial Processes - Industrial Sensing & Actuation, Industrial Internet Systems - Basic principles of design and validation of CPS - Cyber-Physical Systems (CPS) in the real world- Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation.

UNIT 2 EMBEDDED SYSTEMS MODELING AND DESIGN AND CPS 9 Hrs.

Platform components - Embedded Systems definition, specification, and languages. Concepts, requirements, examples. Embedded system models at different abstraction levels. Test benches, design under test, Intellectual Property components. Discrete event simulation, semantics, algorithms. Design, analysis techniques for decentralized computer architectures, communication, and hardware-software systems. -Cyber Physical System Hardware Platform - Processors, Sensors, Actuators - Network – Wireless Hart, CAN, Automotive Ethernet – Software stack -Real-Time Operating system (RTOS) -Scheduling Real Time control tasks.

UNIT 3 SENSORS, ACTUATORS AND SENSOR NETWORKS 9 Hrs.

Sensors, Actuators and Sensor Networks & Real-Time and Distributed Systems - Fundamental principles and applications of sensors, actuators. Smart sensors and microsensor/microactuator array devices. Introduction to signal processing and sensor/actuator networks, deployment and architecture, wireless communication, multiple access control layer, data gathering, routing and querying, collaborating signal processing - Time dependent systems, clock synchronization, real-time communication protocols, specification of requirements, task scheduling. Validation of timelines, real-time configuration management. Middleware architecture for distributed real-time and secure services.

UNIT 4 SECURITY OF CYBER PHYSICAL SYSTEMS 9 Hrs.

Security of Cyber Physical Systems -Embedded and CPS security - attacks and countermeasures, authentication, identification, confidentiality, data integrity, authorization, access control,

malware attacks and counter-measures, security protocols. Privacy issues - vehicular devices and smart metering. Applications of public key and symmetric cryptography, - digital certificates, credentials. Security and vulnerability of cyber-physical infrastructure networks - Mobile and wireless network security, Robust wireless infrastructure - Cloud computing and data security, Event Awareness and System Monitoring for Cyber Physical Infrastructure.

UNIT 5 CYBER-PHYSICAL SYSTEMS CASE STUDIES AND PROJECTS 9 Hrs.

Cyber-Physical Systems Case Studies and Projects - Automotive: SW controllers for Antilock braking system, Adaptive Cruise Control, Lane Departure Warning, Suspension Control - Healthcare: 6 Artificial Pancreas/Infusion Pump/Pacemaker - Green Buildings: automated lighting, AC control - power distribution grid - robotics - civil infrastructure – avionics – Transportation.

Max.45 Hours

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: An ability to expose the student to real world problems in CPS and Industrial revolution 4.0 best practices.

CO2: Identify the limitations of some computational models.

CO3: Apply the theoretical knowledge the design of compilers.

CO4: Student can Analyze and verify the correctness of CPS implementations against system requirements and timing constraints.

CO5: Categorize the essential modeling formalisms of Cyber-Physical Systems (CPS)

CO6: Ability to understand cyber modeling system.

TEXT / REFERENCE BOOKS

1. “Industry 4.0: The Industrial Internet of Things”, Alasdair Gilchrist (Apress)
2. “Industrial Internet of Things: Cyber manufacturingS ystems” Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer).
3. Cyber-physical advances in design and modelling by kravets,Alla.G,Alexander,Springer publications 2019.
4. Edward A. Lee and Sanjit A. Seshia, Introduction to Embedded Systems, A Cyber-Physical Systems Approach, Second Edition, <http://LeeSeshia.org>, ISBN 978-1-312-42740-2, 2015.
5. Rajeev Alur. Principles of Cyber-Physical Systems. MIT Press. 2015.
6. K. J. Astrom and R. M. Murray. Feedback Systems: An Introduction for Scientists and Engineers. Prince- ton University Press, 2009.
http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page.
7. Sajal Das, Krishna Kant, and Nan Zhang, Securing Cyber-Physical Critical Infrastructure – Foundations & Challenges, Morgan Kaufmann, 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

SCSA1703	COMPUTER VISION	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- This course helps in learning the basic principles of image formation and image processing algorithms.
- Discuss on different algorithms for 3D reconstruction and recognition.
- Emphasizes the core vision tasks of scene understanding and recognition.
- Discuss on Applications to 3D modeling, video analysis, and video surveillance, object recognition and vision-based control.

UNIT 1 INTRODUCTION

9 Hrs.

Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality

UNIT 2 IMAGE FORMATION MODELS

9 Hrs.

Monocular imaging system, Radiosity: The ‘Physics’ of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus, Construction of 3D model from images

UNIT 3 IMAGE PROCESSING AND MOTION ESTIMATION

9 Hrs.

Image preprocessing, Image representations (continuous and discrete), Edge detection. Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

UNIT 4 SHAPE REPRESENTATION AND SEGMENTATION

9 Hrs.

Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, and Multi resolution analysis.

UNIT 5 OBJECT RECOGNITION AND IMAGE UNDERSTANDING

9 Hrs.

Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component Analysis, Shape priors for recognition, Pattern recognition methods, HMM, GMM and EM, Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Max. 45 Hours

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** Implement fundamental image processing techniques required for computer vision
CO2: Understand Image formation process
CO3: Extract features from images and do analysis of images
CO4: Generate 3D model from images
CO5: Understand video processing, motion computation and 3D vision and geometry
CO6: Develop applications using computer vision techniques 8

TEXT /REFERENCE BOOKS

1. David A. Forsyth, Jean Ponce.”Computer Vision: A Modern Approach”, 2nd Edition Pearson Education Limited,2015.
2. Trucco and A. Verri, “Introductory Techniques for 3D Computer Vision”, Prentice Hall, 1998.
3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, 3rd Edition, Academic Press, 2012.
4. E. R. Davies, Computer & Machine Vision, 4th Edition, Academic Press, 2012.
5. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 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

SCSA2701	CYBER PHYSICAL SYSTEMS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To introduce basics of cyber-physical system and Industrial revolution 4.0 concepts
- To develop an exposition of the challenges in implementing a cyber-physical system
- To analyze the functional behaviour of CPS based on standard modeling formalisms.
- To design CPS requirements based on operating system and hardware architecture constraints.
- To understand the concepts involved in Cyber Physical Systems Security

LIST OF EXPERIMENTS

1. Study about embedded components such as sensors and actuators
2. Study about Industrial Revolution and Cyber physical system opportunities and challenges
3. Create a program that blinks the LED on the development board using MBED software.
4. Pick one-one from the available sensors and actuators and find or create code that will display the sensed data on the PC
5. Create a program that displays data from the sensor in regular intervals in a compact format.
6. To Design Basic weather station using embedded components using Lab view software.
7. Login to devicehub.net and create a project then create a virtual device. Add the corresponding sensor and actuator to the virtual device.
8. Study the MQTT protocol. Examine the components of the protocol.
9. Create a connection from an MQTT capable device/software with an MQTT broker then send and receive data using it.
10. To configuring the gateways and exchange the data to local database using Dream factory
11. To configuring the gateways and upload the data to cloud server using Dream factory or Ubidots
12. To configuring the gateways and upload the data to cloud server using Dream factory or Ubidots

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: An ability to expose the student to real world problems in CPS and Industrial revolution 4.0 best practices.

CO2: Identify the limitations of some computational models.

CO3: Apply the theoretical knowledge the design of compilers.

CO4: Student can Analyze and verify the correctness of CPS implementations against system requirements and timing constraints.

CO5: Categorize the essential modeling formalisms of Cyber-Physical Systems (CPS)

CO6: Implement the real time use case and problem statements.

S11BLH11	PROGRAMMING IN C	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- To understand the concepts of variables, operators, control structures and arrays.
- To gain knowledge on functions, structures and union in C.
- To explore the concepts of pointers and files to create real world applications using C.

UNIT 1 BITS AND BYTES IN COMPUTING

12 Hrs.

Computers: Hardware – Software – Processor – Memory – I/O devices – Interface – Programming Languages – Evolution from COBOL, FORTRAN to C, Python – Need Algorithms: Role in problem solving – Analysis – Design – Flowcharts: Role in problem solving – Symbols
– Design – Pseudo code: Role in problem solving – Design – Program: Role in problem solving – Design Practice: Describe a simple real world problem in your domain of interest and describe it in the form of problem statement, input, output and provide its solution in terms of algorithm, flowchart, pseudo code and program.

UNIT 2 C: MATH BEHIND CODING

12 Hrs.

C: Structure of program – Character set – Tokens – Keywords – Identifiers – Constants – Variables – Data types – Strings – Operators and its types – Functions – Header Files Algorithmic Strategies: Iteration and Recursion – Efficiency – Role of time and space consumption while building an algorithm – Complexities
Practical:

- Describe a simple real world problem in your domain of interest and provide a computing and non-computing solution for the same. Calculate the time and space consumed in both solutions. Compare and contrast the pros and cons in both solutions.
- Write an algorithm, flowchart, pseudo code followed by a simple C code to do find the Factorial and Fibonacci series using both iteration and recursion.
- Input the number of days taken to cultivate both rice and wheat in turns in an agricultural land from the user. Write a C program to display the days as years, months and days using simple operators.
- You have a circular plot for building playground and a rectangular plot for building an apartment. Get the input from the user for both plots and write a C program to calculate the area and perimeter of both plots.

UNIT 3 C: MAGIC BEHIND INSTANT OUTPUTS

12 Hrs.

Advanced Coding Concepts: Decision Making using branching statements and its types – Decision making using looping statements and its types – Switch statements – Break – Continue – Goto – Jump statements.

Case Study: Fun with Code -- Printing Alphabets / Flags of Countries / Flying Alphabet Screensaver. Practical:

- Describe a problem statement in your domain of interest whose solution involves repetition of same steps and provide code as solution involving for, while and do while loops.

- Describe a problem statement in your domain of interest whose solution involves decision making and provide code as solution involving if-else, nested if-else and ladder if-else.
- Develop a simple scientific calculator using Switch case statement.
- A Cartesian co-ordinate system has four quadrants. Write a C program to find the quadrant of the co-ordinate points given by the user using both if-else and nested if-else control structure.
- Given a rose flower to you, dismantle the petals of the flower from inside, if you notice - it follows the sequence of Fibonacci. Now, try to arrange the word "PIZZA" in several ways without repeating and calculate number of ways it can be done using factorial concept. Write a C program to find both Fibonacci and factorial by getting the mentioned input.
- 1. Product of two large prime numbers is used as encryption key in encryption algorithms. Write a C program to display all the prime numbers between 1 to 100 and give the first two largest numbers as the output.

UNIT 4 STORING GROUP OF HOMOGENOUS ELEMENTS: ARRAYS 12 Hrs.

Diving into Arrays: Definition – Syntax – Types – Representation: Row and Column Order – Dynamic Arrays.

Idea behind Functions: Declaration – Definition – Types – Calling – Arguments – Prototypes – Call by Value – Call by Reference – Pointers – Amalgamation of Pointers with Arrays and Strings.

Case Study: Fun with Code – Simple Game Development using Arrays and Functions. Practical:

- Describe a problem statement in your domain of interest where you need to work with group of same type of data. Provide a solution in terms of C program to store and manage the data effectively.
- You're playing UNO cards, suddenly a person is getting rev card. Write a C program to reverse the round by storing the number of players in array.
- Write a C program for Vehicle Regulation System where odd number ending vehicles can use the road on odd days and even number ending vehicles can use the road on even days using two separate arrays to store and display the odd and even numbers.
- Write a C program to do the following applications in array:
 - (i). Get set of positive and negative integers from user, replace positive integers by 0 in the array.
 - (ii). Reverse the floating point numbers stored in the array.
 - (iii). Return the smallest value and largest value position in the array.
 - (iv). Search the number '5' in array and replace it with '10'
- Write C program to do the following string handling applications.
 - (i). Get favourite actor and actress name, concatenate it and display
 - (ii). Display your name in uppercase, lowercase and as fname and lname.
 - (iii). Count the frequency of "the" in any sentence and delete it from sentence.
 - (iv). Check whether the given string is a palindrome or not.
- Write a C program for counting the total number of duplicate elements in an array, print all the unique elements in the same array as two different functions.
- Write a C program to sort the elements in an array in both ascending and descending order using two different functions.

- Write a C program to find the largest and smallest number in an array using recursion and to convert the output into a binary number.
- Write a C program to swap two numbers using two functions, one using pointers and the other one without using pointers.

UNIT 5 STORING GROUP OF HETEROGENEOUS ELEMENTS: STRUCTURE 12 Hrs.

Outset of Structure and Union: Structure definition and declaration – Structures fusion with Arrays – Pointers – Functions – Union initiation, Definition and declaration – Memory allocation- Static and dynamic

Working with Files: File handling functions – Read – Write – Other operations – Different file types Case Study: Report on using file functions to create score board for any game, importing it to program Practical:

- Describe a problem statement in your domain of interest where you need to work with group of different type of data. Provide a solution in terms of C program to store and manage the data effectively.
 - Write a C program to get the details of the student (roll no, name, date of birth, state, 10th percentage and 12th percentage) using structure. Calculate the age of the student and display the eligibility status for his admission.
- a. Eligibility criteria: more than 60 percent in 10th and 12th, age $\geq$ 17, state==TN.
- Write a menu driven C program for library management system with ten entries:
- a. (i). Add Book (ii). Add Author (iii). Add Category (iv). Book Cos (v). Display - Book by Author, Book by Category, Book under cost
- Write a C program to create an employee Union with employee details (id, name, salary) Accept the details of 'n' employees, rearrange the data in ascending order of employee name, id and salary as three different functions and display it.

Complex Practice Problems

- Design a C program by creating your own header file for any function of your choice and display the output by calling the header file.
- Create TIC-TAC-TOE game using C Language.
- Given a situation, you are going to ATM to withdraw money. Write a C program, get the money requested from the user as input and display the number of possible bank notes for the requested money. Note: Give input as number ending in 0's or 5's.
- Develop a C program for managing Car Rental process with various modules for registration as new user, login, get id proof, keep track of cars available and cars given for rental.
- Create SUDOKU game using C Language.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Interpret the difference between components of problem solving such as algorithm, flowchart, pseudo code and source code.

CO2 - Build simple solutions for any given problem statement using various components of problem solving techniques and measure its efficiency in terms of time and space.

CO3 - Examine the roots and foundation of C programming's key concepts like Data types, Operators.

CO4 - Design applications using different core concepts such as Arrays and Functions in C language.

CO5 - Formulate real time solutions through programs using Structure and Union in C language.

CO6 - Develop various applications for solving real time societal problems.

TEXT / REFERENCE BOOKS

1. Yashavant Kanetkar, “Let us C”, BPB Publications, Fourteenth Edition, 2019.
2. R.G.Dromey, “How to Solve it by Computer”, Pearson Education, 2008..
3. Balagurusamy, “Programming in ANSI C”, McGraw Hill Publications, Eighth Edition, 2019.
4. Greg Perry, Dean Miller “C Programming Absolute Beginner’s Guide”, Third Edition, 2013.

SCSA1704	DATA MANAGEMENT IN CLOUD	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To understand manage data across cloud platforms, either with or instead of on-premises storage
- To understand data storage tier for disaster recovery, backup, and long-term archiving
- Data prepared by vendor, delivered ready to use
- Can be integrated into larger data set to increase analytic validity

UNIT 1 DISTRIBUTED DATABASE

9 Hrs.

Distributed Database Concepts, Data Fragmentation, Replication, Structure of Distributed Database, trade-offs in Distributing the Database, Advantages and Disadvantages of Data Distribution, Allocation Techniques for Distributed Database Design, Design of Distributed Database

UNIT 2 CLOUD DATA MANAGEMENT

9 Hrs.

Data as a service (DaaS)-Data Location- Data Control- Securing data for transport, Scalability and Cloud Services- Large Scale Data Processing- Databases and Data Stores- Data Archival- Data quality - Data Security.

UNIT 3 DATA MANAGEMENT-AS-A-SERVICE

9 Hrs.

Data Management Essentials, Metadata, Auto-tiered Storage, Single Instance Storage, Time-indexed Data System, Data management challenges. Case study: Fast and secure enterprise cloud backup, Cloud disaster recovery: Bounce back with cloud disaster recovery.

UNIT 4 OPEN SOURCE CLOUD SYSTEM

9 Hrs.

Server virtualization techniques- big data processing frameworks (e.g., Apache Hadoop, Spark and Spark Streaming)- Map Reduce programming model and their applications. Cloud computing and big data- efficient cloud resource management- performance control- energy efficiency.

UNIT 5 INFORMATION STORAGE IN CLOUD COMPUTING

9 Hrs.

Storage as a Service, Storage Providers- Amazon Simple Storage Service- Nirvanix- Google Bigtable Datastore- MobileMe- Live Mesh, Storage Security, Merits and Demerits of Storage. . Cloud Computing for Storing IoT Data, AWS IoT-Data, Google Cloud IoT Technology and Tools – MapReduce/Hadoop , In- database Analytics, MADlib and advanced SQL Tools

Max. 45 Hrs.

COURSE OUTCOMES

- CO1: Able to Design and handle Distributed database in cloud computing environment.
- CO2: Able to manage cloud database and apply distributed database with DaaS cloud
- CO3: Analyze DMaaS for Fast and secure enterprise cloud backup, Recovery
- CO4: Design Cloud server environment/ setup for implement Apache Hadoop, Spark and Spark Streaming to manage cloud big data

CO5: Design and can be able to use cloud storage services, servers.

CO6: Evaluate cloud storage for storing IoT data at cloud computing environment .

TEXT/REFERENCE BOOKS

1. Data Management in the Cloud: Challenges and Opportunitieis, Divyakant Agarwal, Sudipto Das, and Amr EL Abbadi, Morgan & Claypool Publishers, 2013
2. Cloud Data Management and Storage A Standards-Based Approach, Mark Carlson, McGraw-Hill Osborne Media; 1 edition (September 5, 2013)
3. <https://blog.panoply.io/data-management-concepts-and-techniques-in-a-cloud-based-world>
4. <https://vilmate.com/blog/data-management-in-cloud-computing-best-practices-challenges-trends/>
5. <https://www.networkworld.com/article/3290240/the-5-pillars-of-cloud-data-management.html>
6. <https://www.druva.com/blog/how-the-cloud-impacts-data-management/>
7. https://link.springer.com/chapter/10.1007/978-3-642-12038-1_1#citeas
8. <https://www.rocketsource.co/blog/data-as-a-service/>.

SCSA3007	INTRODUCTION TO VISUAL COMPUTING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To gain in depth knowledge of fundamentals of Visual Computing
- Modeling and solving image and video processing and analysis problems.
- Exploiting high level knowledge about human visual perception
- To contribute state-of-the-art solutions for multimedia applications
- To learn the field of visualisation, determining how best to turn data into information

UNIT 1 VISUAL COMPUTING INTRODUCTION

Physiological Foundations-Representation of Light and Color-Image and Noise Models- Basics of Fourier series, Sampling Theorem-Vector Quantization- k-Means Clustering- Mixture Models- Gray Level and Color Quantization-Relationships between Pixels- Camera Geometry- 2D and 3D Transforms, Projections

UNIT 2 DIGITAL IMAGE PROCESSING

Digital Image Filtering-Image Transforms-Image Enhancement and Restoration, Wiener Filters, Nonlinear Image Processing (Median filtering)-Nonlinear Diffusion, Gauss-Laplace Pyramid, Wavelets-Scale Space, (Image and Video Compression Image Segmentation-Optical Flow- Stereo Vision-Template Matching, Point Matching

UNIT 3 DIGITAL IMAGE GENERATION

The Graphics Pipeline- Lighting and Reflection Models- Shading-Texture Analysis and Texture Mapping-Aliasing- Global Illumination-Radiosity-Ray Tracing-Graphics Systems- APIs-3D Graphics Hardware

UNIT 4 REPRESENTATION OF GEOMETRY

Parametric Curves-Bézier Curves-B-Splines-NURBS- Tensor Product Surfaces, Triangle Meshes-Subdivision Methods-Shape Models, linear (Gaussian) Diffusion

UNIT 5 LEARNING METHODS IN VISION

Classifier Learning-Support Vector Machines-Radial Basis Function Networks-Dimension Reduction: PCA, ICA- Linear Discriminant Analysis-Graphical Models- Markov Random Fields-Maximum Entropy Inference and Bayesian Image Analysis

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Acquaint students with core knowledge in visual information processing and learning

CO2: Implement Digital Image Processing Mechanisms. .

CO3: Analyze and design Digital Image Generation Mechanisms

CO4: Representation of geometry and subdivision methods.

CO5: Describe the Learning Methods in Vision

CO6: Comprehend the concepts related three dimensional object representations

TEXT/ REFERENCE BOOKS

1. Donald D Hearn, M. Pauline Baker, Computer Graphics C version, Pearson Education.
2. Dave Shreiner, Mason Woo, Jackie Neider, Tom Davis, OpenGL Programming Guide: The Official Guide to Learning OpenGL, (2013).
3. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics: Principles & Practice in C, Addison Wesley Longman
4. Zhigang Xiang, Roy A Plastock, Computer Graphics, Schaums Outline, TMH.

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

SCSA2702	DATA MANAGEMENT IN CLOUD LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To Learn to build and maintain reliable, scalable, Service Oriented Architectures. Web Services. Business considerations Business considerations
- To Able to apply Cloud application with existing tools.
- To set up single and multi-node Hadoop Clusters.
- To implement the concept of On demand Application Delivery like SaaS using google cloud
- To implement the Various Cloud services provided by Amazon Web

SUGGESTED LIST OF EXPERIMENTS

- 1 Introduction to cloud computing.
2. Creating a Warehouse Application in Salesforce.com.
3. Creating an Application in Salesforce.com using Apex programming Language.
4. Implementation of SOAP Web services in C#/JAVA Applications
5. Implementation of Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual Box and Guest O.S.
6. Installation and Configuration of Hadoop.
7. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
8. Case Study: PAAS (Facebook, Google App Engine)
9. Case Study: Amazon Web Services.
10. Implementation of IoT Data stream in Cloud Storage (Google IoT, Azure IoT)

COURSE OUTCOMES

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

CO 1: Build and maintain reliable, scalable, service oriented architectures, web services business applications.

CO 2: Setup different types of Hypervisors in virtualization for cloud computing.

CO 3: Design new algorithms that uses Map Reduce on structured and unstructured data.

CO 4: Set up single and multi-node Hadoop clusters for data management in cloud.

CO5: Represent NoSQL data in cloud environment

CO 6: Load big data into Hadoop, handle files in Hadoop and extract big data from Hadoop

SITA1501	WIRELESS SENSOR NETWORKS AND ARCHITECTURE	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

To learn basics of Sensor and Network technology

- Learn key routing protocols for sensor networks and main design issues
- Learn transport layer protocols for sensor networks, and design requirements
- Understand the medium access control protocols and address physical layer issues
- To learn the security features in WSN.

Unit 1 Introduction and Overview of Wireless Sensor Networks

9Hrs.

Introduction, Brief Historical Survey of Sensor Networks, and Background of Sensor Network Technology, Ad-Hoc Networks, Applications of Wireless Sensor Networks: Sensor and Robots, Reconfigurable Sensor Networks, Highway Monitoring, Military Applications, Civil and Environmental Engineering Applications, Wildfire Instrumentation, Habitat Monitoring, Another Taxonomy of WSN Technology, Basic Sensor Network Architectural Elements, Home Control, Medical Applications.

Unit 2 Routing protocols for Ad Hoc wireless networks

9 Hrs.

Designing issues, classification of routing protocols, table driven routing protocols, on demand routing protocol, Hybrid routing protocol, Hierarchical routing protocols. Multicast routing in Ad Hoc wireless networks: Operations and classification of multicast routing protocols, Tree based multicast routing protocol, Mesh based multicast routing protocol.

Unit 3 System architecture and design issues

9Hrs.

Design Constraints for Routing in Wireless Sensor Networks, Classification of Routing Protocols in Wireless Sensor Networks Hierarchy Role of Nodes in the Network, Data Delivery Model, Optimization Techniques for Routing in Wireless Sensor Networks, Application of the Optimization Techniques: Routing Protocols.

Unit 4 Routing Protocols for Wireless Sensor Networks

9hrs

Introduction, Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks Network Scale and Time-Varying Characteristics, Resource Constraints, Sensor Applications Data Models, Routing Strategies in Wireless Sensor Networks: WSN Routing Techniques, Flooding and Its Variants, Sensor Protocols for Information via Negotiation, Low-Energy Adaptive Clustering Hierarchy, Power-Efficient Gathering in Sensor Information Systems, Directed Diffusion, Geographical Routing.

Unit 5 Transport layer security protocols for Ad Hoc wireless networks

9Hrs.

Designing issues, classification of transport layer solutions, feedback based TCP, TCP bus, Ad Hoc TCP, Security in Ad hoc wireless networks, Issues and challenges in security provisioning, Key management, Secure routing in Ad hoc wireless networks. Quality of Service: Issues and challenges in providing QoS in Ad Hoc wireless networks, classification of QoS solutions.

COURSE OUTCOMES:

On completion of the course the student will be able to

CO1: An Ability to understand the concepts of sensors.

CO2: An Ability to analyse modelling and simulation of various communication networks.

CO3: Demonstrate knowledge of MAC protocols developed for WSN.

CO4: Demonstrate knowledge of routing protocols developed for WSN.

CO5: Understand and explain mobile data-centric networking principles

CO6: An Ability to understand the security features in WSN

TEXT/REFERENCE BOOKS:

1. Ibrahiem M. M. Emary, Ramakrishnan.S “Wireless Sensor Networks from Theory to Applications”, CRC Press, 2013.
2. Fei Hu, Xiaojun Cao, “Wireless sensor networks Principles and Practice”, CRC Press, 2010.
3. MounirFrikha, “Adhoc Networks Routing, Qos and Optimization”, Wiley, 2011.
4. Raheem, Beyah, Janise McNair, Cherita Corbett, Security in Ad hoc

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

SCSA1514	DATA MODELING AND PREDICTIVE ANALYTICS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- To learn fundamentals and concept behind data modeling.
- To understand the concepts of advanced data modeling techniques.
- To study data, its type and visualization techniques.
- To learn predictive analytics and apply the learnt data models.
- To build predictive data model and learn the reasons to build the same.

UNIT 1 DATA MODELING: BASICS

9 Hrs.

Importance – Features – Performance – Data Model: Conceptual, Logical and Physical Data Models – Three Schema Architecture – Organizing the Data Modeling task – Roles – Responsibilities – Maintenance – Distributed Data: Replication – Partitioning – Transaction – Case Study: Advanced Normalization forms

UNIT 2 DATA MODELING: ADVANCED

9 Hrs.

Conceptual Data Modeling – Design – Learning – Usage of patterns and Generic model – Types: Bottom-Up Modeling – Top-Down Modeling – Hierarchy – Network – Chain – Evaluation, Comparison and Testing of Model – Modeling for Data Warehouse and Data Mart – Case Study: Enterprise Data Model Development

UNIT 3 PREDICTIVE ANALYTICS: ALL ABOUT DATA

9 Hrs.

Data: Structured, Unstructured, Static, Streamed – Attitudinal, Behavioral, Demographic data – Data-Driven and User-Driven Analytics – 4 V's in data – Keyword-based and Semantic-based Search – Visualization of raw data – Online marketing retail implementation – Content and Text Analysis – Case Study: PA in Fight, Fraud and Crime

UNIT 4 PREDICTIVE ANALYTICS: APPLYING DATA MODELS

9 Hrs.

Model, Simulation and Categorization of data – Raw data to matrix conversion – Associating similar data – Birds flocking and Ant colony approaches – Preprocessing, structuring data – Building Predictive model – Developing and Testing model – Case Study: Google Search queries as Epidemic Predictors

UNIT 5 PREDICTIVE ANALYTICS: BUILDING PREDICTIVE DATA MODELS

9 Hrs.

Visualization: Benefits – Complexity reduction – Evaluation – Visualizing: Hidden Groupings, Data Classification Results, Outliers in data, Decision Tree and Predictions – Ten reasons to implement Predictive Analytics – Ten steps to build Predictive Analytics model – Case Study: Birds Flocking behavior Data Visualization

COURSE OUTCOMES

Max. 45 Hrs.

On completion of the course, student will be able to

CO1 - List out different types of data models along with its roles and responsibilities.

CO2 - Implement conceptual data modeling design and types of modeling.

CO3 - List out the types of data and techniques to analyze the data.

CO4 - Apply different data models for predictive data analysis.

CO5 -Design and build predictive analytics model and list out ten reasons to implement the same.

CO6 - Apply predictive data model on real world data.

TEXT / REFERENCE BOOKS

1. “Data Modeling Essentials” Third Edition by Graeme C. Simsion and Graham C. Witt.
2. “Designing Data-Intensive Applications: The big ideas behind reliable, scalable and maintainable systems” by Martin Kleppmann.
3. “Predictive Analytics for Dummies” by A. Wiley Brand.
4. “Predictive Analytics: The power to predict who will click, buy, lie or die” by Eric Siegel

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, each carrying 16 marks 80 Marks

SCSA2507	HUMAN COMPUTER INTERACTION LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Learn fundamentals of design principles and paradigms
- Identify the tools for designing interactive systems
- Apply the design principles in real time applications
- Analyze the design requirements for different users/environments
- Design the prototype

LIST OF EXPERIMENTS

1. Design a drop-down list or a menu in a GUI keeping in view the serial position effect
2. Design of a Mobile Keypad focusing on size, layout and devilling(a minimum of two different layouts)
3. Design of different icons in Graphical user Interface (a minimum of four different icons)
4. Design a menu structure for ordering house- hold items from a mall directly to your home through a mobile phone interface. Categorize the items into menus and submenus. (make use of Hick's Law)
5. Design a UI for ATM Interface
6. Design a prototype of a TV remote Control Panel
7. Design a UI prototype of an Automatic vending machine for Drinks
8. Create an interactive player prototype using ProtoPie
9. Design a Mobile banking application using balsamiq design software
10. Design a Web Interface for Online banking system
11. Design a prototype design for a online mobile payment application using figma
12. Interactive Exercise : Perform Analysis on any one of the following applications with respect to the Principles of Universal Design.
 - Google Meet,
 - Amazon Prime Video
 - Google Pay

COURSE OUTCOMES

On completion of the course the student would be able to

CO1 : Understand the fundamentals of interactive design

CO2 : Apply the design rules and principles in web/mobile applications

CO3 : Identify the available to to design the problem

CO4 : Analyze the user requirements for designing the application

CO5: Design the system

CO6 : Develop the prototype with the help of available UX/UI tools

SCSA1515	INTELLIGENCE OF BIOLOGICAL SYSTEM	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand basics of cell biology.
- To learn the basic cellular energy production & cell cycle.
- To get the deep insight of meiosis, gametes and expression of gene.
- To understand about the cellular signal transduction and conversion of energy.
- To investigate the process of DNA replication.
- To understand the application of python to solve bioinformatics issues.

UNIT1 CLASSIFICATION OF MICROMOLECULES AND CELLULAR STRUCTURES

9Hrs.

Composition of Biomolecules, Nucleotide Structure, Protein Structure and Function, Lipid Structure and Function, Carbohydrate Structure and Function, Cell Theory, Prokaryotic Cells, Eukaryotic Cells.

UNIT2 CELLULAR ENERGY PRODUCTION AND UTILIZATION, CELL CYCLE AND DIVISION

9Hrs.

Biochemical Reactions, Enzymes, Photosynthesis, Aerobic Cellular Respiration, Anaerobic Respiration, Cell Stages, Maintenance of Ploidy, Interphase, Mitosis, Other Methods of Cellular Replication

UNIT3 MEIOSIS, GAMETES FORMATION, GENE- EXPRESSION, EVOLUTION

9Hrs.

Meiotic Process, Meiosis-I,II, Genetic diversity as a result of Meiosis, Genes, Structure, Transcription in Prokaryotic .Organisms, Eukaryotic Transcription, Translation, Mutation, Genetic engineering and recombinant DNA technology, Descent with modification, Result of natural selection, Factors in Evolution, Speciation and Phylogeny

UNIT4 CELLULAR SIGNAL TRANSDUCTION AND ENERGY CONVERSION

9Hrs.

Cellular Signaling, Receptor Binding, Signal Transduction via Nuclear receptor, Signaling in Apoptosis, Metabolism and ATP, Anaerobic cellular respiration, Aerobic respiration, Photosynthesis, Carbohydrate synthesis.

UNIT5 DNA REPLICATION & MOTIFS

9Hrs.

DNA replication – genome - hidden messages in the genome - Python Programming and packages for Bioinformatics - Finding Replication Origins - DNA boxes - Counting words - The Frequent Words Problem - Frequent words in Vibrio cholera – encodings in DNA to maintain circadian rhythm – Hunting for Regulatory Motifs - Motif Finding - Scoring Motifs - Greedy Motif Search - Randomized Motif Search - Gibbs Sampling

Max. 45 Hrs.

COURSE OUTCOMES

CO1-Understand the cell biology basics.

CO2-Ability to get the deep insight of cellular energy production and the stages of cell cycle.

CO3-Explain the meiosis, gametes and expression of gene.

CO4- Describe the cellular signal transduction and energy conversion.

CO5-Ability to realize the DNA replication process,

CO6-Apply the features of python to solve the various issues in bio informatics

TEXT /REFERENCE BOOKS

1. Ryan Rogers, “Cell and Molecular Biology for Environmental Engineers”, Momentum Press Engineering, 2018.

2. Gabi Nindle Waite, Lee R Waite, “Applied Cell and Molecular Biology for Engineers”, The McGraw-Hill Companies, 2007.

3. Phillip Compeau & Pavel Pevzner, “Finding Hidden Messages in DNA”, Active Learning Publishers, 2015.

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

SCSA1516	SIGNAL AND IMAGE PROCESSING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the basic concepts of signal and Image processing.
- To explore DFT for 1-D and 2-D signal
- To understand fundamentals of Image Processing
- To provide knowledge of the applications of the theories taught in Image Processing
- To apply digital image processing techniques for edge detection.
- To design and implement 1-D and 2-D Signal and Image Processing applications.

UNIT1 INTRODUCTION TO SIGNAL PROCESSING

9Hrs.

Introduction to Digital Signal Processing- Sampling and Reconstruction-Standard DT Signals- Concept of Digital Frequency-Representation of DT signal using Standard DT Signals-Signal Manipulations:shifting, reversal, scaling, addition, multiplication-Classification of Discrete-Time Signals-Classification of Discrete Systems.

UNIT2 DISCRETE-TIME SIGNAL SYSTEM

9Hrs.

Linear Convolution formulation for 1-D and 2-D signal (without mathematical proof), Circular Convolution (without mathematical proof), Linear convolution using Circular Convolution. Auto and Cross Correlation formula evaluation, LTI system, Concept of Impulse Response and Step Response, Output of DT system using Time Domain Linear Convolution- Introduction to DFT- Properties of DFT- DFT computation using DFT properties

UNIT3 INTRODUCTION TO IMAGE PROCESSING

9Hrs.

Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception- Digital Image-sampling and quantization serial & parallel Image processing.

UNIT4 IMAGE RESTORATION

9Hrs.

Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.

UNIT5 SEGMENTATION TECHNIQUES

9Hrs.

Segmentation Techniques-thresh holding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications, Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, Skelton detection, Hough trans-form, topological and texture analysis, shape matching.

Max. 45 Hrs.

COURSE OUTCOMES

CO1-Understand the concept of DT Signal and DT Systems

CO2-Classify and analyze discrete time signals and systems

CO3-understand Basics of Image formation and transformation using sampling and quantization

CO4-Design and develop the enhancement techniques for digital Image Processing

CO5-To apply digital image processing techniques for edge detection.

CO5-Develop small projects of 1-D and 2-D Signal and Image Processing

TEXT /REFERENCE BOOKS

1. Sanjit Mitra, _Digital Signal Processing: A Computer Based Approach_, TataMcGraw Hill, 3rd Edition.
2. S. Salivahanan, A. Vallavaraj, and C. Gnanapriya, _Digital Signal Processing_ Tata McGraw Hill Publication 1st Edition (2010).
3. A. Anand Kumar, _Digital Signal Processing_, PHI Learning Pvt. Ltd. 2013.
4. S. Jayaraman, E. Esakkirajan and T. Veerkumar, _Digital Image Processing_ TataMcGraw Hill Education Private Ltd, 2009.
5. Fundamental of Image Processing – Anil K.Jain, Prentice Hall of India

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

SCSA2508	ROBOT PROGRAMMING USING PYTHON LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To implement the robotics using python.
- To understand the different operations in robotics using python.
- To learn to control the robot using python API.
- To get familiarized to pick the moving parts.
- To implement the python API to update and distance travelled in robotics.

LIST OF EXPERIMENTS

1. Program to add a robot to simulation world, add a python script behaviour to robot component, python script initialization, add statements, add motion statements using python API.
2. Program to add and edit routines, statements and positions in a robot program using Python API.
3. Program to manipulate the joints of a robot using its controller and DOF objects of nodes.
4. Program to teach a robot to pick parts from a pallet and place them on a conveyor using Python API.
5. Program to implement a robot to pick moving parts and then place them on other moving objects using python API
6. Program to Control and automate the robot using python API
7. Program to Check if a given sequence of moves for a robot is circular or not.
8. Program for Walking Robot Simulation in Python
9. Program to check robot can reach target by keep moving on visited spots in Python
10. Program to create a robot class that contains methods about movements and saving the movement instructions on a text file. A robot object can load the text file and execute the movements. A robot object finally gives the updated position and distance travelled.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Remembering the concept of Python API for Robotics

CO2: Understand basic concepts to add a robot and initialize python script using python API

CO3: Able to apply and implement various robotic operations using python API

CO4: Ability to control and automate the robot using python.

CO5: Design and implement a robot to pick moving parts.

CO6: Develop a robot and teach to do different actions using python

SCSA1517	ETHICS ,LAW AND POLICY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To describe the cyber Ethics.
- To explain about the various cyber Laws.
- To Analyse various types of cyber security policy catalog.
- To understand the secure and trust cyber space.
- To Learn the Indian laws related to cyber security
- To Know the ethics, law and policy following the cyber data.

UNIT 1 INTRODUCTION OF CYBER ETHICS

9 Hrs

Introducing Ethics, Cyber Ethics, Ethical issues in cyber security, Ethics, Law, and Policy: How Are They Different, How Are They Linked?, Policy and Law, Making and Analysing Policy, Law as a Toolbox for Policy; Ethics as Its Foundation, Disability Policy and Law, What's Wrong With Calling It "Disability Law and Policy"?, Disability Policy and the Models of Disability, The Social Model of Disability, The Social Model and the Rights Approach, Enduring Themes of Disability Policy and Law, Disability Ethics.

UNIT 2 INTRODUCTION TO CYBER LAWS

9 Hrs

Repair Deemed Unlawful, CyberLaw (May 1993), Free Speech & Toasters, CyberLaw (Oct. 1993), The End of Fair Use, CyberLaw (Nov. 1993), Pirates, CyberLaw (April 1994), Information & Infrastructure, CyberLaw (July 1994), Apple Loses, CyberLaw (Sept. 1994), Photocopying Unlawful, CyberLaw (Dec. 1994), Methods of Operation, CyberLaw (March 1995), Internet Infringement, CyberLaw (April 1995), Restraining Access, CyberLaw (June 1995), Government Recommendations, CyberLaw (Sept. 1995), Notice of Infringement, CyberLaw (Nov. 1995), Losing Data, CyberLaw (Jan. 1996), Online Defamation, CyberLaw (May 1995)

UNIT 3 CYBER SECURITY POLICY CATALOG

9 Hrs

What Is Cyber Security Policy?, Domains of Cyber Security Policy , Laws and Regulations, Enterprise Policy ,Technology Operations , Technology Configuration, Strategy versus Policy, Cyber security Policy Taxonomy, cyber Governance Issues, Cyber User Issues, Cyber Conflict Issues, Cyber Management Issues, Cyber Infrastructure Issues, Government's Approach to Cyber Security Policy, A Brief History of Cyber Security Public Policy Development in the U.S. Federal Government

UNIT 4 SECURITY AND TRUST IN CYBER SPACE

9 Hrs

Introduction, threat of cybercrime in the financial sector, types of cybercrime in financial institutions, bases for trust building, national culture and trust, trustworthiness: could it be demonstrated?, antecedents of trust, marketing and the internet, creating trust in cyber space, trust issues in cyber space, the private sector role in securing cyberspace - national governments and their role in securing cyberspace - international law's role in securing cyberspace

UNIT 5 CYBER MEDIA, CYBER EDUCATION ETHICS AND CASE STUDIES IN ETHICS 9 Hrs

Cyber Ethics Requires Critical Thinking of Citizens, Cyber Bullying, child protection online: UNICEF India Recommendations, Virtual House Calls: Cyber Home Health Care, The Virtual House Call, Dial-Up Medicine, Cybercare, Avoiding Drug-Drug Interactions, An Interactive Support Group for ALS, Information and Support on the Internet, Fear and Communication.

Max. 45 Hrs.

COURSE OUTCOME

On completion of the course the student will be able to

CO1: Explain the ethics and disability ethics.

CO2: Categorize the various types of cyber laws.

CO3: classify the various cyber security policy catalog.

CO4: summarize the secure and trust of cyber space

CO5: Interpret the cyber media, cyber education ethics

CO6: Analyse the various case studies in ethics

TEXT/ REFERENCE BOOK:

1. Cybersecurity Ethics, Legal, Risks, and Policies by Ishaani Priyadarshini, Chase Cotton, 2021, Apple Academic Press.-

2. Gary L. Albrecht, ETHICS, LAW AND POLICY. The SAGE Reference Series on Disability: Key Issues and Future Directions Series.

3. Jonathan Rosenoer, CyberLaw - The Law of the Internet, 1997 Springer-Verlag New York, Inc

4. Ethics and Information Technology: A Case-Based Approach to a Health Care System in Transition James G. Anderson Kenneth W. Goodman SPRINGER

5. Cyber Ethics 4.0: Serving Humanity with Values (Globethics.net Global Series), by Christoph Stückelberger (Author), Pavan Duggal (Author)

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**

SCSA1518	ENTERPRISE BLOCK CHAIN PLATFORMS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To teach the concepts of blockchain technologies
- To cover the technical aspects of Hyperledger.
- To familiarize potential applications of Ripple and Stellar
- To understand the use of Corda and Quorum
- To learn, how these systems work and how to engineer secure software that interacts with the Bit coin network and other crypt o currencies.

UNIT 1 INTRODUCTION

9 Hrs.

Basic of Blockchain Architecture - Challenges - Applications - Block chain Design Principles - The Blockchain Ecosystem - The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model

UNIT 2 HYPERLEDGER

9 Hrs.

Hyperledger- Hyperledger framework - Public and Private Ledgers-Hyperledger Fabric-Hyperledger sawtooth-Hyperledger Iroha- Introduction to Decentralized Application Platform- Interplanetary File System- Hashgraph

UNIT 3 RIPPLE AND STELLAR

9Hrs

Ripple-Framework-Consensus Algorithm-Ledger-Case Study. Stellar-Framework-Consensus Protocol-Ledger-Smart Contract-Case Study-Comparison of Ripple and Stellar

Unit 3 CORDA AND QUORUM

9 Hrs.

Corda-Framework-Consensus Algorithm- Asynchronous Byzantine Fault Tolerance-Ledger-Case Study. Quorum- Framework-Consensus Protocol- Ledger-Smart Contract-Case Study.

UNIT 5 TEZOS AND DRAGONCHAIN

9 Hrs.

Tezos-Framework-Consensus Algorithm-Delegated Proof of Stake-Ledger-Case Study. DragonChain-Framework-Consensus Algorithm- Context-Based Verification with five levels of consensus-Ledger-Case Study

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Understand emerging abstract models for Block chain Technology CO2: Analyse the concept of Hyperledger

CO3: Apply the tools for understanding the background of Blockchain Platforms

CO4: Identify major research challenges and technical gaps existing between various Blockchain Platforms

CO5: Understanding of latest advances in Block Chain Platform.

CO6: Identify the appropriate block chain platform for an application

TEXT /REFERENCE BOOKS

1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, first edition - 2015.
2. Daniel Drescher, “Block Chain Basics”, Apress; 1st edition, 2017
3. Imran Bashir, “Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Packt Publishing, first edition - 2012.
4. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Block Chain”, Packt Publishing.
5. [https://developer.ibm.com/patterns/create-and-deploy-block chain-network-usingfabric-sdk-java/](https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-usingfabric-sdk-java/)
6. <https://www.leewayhertz.com/blockchain-platforms-for-top-blockchain-companies/>

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**

SCSA2509	NETWORK SECURITY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Develop and implement a java interface for encryption and decryption algorithms i.e., DES, MD5 and RSA algorithms.
- To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
- To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
- To get familiarized to binary tree traversal.
- To familiarize symmetric and asymmetric cryptography.

LIST OF EXPERIMENTS

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
 - Ceaser cipher
 - Substitution cipher
 - Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.
12. Implementation of Hash Functions

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1: Identify basic security attacks and services
- CO2: Use symmetric and asymmetric key algorithms for cryptography
- CO3: Compare the performance of various security algorithms
- CO4: Perform encryption and decryption on any data given.
- CO5: Apply the Digital signature for secure data transmission
- CO6: Apply the cryptographic algorithms for data communication

SCSA1519	ETHICAL HACKING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To introduce the basic concepts of Ethical Hacking and Penetration Testing
- To acquire knowledge about gathering information about the victim
- To demonstrate Enumeration and Port Scanning To learn about vulnerability scanning
- To demonstrate Network sniffing

UNIT 1 INTRODUCTION TO ETHICAL HACKING

12 Hrs.

Important Terminologies Categories of Penetration Test Writing Reports Structure of PT report Vulnerability Assessment Summary Risk Assessment Methodology - Detailed Findings Reports

UNIT 2 INFORMATION GATHERING

12 Hrs.

Active and Passive Information Gathering Sources Copying Website locally yougetsignal.com NeoTrace Intercepting a Response Acunetix Vulnerability Scanner NetCraft Google Hacking Interacting with DNS Servers DNS Cache Snooping

UNIT 3 ENUMERATION AND PORT SCANNING

12 Hrs.

Host Discovery Scanning for Open Ports and Services Types of Port Scanning TCP Three-way handshake TCP Flags Port Status Types TCP SYN Scan TCP Connect Scan NULL, FIN and XMAS SCAN NULL Scan FIN Scan XMAS Scan TCP ACK Scan Responses UDP Port Scan Scanning a vulnerable host Performing an IDLE scan with NMAP Service Version Detection OS Fingerprinting

UNIT 4 VULNERABILITY SCANNING

12 Hrs.

Working with Vulnerability Scanners Nmap Testing SCADA Environments - Nessus Vulnerability Scanner Installing Nessus Adding a user Creating a new policy Safe Checks Silent Dependencies Port Range Preferences

UNIT 5 NETWORK SNIFFING

12 Hrs.

Introduction Types of Sniffing Hubs vs. Switches Promiscuous Mode vs. Non-Promiscuous Mode MITM Attacks ARP Protocol Basics How ARP works ARP attacks DoS Attacks Sniffing with Wireshark DNS Spoofing DHCP Spoofing

Max. 60 Hrs.

COURSE OUTCOMES:

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

CO1: Understand the basic concepts of Ethical Hacking and Penetration Testing and will be able to prepare penetration testing reports.

CO2: Demonstrate information gathering about the victim using various tools such acunetix, netcraft and google hacking

CO3: Enumerate and perform different types of scanning and demonstrate nmap.

CO4: Explore the vulnerability scanners: nmap and Nessus.

CO5: Understand and demonstrate sniffing, MITM attacks, ARP attacks and DoS attacks.

CO6: Explore the crucial areas of Ethical Hacking and Penetration Testing with Case Studies.

TEXT/ REFERENCE BOOKS

1. Rafay Baloch, Ethical Hacking and Penetration Testing Guide , CRC Press Taylor & Francis Group, 2015.
2. Jon Erickson, Hacking The Art of Exploitation , No Starch Press, San Francisco ,2nd Edition,2008.
3. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical
4. Hackers Handbook , TMH ,3rd Edition, 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

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

SCSA2510	ETHICAL HACKING-LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To gather and learn more information about the victim
- To collect tools and techniques used by the target
- To find the vulnerabilities on the network
- To find the vulnerabilities on the web application
- To analysis and explore the packets on the network

SUGGESTED LIST OF EXPERIMENTS

1. Copying Websites Locally for Website Spoofing
2. Tracing and Fingerprinting Network
3. Information Gathering Tools
4. Exploring Webservers with Netcraft
5. Finding Information using Google Hacking
6. Working with Acunetix Vulnerability Scanner
7. Demonstrating different types of port scanning
8. Fingerprinting with NMAP
9. Working with Nessus Vulnerability Scanner
10. Packet Sniffing using Wireshark

COURSE OUTCOMES

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

CO1: To apply the skills and duplicate a website for web spoofing

CO2: To identify the weakness of the target by finding the tools and techniques used

CO3: To examine and trace the blueprint of the network

CO4: To examine and find out the vulnerabilities of the web application

CO5: To explore and sniff the packets moving across the network CO6: To perform vulnerability assessment in an efficient manner

SCSA2511	DATA BASE SECURITY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Introduce the database security issues.
- Cover in details the various state-of-art database security methods and techniques.
- Cover in details the security features in databases
- Make students aware and experiment with database security analysis tools.

SUGGESTED LIST OF EXPERIMENTS

1. Introduction to database security issues
2. The role of databases in information systems.
3. Access control management features.
4. Cryptographic data protection.
5. SQL language features.
6. Statistical databases.
7. Database security methods and techniques
8. Access control to database objects: tables, attributes, records.
9. Triggers, views, data masking.
10. Cryptographic methods of protection.
11. Escaping queries to a database.
12. Change Tracking.
13. Data integrity in the databases.
14. Database backups.
15. Security features in databases
16. SQL statements for access control.
17. Integrity (domain, attributes, tables, referential).
18. Database monitoring tools.
19. Database security analysis tools
20. An overview of the main methods for analysing database security.
21. SQL injections.
22. Database security scanners.
23. Writing your own security analysis tools.

COURSE OUTCOMES

On completion of the course students are expected to be able to:

CO1: Understand and characterize modern techniques of database information security threats and techniques for database security assessment.

CO2: Analyze information in a database to identify information security incidents. Understand and use the main tools for database management systems monitoring.

CO3: Use build-in database functions to enable database integrity support. Understand and identify database information security threats, critically evaluate and apply the potential countermeasures.

CO4: Create a plan for vulnerabilities detection and identification in databases. Use and analyze the results obtained by the database vulnerability scanners.

CO5: Apply new methods of a database protection and use tools for database security assessment.

CO6: Understand the various security analysis tools

List of New Courses

S.no	Course Code	Course Name	Page No.
B.E Computer Science and Engineering with Specialization in Artificial Intelligence			
1	SMEA4001	Resource Management Techniques	3
2	S731APROJ2	Project Work (Phase 2)	
3	SCSB1231	Data and Information Science	5
4	S11BLH21	Programming in Python	7
5	S731BLH22	Data Structures and Algorithms	10
B.E Computer Science and Engineering with Specialization in Data Science			
6	S733PROJ2	Project Work (Phase 2)	
7	SCSB1232	Exploratory Data Analysis	12
B.E Computer Science and Engineering with Specialization in IoT			
8	S732APROJ2	Project (Phase 2)	
9	S11BLH31	Introduction to IoT	14
B.E Computer Science and Engineering with Specialization in Artificial Intelligence and Machine Learning			
10	SMTA1605	Exploratory Data Analysis and Time Series	16
11	SCSA1606	Predictive and Advanced Analytics	18
12	SCSA2608	AI and Visualization lab	20
13	S611AIPROJ	Interdisciplinary Project	
14	SCSB1251	Artificial Intelligence Search methods and Reasoning	21

S.no	Course Code	Course Name	Page No.
B.E Computer Science and Engineering with Specialization in Artificial Intelligence& Robotics			
15	SITA3007	Computational Intelligence	23
16	SMRA1603	Robot Programming	25
17	SCSA1612	Machine Learning for Robotics	27

18	SCSA2609	Neural networks using MATLAB	29
19	SMRA2602	Robot Programming Lab	30
20	S612AIPROJ	Interdisciplinary Project	
21	SMEB1104	Engineering Graphics using CAD	31
22	SMRB1102	Fundamentals of Robotics	33
B.E Computer Science and Engineering with Specialization in Block Chain Technology			
23	SCSA1613	Intrusion Detection System	35
24	SCSA1614	DevOps	37
25	SCSA1615	Smart Contracts	39
26	SCSA2610	Intrusion Detection System Lab	41
27	SCSA2611	DevOps Lab	42
28	S613AIPROJ	Interdisciplinary Project	
29	SCSB1261	Introduction To Block Chain Technology	43
B.E Computer Science and Engineering with Specialization in Cyber Security			
30	SCSA1616	Linux Programming	45
31	SCSA1617	AI Enhanced Cyber threats	47
32	SCSA2612	Linux Lab	47
33	S614AIPROJ	Interdisciplinary Project	
34	SCSB1271	Introduction to Cyber Security	50
35	SCSB1262	Block chain and Crypto Currency	52

		L	T	P	Credits	Total Marks
SMEA4001	RESOURCES MANAGEMENT TECHNIQUES					

COURSE OBJECTIVES

- Understand the mathematical tools that are needed to solve optimization problems.
- The purpose of the course is to provide students with the concepts and tools to help them understand the operations research.
- To construct a project network and apply program evaluation review technique and critical path management.
- Illustrate how queuing theory can solve problems with inter-arrival and service time.
- To learn the concepts of operation research applied in decision making.

UNIT 1 INTRODUCTION AND LINEAR PROGRAMMING

9Hrs.

Operations Research(OR)- Nature – Characteristics – Phases - Role of OR in Decision making - Outline of OR Models Linear Programming – Formulation of L.P.problems –Solution by graphical method, simplex method, Two Phase Method, Big M methods, Dual Simplex method (Qualitative)

UNIT 2 TRANSPORTATION AND ASSIGNMENT MODEL

9Hrs.

Transportation problem – Initial Basic feasible solution- Northwest corner method, Least Cost method, Vogel's approximation method – Test for optimality-MODI method. Assignment problems- Hungarian assignment models Travelling salesman problems.

UNIT 3 RESOURCE SCHEDULING AND NETWORK ANALYSIS

9Hrs.

Problem of Sequencing – Problem with N jobs and 2 machines N Jobs 3 machines N Jobs and m machines and 2 Jobs m machines (Graphical method). Project -Basic concepts–Network construction and scheduling Critical Path Method (CPM) & Program evaluation review technique (PERT) and resource levelling by network techniques, time – Cost trade off.

UNIT 4 INVENTORY CONTROL

9Hrs.

Inventory Control – Various Types of inventory models – deterministic inventory models – Production model, Purchase model– with and without shortage- Economic Order Quantity (EOQ) – Buffer stock – Shortage quantity, Probabilistic inventory models – Quantity Discount and Price Breaks.

UNIT 5 QUEUEING THEORY, GAME THEORY AND REPLACEMENT MODELS

9Hrs.

Queuing theory – Poisson arrivals and exponential service times, Single channel models only, Game Theory – The formulation of two persons, Saddle point, Maxmini and Minimax principle, Mixed Strategies for 2x2 games, Dominance Principle, Replacement policy for items whose maintenance cost increases with time- Consideration of time value of money - Replacement policy- Individual, Group replacement of items that fail completely and suddenly.

Max.45 Hours

COURSE OUTCOMES

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

CO1: Understand the basic concept of Linear Programming Problems.

CO2: To analyze various types of deterministic models like linear programming, transportation model etc.

CO3: To develop Mathematical skills for formulating networks & Scheduling.

CO4: To apply various types of inventory models in industrial applications.

CO5: Apply various types of models like Inventory model, Queuing model, Replacement model & simulation.

CO6: To facilitate quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.

TEXT/REFERENCE BOOKS

1. PanneerselvamR, Operation research, 2nd Edn., Prentice Hall, 2011.
2. Sharma S.D, Operation research Theory, Methods and Application, 17th Edn., KedarNath Ram Nath Publication, 2010.
3. Nita H Shah, Ravi M Gor&HardikSoni, Operation research, 4th Edn., PHI, 2010.
4. HamdyA.Taha, Opeartion Research, 8th Edn, PHI, 2010.
5. Hiller &Liberman., Introduction to Operations Research, 5th Edition, Mc Graw Hill, 2012.
6. Ravindran,Phillips&Solberg, Operations Research: principles and practice, 2nd Edn., Wiley IndiaLts, 2007
7. Ronald L. Rardin, Optimization in Operations Research, Prentice Hall, 2009

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

SCSB1231	DATA AND INFORMATION SCIENCE	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- Learn how to process raw data into formats necessary for analysis
- Conquer in-depth knowledge of data science concepts through motivating real-world case studies.
- Understand the methods and principles of data handling and big data.

UNIT1 DATA ACQUISITION

9Hrs.

Data Acquisition–Sources of acquiring the data - Internal systems and External systems- Web APIs,Data preprocessing- Exploratory Data Analysis (EDA)- Basic tools (plots, graphs and summary statistics) of EDA -Open Data Sources, Data APIs, Web Scrapping -Relational Database access(queries)to process/access data.

UNIT2 DATA PREPROCESSING AND PREPARATION

9Hrs.

Data Munging, Wrangling - Data Visualization Basics -Plyr packages - Cast/Melt. Tableau: Creating Visualizations in Tableau-Datahierarchies,filters,groups,sets,calculated fields-Mapbased visualizations-Build interactive dashboards-Data Stories.

UNIT3 DATA QUALITY AND TRANSFORMATION

9Hrs.

Data imputation -Data Transformation (minmax, log transform, z-score transform etc.,). - Binning,Classing and Standardization.-Outlier/Noise&Anomalies.

UNIT4 HANDLING TEXT DATA

9Hrs.

Bag-of-words- Regular Expressions - Sentence Splitting and Tokenization - Punctuations and Stopwords, Incorrect spellings- Properties of words and Word cloud- Lemmatization and Term-Document Tx Dcomputation –Sentiment Analysis (CaseStudy).

UNIT5 PRINCIPLES OF BIGDATA

9Hrs.

Introduction to BigData-Challenges of processing BigData (Volume,Velocity and Variety perspective)
- UseCases.

Max.45Hrs.

COURSEOUTCOMES

On completion of the course the student will be able to

CO1-Explore the fundamental concepts of Data Science.

CO2-Identify and execute the basic data format.

CO3-Understand basics of Data Preprocessing and Data Visualization.

CO4-Improve the Data quality through various transformations.

CO5-Implement the methods of handling text data.

CO6-Analyze and understand the basics of Big Data.

TEXT/REFERENCEBOOKS

1. Data Science at the Command Line, Jeroen Janssens, O'Reilly, 2015, ISBN 978-1-491-94785-2.
2. Python for Data Analysis, Wes McKinney, O'Reilly, 2018, ISBN-13: 978-1-491-95766.
3. Cathy O'Neil and Rachel Schutt .Doing Data Science, Straight Talk from The Frontline. O'Reilly. 2014.
4. Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max.Marks:100****Exam Duration: 3Hrs.****PART A:** 10 questions of 2 marks each; No choice **20Marks****PART B:** 2 questions from each unit of internal choice; each carrying 16 marks **80Marks**

S11BLH21	PROGRAMMING IN PYTHON	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- To learn about data structures lists, tuples, and dictionaries in Python.
- To build packages with Python modules for reusability and handle user/custom exceptions.
- To create real world GUI applications, establish Database connectivity and Networking.

UNIT 1 INTRODUCTION TO PYTHON

12 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in function – Conditional statements - Iterative statements- Input/output functions - Python Database Communication - data analysis and visualization using python

Practical:

- Implement built-in functions and trace the type of data items.
- Implement concepts of Conditional and Iterative Statements.
- Use the built-in csv module to read and write from a CSV file in Python.
- Perform data analysis and visualization on a given dataset using Python libraries like pandas, numpy, matplotlib and display charts, graphs, and plots.

UNIT 2 OBJECT ORIENTED CONCEPTS

12 Hrs.

Class – Objects – Constructors – Polymorphism – Encapsulation -Inheritance -Data Abstraction- Method Overloading-Method Overriding-Database Access-Data Hiding-Import Class.

Practical:

- Execute concepts on Polymorphism, Encapsulation.
- Implement Data Abstraction and Inheritance.
- Differentiate Method Overloading and Overriding.
- Create a class called "Person" with attributes "name" and "age." Make the "age" attribute private and implement a getter method to access it.
- Create a module called "math_operations.py" with a class called "Calculator." Import the "Calculator" class into another script and use its methods to perform mathematical operations.

UNIT 3 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES 12 Hrs.

File Operations –Iterators - Exception handling - Regular Expressions- Functions and Modules- Import Statement Introduction to PIP-Installing Packages via PIP-Using Python Packages.

Practical:

- Create a text file called "numbers.txt" and write the numbers from 1 to 10 in words, each on a separate line.
- Implement a custom iterator that generates a sequence of Fibonacci numbers and print the first 10 numbers.
- Create a try-except block to catch a File Not Found Error and print a message when a file is not found.
- Write a Python program that handles a Zero Division Error and prints a custom error message to the console.

- Create a module called "greetings.py" with a function called "hello" that prints "Hello, World!" Import the module into another script and use the "hello" function.
- Install the "numpy" package using PIP. Import the package and create a NumPy array with random values

UNIT 4 GUI PROGRAMMING

12 Hrs.

GUI Programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts – Colors - Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box).

Practical:

- Design a GUI form with a vertical box layout that includes labels and entry fields for user registration information.
- Create a GUI window with a grid layout that contains buttons representing a 3x3 game board.
- Create a canvas in your GUI program and draw simple shapes such as rectangles, circles, and lines.
- Create a GUI form program that includes various widgets and implement event handling Concepts also add Create a drop-down menu that allows users to select different font styles for text display.

UNIT 5 DATABASE AND NETWORK

12 Hrs.

Database (using NoSQL): Connector Module –Cursor – Statements - Exceptions in database. Network connectivity: Socket module - Client – Server –Email – URL Access.

Practical:

- Connect to the NoSQL database using a Python connector module, such as "pymongo" for MongoDB or "cassandra-driver" for Cassandra.
- Use a cursor to iterate over the records in a collection/table and print specific fields/attributes.
- Implement error handling for specific scenarios, such as duplicate key violation or record not found, in the NoSQL database.
- Implement either a TCP/IP or UDP client-server application using the socket module for sending and receiving messages.
- Write a program using the smtplib module to send an email from a specified email address to another recipient.

Max. 60 Hrs.

COURSE OUTCOMES

On Completion of the course the student will able to:

CO1 - Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.

CO2 - Do the decision making and write functions in Python.

CO3 - Explain how to design GUI Applications in Python and evaluate different database operations.

CO4 - Design and develop Client Server network applications using Python.

CO5 - Ability to design real life situational problems and think creatively about solutions of them.

CO6 - Apply the best features of mathematics, engineering and natural sciences to program real life problems.

TEXT / REFERENCE BOOKS

1. Y. Daniel Liang, “Introduction to Programming Using Python”, Pearson, 2013.
2. Python Notes for Professionals by Stack Overflow Documentation (<https://books.goalkicker.com/PythonBook/>)
3. Dr. Charles R. Severance, “Python for Everybody- Exploring Data Using Python 3”, 2016.
4. Paul Gries, Jennifer Campbell, Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3”, Pragmatic Bookshelf, 2nd Edition, 2014.

S731BLH22	DATA STRUCTURES AND ALGORITHMS	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms.
- To be familiar with writing recursive methods
- To implement operations on Linked List, Stack and Queues.
- To implement traversal operations of trees and graphs.
- To understand concepts about various algorithm design techniques, searching and sorting techniques.

UNIT 1 INTRODUCTION TO ALGORITHMS

12 Hrs.

Introduction to Data vs Information - Data Structures - Classification – Abstraction - Abstract data types (ADT) - Array - characteristics - Storage Representations. Array Order Reversal- Recursion- Array operations, Algorithm- complexity – Time and Space trade off.

Practical:

- Python program to find the sum of all elements of an array
- Python program to find a series in an array consisting of characters
- Python program to find the occurrence of a particular number in an array
- Python program to find the largest element in an array
- Python program for array rotation

UNIT 2 LINKED LIST

12 Hrs.

Array Vs Linked List – Singly linked list - Representation of a linked list in memory - Operations on a singly linked list - Merging two singly linked lists into one list - Reversing a singly linked list – Polynomial Manipulation using List - Advantages and disadvantages of singly linked list - Circular linked list - Doubly linked list - Circular Doubly Linked List.

Practical:

- Program to implement operations on a Singly linked list.
- Program to implement operations on a doubly linked list

UNIT 3 STACKS AND QUEUES

12 Hrs.

Introduction – Array Representation of a Stack – Linked List Representation of a Stack - Stack Operations - Algorithm for Stack Operations - Stack Applications: Tower of Hanoi - Infix to postfix Transformation - Evaluating Arithmetic Expressions. Queue – Introduction – Array Representation of Queue – Linked List Representation of Queue - Queue Operations - Algorithm for Queue Operations -. Queue Applications: Priority Queue.

Practical:

- Program to implement a Stack using an array and Linked list.
- Program to implement Queue using an array and Linked list.
- Program to implement Circular Queue.

UNIT 4 TREES AND GRAPHS

12 Hrs.

Preliminaries of Tree ADT - Binary Trees - The Search Tree ADT–Binary Search Trees - AVL Trees - Tree Traversals - B-Trees - Heap Tree – Preliminaries of Graph ADT - Representation of

Graph – Graph Traversal - BFS – DFS – Applications of Graph – Shortest - Path Algorithms – Dijkstra’s Algorithm Minimum Spanning Tree – Prims Algorithm.

Practical:

- Program to convert an infix expression to postfix expression.
- Program to implement BFS and DFS
- Program to implement N Queens problem.
- Program to implement Binary Tree Traversal
- Program to implement Travelling Salesman Problem.
-

UNIT 5 ALGORITHM DESIGN TECHNIQUES AND SEARCHING AND SORTING TECHNIQUES

12 Hrs.

Divide and Conquer Strategy – Greedy Algorithm – Dynamic Programming – Backtracking Strategy - List Searches using Linear Search - Binary Search - Fibonacci Search - Sorting Techniques - Insertion sort - Heap sort - Bubble sort - Quick sort - Merge sort - Analysis of sorting techniques.

Practical:

- Program to sort the elements using insertion sort.
- Program to sort the elements using quick sort.
- Program to sort the elements using merge sort.
- Program to find an element using Linear and Binary Search.

Max. 60 Hrs.

COURSE OUTCOMES

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

CO1 - Understand the concept of recursive algorithms.

CO2 - Demonstrate the different types of data structures.

CO3 - Able to understand the operations on linear data structures.

CO4 - Summarize searching and sorting techniques.

CO5 - Choose appropriate data structure as applied to specified problem definition.

CO6 - Understand and implement the various algorithm design techniques.

TEXT / REFERENCE BOOKS

1. Jean-Paul Tremblay, Paul G. Sorenson, 'An Introduction to Data Structures with Application', TMH, 2017.
2. Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2004, 2nd Edition.
3. Larry R. Nyhoff, ADTs, Data Structures, and Problem Solving with C++, Prentice Hall Editin, 2004.
4. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010.

SCSB1232	EXPLORATORY DATA ANALYSIS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSEOBJECTIVES

- To focus on the significance of data and software tools.
- To emphasize the relationship between variables and gain knowledge about univariate data analysis.
- To explore multivariate data analysis and visualize the data.

UNIT1 INTRODUCTION

9Hrs.

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data - Comparing EDA with classical and Bayesian analysis– Software tools for EDA – VisualAids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT2 THE EXPLORATORY PERSPECTIVE

9Hrs.

Introduction: Overview – Sources of Data – Process for Making Sense of Data - Describing Data: Observations and Variables – Types of Variables – Central Tendency – Distribution of the Data – Confidence Intervals – Hypothesis Tests - Distributions of Single Variables. Displaying Data: The Stem and Leaf – Summarizing Data – Resistant Statistics and Number Summaries - The Box and Whisker -Understanding Data: Skewness – Outliers – Gaps and Multiple Peaks.

UNIT3 RELATIONSHIPS BETWEEN VARIABLES

9Hrs.

Preparing Data Tables: Cleaning - Displaying Relationships -The Scatter Plot –Summarizing Relationships–Fitting A Line–Smoothing the Data–Median and Hinge Traces–Examining Residuals – Understanding Relationships: Outliers – Nonlinear Monotonic Relationships.

UNIT4 REEXPRESSIONANDUNIVARIATEANALYSIS

9Hrs.

Choosing Re-expressions: Nonlinear Monotonic Functions – Nonmonotonic Functions. Introduction to Single variable: DistributionVariables –Numerical Summaries of Level and Spread –Scaling and Standardizing – Inequality - Univariate data: measures of center and spread, transformations.

UNIT5 MULTIVARIATE ANALYSIS AND VISUALIZATION

9Hrs.

Introducing a Third Variable – Causal Explanations – Three-Variable Contingency Tables and Beyond- Bivariate Analysis–Multivariate Analysis–Casual Analysis.

Basics of Matplot lib,Plotting with Pandas and Seaborn,Other Python VisualizationTools.

Max.45Hrs.

COURSEOUTCOMES

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

CO1- Understand about the significance of exploratory data analysis.

CO2- Analyze the data statistically.

CO3- Summarize data and understanding their relationship.

CO4- Perform univariate data exploration and analysis.

CO5- Apply multivariate data exploration and analysis.

CO6- Perform data exploration and visualization techniques.

TEXT/REFERENCEBOOKS

1.Glenn J.Myatt,Wayne P.Johnson–Making Sense Of Data| A Practical Guide To Exploratory Data Analysis And Data Mining, Second Edition, 2014.

2.Frederick Hartwig, BrianE.Dearing, Exploratory Data Analysis, 1979.

3.Suresh Kumar Mukhiya,Usman Ahmed,Hands-On Exploratory Data Analysis with Python, Packt Publishing,2020.

4.JakeVanderPlas,“Python Data Science Handbook: Essential Tools for Working with Data”,First Edition, O Reilly, 2017.

5.Catherine Marsh,Jane Elliott, Exploring Data: An Introduction to Data Analysis for Social Scientists,Wiley Publications, 2nd Edition,2008.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration:3Hrs.

PART A :10 questions of 2 marks each –No choice **20 Marks**

PARTB: 2 questions from each unit of internal choice; each carrying 16 marks **80 Marks**

S11BLH31	INTRODUCTION TO IoT	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of Internet of Things and To identify the various elements of an IoT System.
- To understand the various means of communication from Node / Gateway to Cloud Platforms.
- To transfer data from IoT devices to various cloud providers.
- To make students aware of various domain specific applications 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 - IoT Devices -IoT Devices vs. Computers - Trends in the Adoption of IoT - Societal Benefits of IoT -, Business Scope,Relation with embedded system - IoT Reference Architecture physical-logical design of IOT-From M2M to IoT, Software define Network.

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 - Wireless medium access issues - MAC protocol survey -Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination. Communication technologies, Long-range Wireless Protocols : LoRa WAN, Ingenu, Satellite Communications, Shortrange Wireless Protocols : ANT+, WiFi, ZigBee, WHART, EnOcean, Z-Wave, NFC communication technologies : Zigbee Wifi - Zwave.

UNIT 4 IoT AND CLOUD

9 Hrs.

Interoperability in IoT - Introduction to Arduino Programming - Integration of Sensors and Actuators with Arduino - Cloud computing in IoT, IoT in cloud architecture, Logging on to cloud,- cloud based IoT platforms - IBM Watson, Google cloud.

UNIT 5 DOMAIN SPECIFIC APPLICATIONS OF IoT

9 Hrs.

Home automation, Industry applications, Surveillance applications, Other IoT applications - Introductionto different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform case studies : 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** - Understand general concepts of Internet of Things (IoT).
- CO2** - Recognize various devices, sensors and applications.
- CO3** - Apply design concept to IoT solutions.
- CO4** - Analyze various M2M and IoT architectures.
- CO5** - Evaluate design issues in IoT applications.
- CO6** - Create IoT solutions using sensors, actuators and Devices.

TEXT / REFERENCE BOOKS

1. Boswarthick, Omar Elloumi., The Internet of Things: Applications and Protocols, Wiley publications., 2012.
2. Dieter Uckelmann, Mark Harrison, Florian Michahelles., Architecting the Internet of Things, Springer publications. 2011.
3. Marco Schwatz Internet of Things with Arduino Cookbook, Packt Publications. 2016 .
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatios Kamouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
5. Vijay Madisetti, Arshdeep Bahga, “Internet of Things : A Hands on Approach”, published by Vijay Madisetti 2014.

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

SMTA1605	EXPLORATORY DATA ANALYSIS AND TIME SERIES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the basic statistical tools for analysis & interpretation of qualitative & quantitative data.
- To introduce basic concepts of Statistics and to provide Statistical techniques for data analysis.
- To understand various components of time series.

UNIT I: INTRODUCTION TO DATA ANALYSIS

9 Hrs.

Introduction – collection, classification and tabulation of data – Concept of primary and secondary data – Data - quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio – Data visualization - Bar diagram, pie chart, histogram, frequency curve and frequency polygon – Ogives

UNIT II: DESCRIPTIVE STATISTICS

9 Hrs.

Data summarization – Mean, Median and Mode – Measures of dispersion – Range, Quartile deviation and standard deviation – coefficient of variation – skewness and kurtosis

UNIT III: BIVARIATE DATA

9 Hrs.

Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves

UNIT IV: INTRODUCTION TO TIME SERIES

9 Hrs.

Introduction to times series data - application of time series in various fields - Components of a times series, Decomposition of time series - Trend - types of Trends

UNIT V: ANALYSIS OF TIME SERIES

9 Hrs.

Measure of trend – Graphical method, Semi Average method, Moving Average method and Least Square method – Measurement of Seasonal Variation – Simple Average method, Ratio Trend method and Ratio Moving Average method

COURSE OUTCOMES:

CO1: Identify, classify and tabulate the data. Construct various frequency charts.

CO2: Evaluate the various measures of central tendency and measures of variation.

CO3: Evaluate the Karl Pearson's correlation coefficient, Spearman's correlation coefficient and Regression Equations. Explore the relationship between correlation and regression. Fitting of straight line by least squares.

CO4: Empathize the students about the importance of Time series and components of Time series.

CO5: Explain the various methods to measure the trend

CO6: Explore the methods designed to measure the seasonal variation.

TEXT / REFERENCE BOOKS

1. Veerarajan.T, Probability, Statistics and Random Process, Tata McGraw Hill, 3rd edition, TataMcGrawHill, 2017.
2. David S. Moore, George P. McCabe, Bruce A. Craig. Introduction to the practice of statistics, 7th edition, W.H. Freeman and Company, New York 2011.
3. J. N. Kapur and H. C. Saxena, Treatment and Content as in Mathematical Statistics, 20th Edition, S. Chand & Co. Ltd., New Delhi, 2010.
4. Stephen Bernstein Schaum's Outline of Elements of Statistics I: Descriptive Statistics and Probability, McGraw-Hill, 1998.
5. P. R. Vittal, Mathematical Statistics, Margham Publications, 2002.

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 analyze the performance in different models

UNIT1 INTRODUCTION TO DATA MINING INTRODUCTION 9 Hrs.

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

UNIT2 DATA UNDERSTANDING AND PREPARATION 9Hrs.

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.

UNIT3 MODEL DEVELOPMENT & TECHNIQUES 9Hrs.

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.

UNIT4 MODEL EVALUATION AND DEPLOYMENT 9Hrs.

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

UNIT5 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

Max.45Hrs.

COURSE OUTCOMES

On completion of the course the student 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 applications.

CO4: Compare the underlying predictive modeling techniques.

TEXT/REFERENCEBOOKS

1. Predictive & Advanced Analytics (IBMICE Publication)
2. Trevor Hastie,Robert Tibshirani,Jerome Friedman,The Elements of Statistical Learning-DataMining,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 20 Marks

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

SCSA2608	AI AND VISUALIZATION LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- Understanding the AI algorithms.
- Apply ML algorithms for classifying the data
- identify the pattern in text data.
- Visualize the data using different different data visualization approaches.

SUGGESTED LIST OF EXPERIMENTS

1. Techniques for Data Preprocessing:
Mean Removal, Scaling, Normalization
2. Classification Techniques:
Naïve Bayes Classifier, SVM, Logistic Regression, Decision Tree, Random Forest
3. K-Means Clustering algorithm
4. NLTK – implementation of Tokenization, Stemming, and Lemmatization
5. Building a Bag of Words Model in NLTK
6. Topic Modeling: Identifying Patterns in Text Data
7. Analyzing Sequential Data by Hidden Markov Model (HMM)
8. Concept of Heuristic Search in AI
9. A Bot to Play Tic Tac Toe
10. Single - Layer Neural Networks, Multi-Layer Neural Networks
11. Building Linear Regressor using ANN
12. Image Classifier: An Application of Deep Learning

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: To use appropriate tools for analyzing text data

CO2: Classify the data according to the customer requirement

CO3: Analyze the time series data semantics of a text document.

CO4: Predict the hidden pattern using the given dataset.

CO5: Apply deep learning algorithms for a given application.

CO6: Design an intelligent system using AI algorithms

SCSB1251	ARTIFICIAL INTELLIGENCE SEARCH METHODS AND REASONING	L	T	P	EL	Credits	TotalMarks
		3	0	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 BASIC SCIENCE BEHIND AI

9 Hrs.

Intelligence – Memory – Computation – Learning – AI's Foundation and History – Intelligent Agents: Features –Behaviour in the environment – Rationality – Nature and its Structure – Case Study: AI Programming Languages History: LISP – Prolog – Python.

UNIT 2 SEARCHING TOWARDS SOLUTION

9 Hrs.

Searching Strategies: Informed Search: BFS – DFS – Depth Bounded DFS – Uninformed Search: Heuristic Functions – Hill Climbing Search – Best First Search – Local Maxima – Solution Space Search – Adversarial Search – Constraint Satisfaction Problem – Case Study: N-Queens Problem

UNIT 3 KNOWLEDGE: ROLE AND REPRESENTATION

9 Hrs.

Knowledge – Definition and Management – Types: Declarative and Procedural Knowledge – Knowledge Engineering behind Logical Agents: Propositional Logic – First Order Logic – Inference: Forward and Backward Chaining – Ontological Engineering – Case Study: Ontology based knowledge representation

UNIT 4 APPROACHES BEHIND PLANNING AND REASONING

9 Hrs.

Algorithm for Planning as State Space Search – Analysis of Planning Approach – Reasoning: Bayes Rule – Bayesian Network and its approximation – Hidden Markov Model – Kalman Filters – Decision Networks – Case Study: Wumpus World Problem

UNIT 5 DECODING AND LEARNING INTELLIGENCE

9 Hrs.

Learning Algorithms: Classification and Regression with Linear Model – Non-Parametric Models – Ensemble Learning – Explanation Based Learning – Learning with Hidden Variables – AI Real Time Applications – Case Study: Nature Inspired Computation

Max.45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

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 bayes 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”, 3rd Edition, 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., 1st Edition, 2008.
- 4.David L. Poole and Alan K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, 2nd Edition,2010.
- 5.Ertel, Wolfgang, Introduction to Artificial Intelligence,1st Edition ,2017

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:100

Exam Duration: 3Hrs

PART A: 10 questions of 2 marks each –No choice 20 Marks

PART B:2 questions from each unit of internal choice; each carrying 16 marks 80 Marks

SITA3007		L	T	P	Credits	Total Marks
	COMPUTATIONAL INTELLIGENCE	3	0	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 Russel, Peter Norvig, “Artificial Intelligence A Modern Approach”, 3rd Edition, Pearson Education, 2010
2. Elain Rich & Kevin Knight, Artificial Intelligence, Third edition, Tata McGraw Hill, 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 of internal choice, each carrying 16 marks **80 Marks**

		L	T	P	Credits	Total Marks
SMRA1603	ROBOT PROGRAMMING	3	0	0	3	100

COURSE OBJECTIVES

- To understand why Robot programming needed for programming a robot.
- To learn how Commands, Instructions in Robot programs.
- To understand how to provide Signal, Delay and Call functions in Robot Programming.
- To learn how to control a robot using offline programming.
- To design a robot program for controlling a industrial robot manipulator

UNIT1 INTRODUCTION TO ROBOT PROGRAMMING

9Hrs.

Robot software functions – coordinate systems - position control, other control functions, subroutines, Program planning for Robot flow charting for robot programs with few examples.

UNIT2 METHODS OF ROBOT PROGRAMMING

9Hrs.

Online programming, off-line programming, advantages of off-line programming, lead through methods - powered lead through, manual lead through, teach pendant, Robot program as a path in space, defining position in space, motion interpolation, WAIT, SIGNAL and DELAY commands, Branching capabilities and Limitations of head through methods.

UNIT3 ROBOT LANGUAGES

9Hrs.

Textual ROBOT Languages, first generation and second-generation languages, structure of a robot language – operating systems, Elements and Functions, constants, variables and other data objects, Motion commands, points in workspace, End effector and sensor commands, computations and operations, program control and subroutines, communications and Data processing.

UNIT4 VAL II

9Hrs.

General description, Monitor commands, motion command, Hand Control, Configuration control, interlock commands, INPUT/OUTPUT Controls, Program Control, examples.

UNIT5 AML

9Hrs.

General description, AML statements, Constant and variables, program control statements, motion commands, Sensor commands, Grip sensing capabilities, Data processing, examples

Max. 45 Hrs.

COURSE OUTCOMES

CO1-Describe the types of robot coordinate systems and programming functions.

CO2- Describing how to perform robot programming using online and offline method

CO3-Explain how to programming in various programming languages.

CO4-Design and develop robot programs with WAIT , SIGNAL and DELAY commands.

CO5-Ability to design robot program with interlock functions.

CO6-Apply the sensor feedbacks in robot programs.

TEXT /REFERENCE BOOKS

1. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Odrey, 'Industrial Robotics Technology, Programming and Applications', Mc Graw Hill Book company, 1986
2. Bernard Hodges, 'Industrial Robotics', Second Edition, Jaico Publishing House, 1993

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**

		L	T	P	Credits	Total Marks
SCSA1612	MACHINE LEARNING FOR ROBOTICS	3	0	0	3	100

COURSE OBJECTIVES

- Understand and implement the most popular learning algorithms.
- Perform feature selection and experimental set up on real tasks.
- Analyze in detail about unsupervised learning, dimensionality concepts and neural networks.
- Evaluate multiple learning algorithms across several Robotic tasks.

UNIT 1 INTRODUCTION

9 Hrs.

Machine learning– Applications- Learning Input-Output functions: Types of learning–Input Vectors– Outputs– Supervised- Learning class from Examples – PAC- Unsupervised– Noise - BIAS AND VARIANCE - OCCAM'S RAZOR PRINCIPLE–Performance Evaluation.

UNIT 2 SUPERVISED LEARNING

9 Hrs.

Introduction-Discriminative and Generative Models -Linear Regression - Least Squares -Under-fitting / Overfitting -Cross-Validation – Lasso Regression- Classification - Logistic Regression- Gradient Linear Models -Support Vector Machines –Kernel Methods -Instance based Methods - K-Nearest Neighbours - Tree based Methods – Evaluation of Classification Algorithms.

UNIT 3 ADVANCED SUPERVISED LEARNING

9 Hrs.

Linear models and gradient descent–Support Vector machines–Naïve Bayes models and probabilistic modeling– Model selection and feature selection–Model Complexity and Regularization - Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Model.

UNIT 4 UNSUPERVISED LEARNING

9 Hrs.

Curse of dimensionality, Dimensionality Reduction, PCA, Clustering–K-means–Expectation Maximization Algorithm –Mixtures of latent variable models – Supervised learning after clustering – Hierarchical clustering-Autonomous learning.

UNIT 5 NEURAL NETWORKS AND REINFORCEMENT LEARNING

9 Hrs.

Neural Networks – Biological Motivation- Perceptron – Multi-layer Perceptron – Feed Forward Network – Back Propagation-Activation and Loss Functions- Limitations of Machine Learning – Deep Learning– Convolution Neural Networks – Recurrent Neural Networks – Use cases.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Define a model for your data and make the model learn.

CO2 - Build regression models to predict an unknown output from a given set of inputs.

CO3 - Create Machine Learning techniques to teach a robotic manipulator to move.

CO4 - Develop unsupervised and reinforcement models for various robotics tasks.

CO5 - Determine hidden parameters in data to improve the accuracy of your model's predictions.

CO6 - Create probabilistic data models to predict a range of possible outcomes that account for real-world robotic operation risks and uncertainties.

TEXT / REFERENCEBOOKS

1. Michalski, Carbonell, Tom Mitchell, 'Machine Learning', Springer, 2014.
2. Ethem Alpaydin, 'Introduction to Machine Learning', The MIT Press, 2004.
3. Peter Flach, 'Machine Learning: The Art and Science of Algorithms that make sense of data', Cambridge, 2014.
4. Hal Daume III, 'A Course in Machine Learning', Todo, 2015.
5. Bruno Apolloni, Ashish Ghosh, Ferda Alpasian, "Machine Learning and Robot Perception", Springer, 2005.
6. Judy Franklin, Tom Mitchell, Sebastian Thrun, "Recent Advances in Robot Learning: Machine Learning", Springer, 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

SCSA2609	NEURAL NETWORKS USING MATLAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To make students familiar with basic concepts and tools used in neural networks
- To understand students' structure of a neuron including biological and artificial
- To implement learning in network (Supervised and Unsupervised)
- To get familiarized the concepts of learning rules.
- To Use MATLAB to perform complex arithmetic

LIST OF EXPERIMENTS

1. Study of MATLAB
2. (a) Program to perform basic operations in MATLAB
(b) Program to perform matrix operations in MATLAB
3. Program to calculate the factorial of a number by creating a script file by using while loop
4. Program to plot the straight line and sine curve
5. program in MATLAB to find the factorial by creating a function file by using for loop
6. Program to draw a graph with multiple curve
7. Program to plot Activation function used in neural network
8. Program to plot piecewise continuous activation function (threshold and signum function in neural network)
9. Program to realize gates using McCulloch Pitt model in MATLAB
10. Program to implement XOR gate using McCulloch-Pitts neuron
11. Program to create `Perceptron using commands
12. Program for creating a Back Propagation Feed-forward neural network
13. Program to design a Hopfield Network which stores 4 vectors
14. Program to illustrate how the perception learning rule works for non-linearly separable problems
15. Program to illustrate Linearly non-separable vectors;

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Remembering the concept of MATLAB and its operations.

CO2: Understand supervised and unsupervised learning concepts

CO3: Able to apply for cognitive tasks and processing of sensorial data such as vision, image- and speech recognition, control, robotics, expert systems

CO4: Design single and multi-layer feed-forward neural networks

CO5: understand training of recurrent Hopfield networks and associative memory concepts.

CO6: Ability to create Back Propagation Feed-forward neural network

SMRA2602	ROBOT PROGRAMMING LAB	L	TP	Credits	Total Marks
		0	04	2	100

COURSE OBJECTIVES

- To implement basic functions like MOVES, MOVE J Commands in Industrial Robot.
- To understand the different modes of operation of Industrial robot.
- To implement DELAY, SIGNAL Commands in robot programming
- To get familiarized on SUBROUTINES in Robot Programming.
- To implement Advanced commands and Gripper functions in Robot.

LIST OF EXPERIMENTS

1. Study of Robot coordinates and Joints in ABB IRB1520 Industrial Robot
2. Program the Robot for moving Major Axis
3. Program the Robot for moving Minor Axis
4. Program the Robot to draw Square.
5. Program the Robot to draw Letter A and L
6. Program the Robot using MOVE L , MOVE J and MOVES.
7. Program the Robot for Simple Pick and Place Operation
8. Program the Robot for Multiple movements in AUTOMATIC MODE.
9. Program the Robot using MOVE L and MOVE C commands
10. Program the Robot to Parabola, Hyperbola and Ellipse.
11. Program the Robot using WAIT, SIGNAL commands

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Remembering the robot coordinates, basic joint movements.

CO2: Understand basic concepts about MOVE L, MOVE S and MOVE J Commands

CO3: Able to apply and implement various programming functions to perform Square / Rectangle using gripper.

CO4: Ability to analyze the commands suitable for drawing Parabola and Hyperbola using Gripper

CO5: Compare and contrast different programming instructions

CO6: Design robot program for Pick and Place application.

SMEB1104	ENGINEERING GRAPHICS USING CAD	L	T	P	EL	Credits	Total Marks
		1	0	4	0	3	100

COURSE OBJECTIVES

- To know the basics of Engineering Graphics and make the student to possess the efficient drafting skill.
- To make the students to understand the importance of sectioning and concept of development.
- To learn about the orthographic and pictorial projections.
- Identify engineering graphics. Draw objects like points, lines, planes, and solids in perspective & orthographic projections

UNIT 1 DRAWING STANDARDS AND CONSTRUCTION OF BASIC SHAPES 9 Hrs.

Drawing standards: BIS – Lettering - Two systems of dimensioning - Drawing tools. Construction of the basic shapes: Points – Lines – Circle –Circular arc - Polygons – Ellipse – Parabola - Hyperbola – Spline Curves. Introduction to CAD packages: Setting up a new drawing template - Drawing Commands - Modifying Commands - Formatting commands - Dimensioning styles – Texts - Basic Function keys - Shortcuts. Features and applications of CAD.

UNIT 2 PROJECTION OF POINTS AND LINES

9 Hrs.

Projections - Types of projections –projection of points – Change of position method - Sketching the orthographic projection of points lying in four quadrants using a CAD package - Orthographic projection of lines (First angle projection only) - Sketching the orthographic projection of lines using a CAD package (Projection of lines parallel to one plane and inclined to another).

UNIT 3 ORTHOGRAPHIC PROJECTION OF SOLIDS

9 Hrs.

Types of solids – Orthographic projection of simple solids like prisms, pyramids, cylinder and cone (Change of position method) – Sketching of the front view and top view of solids in simple vertical position or the inclined position (inclined to one plane and perpendicular to another plane) using a CAD package.

UNIT 4 SECTION OF SOLIDS

9 Hrs.

Types of sectional views - Hatching - Section plane perpendicular to one plane and parallel to other plane– Sketching of the front view, top view and true shape of the solids with cutting plane parallel to one plane or inclined to one plane and perpendicular to another using a CAD package.

UNIT 5 DEVELOPMENT OF SURFACES AND ORTHOGRAPHIC PROJECTION 9 Hrs.

Need for development of surfaces - Types of development of surfaces - Development of pentagonal and hexagonal prisms - Development of cylinders - Development of pentagonal and hexagonal pyramids - Development of cones - Sketching of the development drawings of surfaces of solids in simple vertical position with or without sectioning using a CAD package.

Orthographic Projection- Drawing front view, top view and side view of objects from the given pictorial views using CAD package.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify the national standards related to the Engineering drawing based on BIS and construct conic sections and polygons.

CO2 - Draw the projections of points, lines.

CO3 - Draw projection of solid objects like prisms, cylinders, pyramids and cones used in various engineering objects.

CO4 - Draw orthographic section of solids and improve the visualization skill to develop New products.

CO5 - Draw the development of surfaces and its applications in manufacturing industry.

CO6 - Draw the 2D and 3D surfaces of engineering components using modeling software.

TEXT / REFERENCE BOOKS

1. Venugopal, K. and Prabhu Raja, V., Engineering Drawing and Graphics + AutoCAD, New Age International, 2021.
2. Trymbaka Murthy, S., Computer Aided Engineering Drawing, I.K. International Publishing House, 2017.
3. SP 46: Engineering Drawing Practice for schools and colleges, Bureau of Indian Standards.
4. AutoCAD – 2D CAD Reference Guide
5. Luzzader, Warren J., Duff John M., Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Prentice Hall of India Pvt. Ltd., 2016.

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

SMRB1102	FUNDAMENTALS OF ROBOTICS	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand the concepts of robotics and automation.
- To learn the basic configurations and performance of robot.
- To familiarize with the sensors, drive system, and control systems of a robot.
- To design a robot work cell for an industrial application.
- To understand the various applications of robots, justification, implementation and safety of robot.
- To write programming for various robotic application.

UNIT1 BASICS OF ROBOTICS

9 Hrs.

Introduction - Anatomy of Robot - Laws of robotics - Links and Joints of robot - Robot wrist - Configurations of robot - work volume - Spatial resolution - Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity–Drive Systems of Robot - Control system of Robot - Types of robot control - Robot motions Rotary to rotary motion, Rotary to linear motion, Harmonics drives.

UNIT 2 ROBOT SENSORS AND END EFFECTORS

9 Hrs.

Robotic sensors and actuators - Robot actuation and feedback components - Power transmission system – Robot joint control design - Robot End effectors Types of End effectors - Requirements and challenges of end effectors- Mechanical gripper- types of gripper mechanism - gripper force analysis – other types of gripper - special purpose grippers - Tools – Degrees of Freedom - Selection and design of Grippers.

UNIT 3 ROBOT KINEMATICS

9 Hrs.

Robot kinematics: Introduction - Position representation - 2 DOF Arm in 2D - 3 DOF Arm in 2D - 4 DOF Arm in 3D - rigid motion & homogeneous transformation forward & inverse kinematics - trajectory planning - Wrist Orientation - Manipulator path control - Robot Dynamics: Robot Arm dynamics - configuration of a robot controller.

UNIT 4 WORK CELL DESIGN AND MACHINE VISION SYSTEM

9 Hrs.

Robot work cell design - Work cell types – Work cell Control - Factors to be considered for work cell design - Interlocks - Machine vision: - Sensing and Digitizing - Imaging Devices - Lighting Techniques - AD Converter - Image Processing - Data reduction - Segmentation - Thresholding - Region Growing- Edge Detection - Feature extraction - Object recognition - Applications Inspection - Identification - Visual servicing and navigation - Training the vision.

UNIT 5 ROBOT PROGRAMMING METHODS

9 Hrs.

Robot programming Methods - Methods of Defining Position - Motion Interpolation - Commands - Branching - Robot Languages Classification of robot language - Computer control and robot software - Val system and Languages - Application of robots - Process Applications - Material Loading and Unloading - Material handling - spot and continuous arc welding & spray painting -Robots for Assembly and Inspection

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1 - Understand the basics of robotics and to choose the appropriate type of drive and sensor system

CO2 - To select the appropriate type of tools and grippers for various applications

CO3 - To design a robotic arm and to bring a controlled movement in the end effectors

CO4 - Understand the concept of Computer vision system and to develop a machine vision system for inspection

CO5 - Ability to design robot work cell and develop robots for real life situational problems and think creatively for solutions

CO6 - Ability to write various robot programs for various applications

TEXT / REFERENCE BOOKS

1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey , Ashish Dutta, Industrial Robotics - Technology, Programming and Applications McGraw Hill (SIE) | 2nd Edition 2012
2. John J. Craig, Introduction to Robotics: Mechanics and Control, third edition, Pearson Prentice Hall 2004
3. Harry H. Poole, Fundamentals of Robotics Engineering Van Nostrand Reinhold, Springer 2012
4. Frank L. Lewis, Darren M.Dawson, Chaouki T.Abdallah, Robot Manipulator Control Theory and Practice Second Edition, Revised and Expanded 2004
5. R.D.Klafter, T.A.Chimielewski and M.Negin, Robotic Engineering—An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
6. Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis ‘, Oxford University Press, Sixth impression, 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

SCSA1613	INTRUSION DETECTION SYSTEM	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES:

- To study the pre crime data mining techniques
- To be familiar with the searchable database
- To learn the clustering concepts using text mining
- To evaluate and analyse the Intrusion detection, techniques and systems
- To learn to map the crime using clustering

UNIT 1 PRE-CRIME DATA MINING

9hrs

Behavioural Profiling, Rivers of Scraps, Data Mining, Investigative Data Warehousing, Link Analysis, Software Agents, Text Mining, Neural Networks, Machine Learning, Precrime, September 11, 2001, Criminal Analysis and Data Mining, Profiling via Pattern Recognition, Calibrating Crime, Clustering Burglars: A Case Study

UNIT 2 INVESTIGATIVE DATA WAREHOUSING

9hrs

Relevant Data, Data Testing, The Data Warehouse, Internet Data, XML, Data Preparation, Interrogating the Data, Data Integration, Security and Privacy, Choice Point: A Case Study, Tools for Data Preparation, Link Analysis: Visualizing Associations, Using Link Analysis Networks, Fighting Wireless Fraud with Link Analysis: A Case Study, Link Analysis Tools

UNIT 3 TEXT MINING: CLUSTERING CONCEPTS

9hrs

Text Mining Definition, Working of Text Mining Work, Text Mining Applications, Searching for Clues in Aviation Crashes: A Case Study, Clustering News Stories: A Case Study, Text Mining for Deception, Text Mining Threats, Text Mining Tools

UNIT 4 INTRUSION DETECTION: TECHNIQUES AND SYSTEMS

9hrs

Cybercrimes, Intrusion MOs, Intrusion Patterns, Anomaly Detection, Misuse Detection, Intrusion Detection Systems, Data Mining for Intrusion Detection: A Case Study from the Mitre Corporation, Types of IDSs, Misuse IDSs, Anomaly IDSs, Multiple-Based IDSs, Data Mining IDSs, Advanced IDSs, Forensic Considerations, Early Warning Systems

UNIT 5 MAPPING CRIME: CLUSTERING CASE WORK

9hrs

Crime Maps, Interactive Crime GIS, Crime Clusters, Modelling the Behaviour of Offenders Who Commit Serious Sexual Assaults: A Case Study, Decomposing Signatures Software, Computer Aided Tracking and Characterization of Homicides and Sexual Assaults (CATCH), Forensic Data Mining, Alien Intelligence, Weka tool: Introduction to WEKA, The Explorer - Getting started, Exploring the explorer.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1: Study the pre crime data mining techniques
- CO2: Be familiar with the searchable database
- CO3: Learn the clustering concepts using text mining
- CO4: Evaluate and analyse the intrusion detection, techniques and systems
- CO5: Learn to map the crime using clustering
- CO6: Learn the different tools for applying mining concepts.

TEXT REFERENCE BOOKS:

1. Investigative Data Mining for Security and Criminal Detection, Jesús Mena, Butterworth Heinemann, Elsevier Science, 2003
2. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
3. Ian H. Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.
4. Intrusion detection systems Edited by Pawel Skrobanek Intrusion Detection Systems Edited by Pawel Skrobanek Published

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**

SCSA1614	DEVOPS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand DevOps the advanced process of software engineering for faster problem resolution & team collaboration.
- To understand about Agile methodology as a practice to promote continuous iteration of development and testing throughout SDLC.
- To learn the integration of Cloud with DevOps
- To understand the Configuration Tool
- To Understand the Monitoring Tool

UNIT 1 INTRODUCTION TO DevOps 9 Hrs.

Introduction to DevOps - DevOps vs Agile - DevOps Principles and Life Cycle - Introduction to CI / CD & DevOps Tools-Version Control - Build Automation - Configuration Management- Containerization-- Continuous Deployment - Continuous Integration - Continuous Testing -Continuous Monitoring.

UNIT 2 AGILE SOFTWARE DEVELOPMENT 9 Hrs.

Software Development- using Extreme Programming - Roles & Rules - Software Development using Scrum Framework - Scrum team - Sprints - Sprints planning - Metrics - Scrum tools - Case Studies.

UNIT 3 CLOUD COMPUTING AND AWS 9Hrs

Cloud computing -Characteristics of cloud computing - Cloud implementation models - Cloud service models - Elastic Cloud Computing - Simple Storage Service - Elastic Block Storage - Elastic Load Balancer - Auto Scaling - Identity Access Management - Relational Database Server.

UNIT 4 GIT AND CONFIGURATION MANAGEMENT TOOL 9 Hrs.

GIT Basics-Different Git tools - Git Installation and Configuration - Setting up Git Bash and Git UI -GIT commands -Configuration Management Tool: Overview of Chef-Workstation Setup - Organization Setup- Test Node Setup -Puppet Architecture - Installation and Configuration.

UNIT 5 DEPLOYMENT AND MONITORING TOOL 9 Hrs.

Deployment Tool - Jenkins - Build Cycle - Jenkins Architecture-Installing and configuring Jenkins using WAR and RPM-Securing Jenkins- Dockers vs Virtualization - Docker Architecture - Docker Networking- Monitoring tool - About New Relic - Installing and Configuring New Relic - Application Monitoring using New Relic - Server Monitoring using New Relic - Alerts policies.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Apply DevOps faster problem resolution & team collaboration.

CO2: Implement Agile software methodology for faster development of quality software

CO3: Describe how to improve collaboration between Cloud and DevOps.

CO4: Implement Configuration Management

CO5: Implement Automated Installations and Deployments

CO6: Unresolved different transformations of a product or a service through brainstorming and incremental approach, etc.

TEXT /REFERENCE BOOKS

1. KalloriVikram, —Introduction to DevOps, 1 st Edition, KalloriVikram Publication, 2016.
2. Jaokim Verona, —Practical DevOps, 2 nd Edition, Packt. Publication, 2018.
3. Stephen Fleming, Pravin, —DevOps Handbook: Introduction of DevOps Resource Management—,1st Edition, Createspace Independent Pub., 2010.
4. Len Bass, Ingo Weber, Liming Zhu, G., —DevOps: A Software Architect's Perspective, 1st Edition, Addison-Wesley Professional, 2015.
5. Alistair Cockburn, “Agile Software Development”, 2nd ed, Pearson Education, 2007.

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

SCSA1615	SMART CONTRACT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand about Ethereum and differentiate with Bitcoin
- To learn about open Blockchain Platform
- To understand smart contracts, Dapps, and DAOs
- To learn about open Blockchain platform's and ICOs
- To create private blockchain, new crypto-currency and Mine for tokens
- To set-up a blockchain development environment and Program using Solidity
- To build a smart contracts Dapps

UNIT 1 INTRODUCTION

9Hrs.

Ethereum, EthereumVsBitcoin, Ethereum Clients, Account Management, Ether, The Ethereum network, Mining, History of Ethereum, Community, The Ethereum Foundation. Smart Contracts, Dapps, And DAOs, Quick Start Overview of Remix using JavaScript VM.

UNIT 2 Ethereum Technology Overview & Current and Potential Uses of Ethereum

9Hrs.

Architectural Overview, EthereumBlockchain Platform, Ethereum Virtual Machine, Create your private EthereumBlockchain, Download the main EthereumBlockchain, Analyse EthereumBlockchain. Current Ethereum, Applications, Initial Coin Offerings, Payment Systems, Investing in Gold, Crowdfunding, Corporate Finance, The Internet of Things, Casinos, Lotteries, And Online Gambling, Prediction Markets, Web Hosting, Social Networks, Insurance, Entertainment, Real Estate, Energy Transfer, Marriage Contracts and Wills, Decentralized Cryptocurrency Exchange, Supply Chain Management, Financial Markets, Election and Votes.

UNIT 3 Introduction to Programming Smart Contracts & Programming Tutorial - Installing, Building, Testing, & Deploying

9Hrs.

A Simple Smart Contract, Account Types, Gas, and Transactions, Contracts, Accessing Contracts and Transactions, Mix, Dapps, Developer Tools, Ethereum Tests, Web3 Base Layer Services, Ethereum Nodes, Building A Private Blockchain Network, MetaMask Browser Plug In, Mist Browser, Ethereum Wallet, Web3 Ethereum JavaScript API, Remix Web Browser IDE, Geth (Go Ethereum) Command Line Interface.

UNIT 4 Solidity Programming

9Hrs.

Layout of a Solidity Source File, Structure of a Contract, Types, Units and Globally Available Variables Input Parameters and Output Parameters, Control Structures, Function Calls, Creating Contracts via new Order of Evaluation of Expressions, Assignment,

Scoping and Declarations, Error handling: Assert, Require, Revert and Exceptions, Creating Contracts, Visibility and Getters, Function Modifiers, Constant State Variables, Functions Events, Inheritance, Abstract Contracts, Interfaces, Libraries.

UNIT 5 Decentralized Apps - Coding Details, Style Guide, Design Patterns 9Hrs.

Decentralized Application Architecture, Connecting to the Blockchain and Smart Contract, Web3js, Deployment Sample Web Pages (HTML/CSS/JavaScript), Voting Contract and App, Blind Auction Contract and App Safe Remote Purchase Contract and App, Micropayment Channel Contract and App, Coding Style Guide Code Layout, Naming Conventions, Common Design Patterns, Withdrawal from Contracts, State Machine.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1- Knowledge on Ethereum and it's significant difference from Bitcoin
- CO2- Technological overview on Ethereum and it's uses
- CO3- Step to set-up for Smart Contract
- CO4- Development of application using Smart Contract programming
- CO5- Decentralised application study
- CO6- Scope and significant uses of Smart Contract

TEXT /REFERENCE BOOKS

1. Ethereum Homestead Documentation, Ethereum Community, March 01, 2017:
<http://www.ethdocs.org/en/latest/index.html>
2. Solidity Documentation, Ethereum Community, May 14, 2021:
<https://solidity.readthedocs.io/en/develop/index.html>
3. <http://www.ethdocs.org/en/latest/introduction/what-is-ethereum.html>
4. <https://solidity.readthedocs.io/en/develop/introduction-to-smart-contracts.html>
5. <http://www.ethdocs.org/en/latest/contracts-and-transactions/index.html>
6. <https://solidity.readthedocs.io/en/develop/solidity-in-depth.html>
7. <https://solidity.readthedocs.io/en/develop/solidity-by-example.html>
8. <https://solidity.readthedocs.io/en/develop/style-guide.html>
9. <https://solidity.readthedocs.io/en/develop/common-patterns.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**

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

SCSA2610	INTRUSION DETECTION SYSTEM LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To apply data mining techniques and methods to large data sets.
- Be familiar with the algorithms of data mining
- Be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
- Be exposed to web mining and text mining
- To use network security tools and vulnerability assessment tools
- To compare and contrast the various classifiers

SUGGESTED LIST OF EXPERIMENTS

1. Apriori Algorithm.
2. FP-Growth Algorithm.
3. K-means clustering.
4. One Hierarchical clustering algorithm.
5. Bayesian Classification.
6. Decision Tree.
7. Support Vector Machines.
8. Applications of classification for web mining.
9. Case Study on Text Mining or any commercial application.
10. Demonstrate intrusion detection system (ids) using any tool e.g. Snort or any other s/w.
11. Automated Attack and Penetration Tools, Exploring N-Stalker, a Vulnerability Assessment Tool
12. Demonstrate Intrusion Detection System (IDS) using any tool (snort or equivalent software)
13. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).
14. Setup a honey pot and monitor the honeypot on network (KF Sensor)
15. Penetration testing, IDS

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1 - Apply data mining techniques and methods to large data sets.
- CO2: Familiar with the algorithms of data mining
- CO3: Acquaint with the tools and techniques used for knowledge discovery in databases.
- CO4: Expose to web mining and text mining
- CO5: Use network security tools and vulnerability assessment tools
- CO6: Compare and contrast the various classifiers

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

SCSA2611	DEVOPS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To learn the software configuration management in DevOps
- To Perform Version Control on Websites
- To Install and Configure Docker for Creating Containers
- To Build Web Application on Docker.
- To Perform Configuration Management using Chef/Puppet.

LIST OF EXPERIMENTS

1. Version Control to Perform Version Control on websites/ Software using different Version control tools like RCS/ CVS/GIT/Mercurial.
2. Virtualization & Containerization to Install and Configure Docker for creating Containers of different Operating System Images 04 LO 1 LO 4.
3. Virtualization & Containerization to Build, deploy and manage web or Java application on Docker
4. Provisioning to Perform Software Configuration Management and provisioning using Chef/Puppet/Ansible or Saltstack.

COURSE OUTCOMES

On completion of the course the student will be able to

CO1: Remember the importance of DevOps tools used in software development life cycle

CO2: Understand the importance of Jenkins to Build, Deploy and Test Software Applications

CO3: Examine the different Version Control strategies

CO4: Analyse & Illustrate the Containerization of OS images and deployment of applications over Docker

CO5: Summarize the importance of Software Configuration Management in DevOps

CO6: Synthesize the provisioning using Chef/Puppet/Ansible or Saltstack.

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

SCSB1261	INTRODUCTION TO BLOCKCHAIN TECHNOLOGY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVE

- To understand the history, types and applications of Blockchain
- To acquire knowledge about cryptography and consensus algorithms.
- Deploy projects using Web3j and design blockchain based applications.

UNIT 1 INTRODUCTION TO BLOCKCHAIN

9 Hrs.

Distributed DBMS – Limitations of Distributed DBMS, Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features and Types of Blockchain.

UNIT 2 BLOCKCHAIN ARCHITECTURE

9 Hrs.

Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain- Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET).

UNIT 3 BLOCKCHAIN-BASED FUTURES SYSTEM

9 Hrs.

Project presentation- Futures smart contract: Blockchain oracles- Web3j: Setting up the Web3J- Installing web3j- Wallet creation, Java client: The wrapper generator- Initializing web3j- Setting up Ethereum accounts- Deploying the contract.

UNIT 4 BLOCKCHAINS IN BUSINESS AND CREATING ICO

9 Hrs.

Public versus private and permissioned versus permission less blockchains- Privacy and anonymity in Ethereum- Why are privacy and anonymity important? - The Ethereum Enterprise Alliance- Blockchain -as-a-Service- Initial Coin Offering (ICO): Project setup for ICO implementation- Token contracts- Token sale contracts-Contract security and testing the code.

UNIT 5 DISTRIBUTED STORAGE IPFS AND SWARM

9 Hrs.

Ethereum Virtual Machine- Swarm and IPFS: Installing IPFS, Hosting our frontend: Serving your frontend using IPFS, Serving your frontend using Swarm, IPFS file uploader project: Project setup the web page.

Max. 45 Hrs.

COURSE OUTCOME

On completion of the course, student will be able to

CO1 - Contentedly discuss and describe the history, types and applications of Blockchain.

CO2 - Gains familiarity with cryptography and Consensus algorithms.

CO3 - Create and deploy projects using Web3j.

CO4 - Implement an ICO on Ethereum.

CO5 - Design block chain based application with Swarm and IPFS.

CO6 - Create and deploy projects using distributed storage.

TEXT / REFERENCE BOOKS

1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained”, 2ndEdition, Packt Publishing Ltd, March 2018.
2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, “Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger”, Packt Publishing Limited, 2018.
3. Andreas M. Antonopoulos , “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly Media Inc, 2015.
4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.

E BOOKS

1. <https://www.velmie.com/practical-blockchain-study>.

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

SCSA1616	LINUX PROGRAMMING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand and make effective use of Linux utilities and shell scripting language to solve problems
- To develop skillsets that are required for systems programming including file system programming, process and signal management and inter process communication
- To develop the basic skills required to write network programs using sockets

UNIT 1 INTRODUCTION AND FILE UTILITIES

9 Hrs.

Introduction to Linux - Linux Utilities - File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities - grep commands - sed commands - System commands in awk

UNIT 2 SHELL PROGRAMMING

9 Hrs.

Introduction to Shell programming – Working with Bourne again shell (Bash): Shell commands, Shell variables, Command substitution, Shell responsibilities, Pipes and Redirection, Aliases, Shell environment, Quoting, Test command, Control structures, Arithmetic in shell, Shell script examples, Interrupt processing, Functions, Debugging shell scripts

UNIT 3 FILE AND DIRECTORIES

9 Hrs.

Files and Directories: File Concept, File types, File System Structure, Inodes, File Attributes, File types, Standard I/O operations, Kernel support for files, System calls, File descriptors, File and directory management – Directories: creating, removing, and changing directories – Directory API functions.

UNIT 4 PROCESS AND SIGNALS

9 Hrs.

Process and Signals: Process concepts, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec – Signal generation and handling, Signals functions, Reliable and unreliable signals, Interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions

UNIT5 IPC AND SOCKETS

9 Hrs.

Inter Process Communication: Introduction – Pipes, Process pipes, the pipe call, parent and child processes, and named pipes: FIFOs, Semaphores, File locking with Semaphores, Message queues, Shared memory – Introduction to Sockets: Socket connections - Socket attributes, Socket addresses, Socket, connect, bind, listen, accept, socket communications.

Max. 45 Hrs.

COURSE OUTCOMES

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

- CO1: Understand the basic commands of Linux operating system and can write shell scripts.
- CO2: Create and operate file systems and directories.
- CO3: Create processes background and fore ground etc. by fork () system calls.
- CO4: Create shared memory segments, pipes, message queues and can exercise inter process communication.
- CO5: Understand Socket connections and attributes and write network scripts.
- CO6: Learn the concepts of Inter process Communication.

TEXT / REFERENCE BOOKS

1. Sumitabha Das,” Unix Concepts and Applications”, Tata McGraw-Hill, 4th Edition, New Delhi, India.
2. W. Richard. Stevens,” Advanced Programming in the UNIX Environment”, Pearson Education, 3rd edition, New Delhi, India.
3. Beginning Linux Programming, 4th Edition, N. Matthew, R. Stones Wrox, Wiley India Edition.

SCSA1617	AI ENHANCED CYBER THREATS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the knowledge in solving AI problems
- To study the fundamentals of Cyber security
- To learn and analyse the impact of AI on cyber security
- To secure the web with AI and develop the Web Application Security
- To study the cyber threats

UNIT 1 INTRODUCTION AND PROBLEM SOLVING

9 Hrs.

Introduction – Understanding AI Basics – History of AI – Intelligent agent – Types of agents - Structure – Problem solving agents – Uninformed search strategies - Searching with partial Information. Fundamentals of AI for Security- deep learning fundamentals from a security perspective - cyber security space problem solution

UNIT 2 FUNDAMENTALS OF CYBER SECURITY

9 Hrs.

Identity, authentication, confidentiality, privacy, anonymity, availability and integrity- Exploring cryptographic algorithms together with major attacks- Exploring high-level security protocols- biometric authentication - Compliance and security assessment – introduction to penetration testing - Active Directory Security Assessment (ASDA) and cyber insurance risk assessment.

UNIT 3 IMPACT OF AI ON CYBER SECURITY

9 Hrs.

Threat hunting in memory, file system and network data - introductory analysis of malicious programs - cyber threat hunting and digital investigation -- detailed analysis of real-world case studies - unusual and non-virulent types of malwares: KNN (K - Nearest Neighbours) for threat visualizers, Isolation Forest for anomaly detection, LSTM for multi-vector correlation, DBSCAN for risk ware detection and fraud, LSTM (Autoencoder) for endpoint protection

UNIT 4 SECURE WEB AND APPLICATION

9 Hrs.

Securing web with AI - making websites secure using AI techniques for injection - using regular expressions and identifying patterns and matching with existing scores – Applications using statistical patterns and Bayesian statistics -Web Application Security, Injection, Broken authentication, Sensitive data exposure, XML External Entities (XXE), Broken access control, Security misconfiguration, Cross-Site Scripting (XSS), Insecure deserialization, Using components with known vulnerabilities and Insufficient logging and monitoring.

UNIT 5 CYBER THREATS

9 Hrs.

Future of AI in Advancing Security and Promoting, Artificial Intelligence vs. Data Analytics, Applying AI to cybersecurity, some early AI adopters, AI Use by Adversaries, Using Artificial Intelligence Tools to Enhance Security, Deep learning applications,

Cyber Security Threats and Development of Secure Software, Securing IOT Infrastructure, Secure AI Development, Large scale deployment of AI algorithms on production, End-to-end case study for a secure IoT application in a develops ecosystem

Max. 45 Hrs.

COURSE OUTCOMES

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

- CO1: Understand the knowledge in solving AI problems.
- CO2: Study the fundamentals of Cyber security.
- CO3: Learn and analyze the impact of AI on cyber security.
- CO4: Secure the web with AI and develop the Web Application Security.
- CO5: Study the cyber threats.
- CO6: Learn the case study for secure IOT application.

TEXT/ REFERENCE BOOKS

1. Jerzy Peja and rzejPiegat,” Enhanced Methods in Computer Security, Biometric and Artificial Intelligence Systems”, Springer, Technical University of Szczecin, Poland.
2. <https://www.coursera.org/learn/ibm-cyber-threat-intelligence#instructors>
3. <https://www.captechu.edu/search?keywords=syllabus>
4. [http://polisci.rutgers.edu/images/syllabi/Cyber Security and AI 790 574 90 Course Syllabus V1 19493.pdf](http://polisci.rutgers.edu/images/syllabi/Cyber_Security_and_AI_790_574_90_Course_Syllabus_V1_19493.pdf)

SCSA2612	LINUX LAB	L	TP	Credits	Total Marks
		0	04	2	100

COURSE OBJECTIVES

- To familiarize basic commands of kernel and shell programming
- To demonstrate use of system calls
- To demonstrate Inter Process Communication

SUGGESTED LIST OF EXPERIMENTS

1. Study and Practice on various commands like man, passwd, tty, script, clear, date, cal, cp, mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, w.
2. Study and Practice on various commands like cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, tar, cpio.
3. a) Write a Shell Program to print all .txt files and .c files.
b. Write a Shell program to move a set of files to a specified directory.
4. a) Write a Shell program to display all the users who are currently logged in after a specified time.
b. Write a Shell Program to wish the user based on the login time.
5. a) Simulate cat command
b. Simulate cp command.
6. a) Simulate head command.
b. Simulate tail command.
7. a) Simulate mv command.
b. Simulate nl command.
8. Write a program to handle the signals like SIGINT, SIGQUIT, SIGFPE.
9. Write a program to create a Zombie process
10. Write a program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.
11. Implement the following IPC forms
a) FIFO b) PIPE
12. Implement message queue form of IPC.
13. Implement shared memory form of IPC.
14. Write a Socket program to print system date and time (Using TCP/IP).

COURSE OUTCOMES

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

CO1: Understand the basic commands of kernel system and can write BASH scripts.

CO2: Create and operate file systems and directories operations and handle text documents using BASH.

CO3: Create Inter Process Communication viz., Parent – Child process, FIFO & PIPE, Zombies and Socket program.

CO4: Create a logging process using shell programs

CO5: Analyze the concepts of inter process communication

CO6: Understand the socket programming.

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**

SCSB1271	INTRODUCTION TO CYBER SECURITY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

Understand the key concepts and principles of cybersecurity.

- To Identify common threats, attacks, and vulnerabilities in computer systems.
- Understand basics of cryptographic algorithms.
- Demonstrate knowledge of cryptographic techniques and their applications.
- Understand legal and ethical issues related to cybersecurity.

UNIT 1 INTRODUCTION TO CYBERSECURITY

9 Hrs.

Definition and scope of cybersecurity, Cybersecurity goals and objectives, Security principles: confidentiality, integrity, availability, Threats, Attacks, and Vulnerabilities- Overview of common cybersecurity threats and attack vectors, Malware, phishing, and other attack techniques, Identifying and assessing vulnerabilities in systems and networks

UNIT 2 NETWORK SECURITY

9 Hrs.

Network security concepts and protocols - Firewall -Intrusion Detection System (IDS) and Intrusion Prevention System (IPS)-TCP/IP-Virtual Private Network (VPN)- Internet Protocol Security (IPsec)- -Secure Sockets Layer/Transport Layer Security (SSL/TLS)- Internet Protocol Security (IPsec)

UNIT 3 CRYPTOGRAPHY AND DATA PROTECTION

9 Hrs.

Basics of cryptography: encryption, decryption, hashing, Symmetric and asymmetric encryption algorithms- Advanced Encryption Standard (AES)- Data Encryption Standard (DES)- Blowfish, RSA (Rivest-Shamir-Adleman)- Diffie-Hellman (DH)- Digital Signature Algorithm (DSA)- PGP (Pretty Good Privacy), ElGamal.

UNIT 4 WEB SECURITY

9 Hrs.

Common web security vulnerabilities (e.g., Cross-Site Scripting, SQL injection), Web application security best practices, Securing web servers and web applications. Access Control and Authentication- Principles of access Control-Authentication methods (e.g., passwords, biometrics).

UNIT 5 ETHICAL AND LEGAL ISSUES IN CYBERSECURITY

9 Hrs.

Ethical principles and professional codes of conduct, Laws, regulations, and privacy issues in cybersecurity, Cybersecurity ethics in the workplace.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understands the importance fundamentals of cyber threat intelligence and its importance in cybersecurity.

CO2 - Understands to develop skills to collect, analyze, and interpret threat intelligence data.

CO3 - Understands basics of cryptographic algorithms.

CO4 - Understands various types of malware and their characteristics.

CO5 - Explain the fundamentals of cryptography and its role in securing data

CO6 - Understand legal and ethical issues related to cyber security.

TEXT / REFERENCE BOOKS

1. Raef Meeuwisse." Cybersecurity For Beginners"Lulu,2015

2. Mayank Bhusan/Rajkumar Singh Rathore/Aatif Jamshed, "Fundamentals of Cyber Security", BPB, 2020

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 of internal choice; each carrying 16 marks **80 Marks**

SCSB1262	BLOCK CHAIN AND CRYPTOCURRENCY	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To Impart strong technical understanding of Blockchain technologies.
- To introduce the concept and the basics of Ethereum that helps developers publish distributed applications.
- To learn various aspects of working and use of BitCoin.
- To give the knowledge to transfer of money for medium of exchange .
- To provide knowledge on SECURITY AND PRIVACY of Block chain technologies.
- To applied the various applications of block chain technologies.

UNIT 1 INTRODUCTION OF BLOCKCHAIN

9 Hrs.

Peer-to-Peer(P2P) Networking, Blockchain Architecture, Design and Integration, key Participants in the block chaining, Blocks in Blockchain, Types of Block chain, the Logical Components of Blockchain, Core Components of Blockchain Architecture, Smart contracts and their applications.

UNIT 2 ETHEREUM BASICS

9 Hrs.

Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts, writing smart contracts using Solidity & JavaScript

UNIT 3 INTRODUCTION OF BITCOIN

9 Hrs.

Bitcoin features, Blockchain and Bitcoin, Bitcoin Security, Bitcoin Transaction, Transaction Lifecycle, Consensus Protocol, Role of Bitcoin Crimes, Dark Side of Bitcoin Crimes, Open Challenges to Bitcoin Crimes.

UNIT 4 FUNDAMENTALS OF CRYPTOCURRENCIES

9 Hrs.

Nodes, P2P, Ledger, Gossip Protocol, Consensus Methods, Messages, Account Balance, Genesis Block and New Coins, how a Crypto currency Works, crypto currency Exchange, Smart Contracts, E- Governance.

UNIT 5 SECURITY AND PRIVACY ISSUES OF BLOCKCHAIN TECHNOLOGY

9 Hrs.

Introduction, Blockchain Aspects for Consideration, Security of block chain, Privacy of blockchains, Security Issues of Blockchain Technology, Privacy Issues of Blockchain Technology, Types of Attack, Security Enhancement to Blockchain Systems, Applications of Blockchain in Health care, Finance.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the concepts of Blockchain technologies.

CO2 - Implement Ethereum block chain contract.

CO3 - Illustrate the concepts of Bitcoin and their usage.

CO4 - Understand basic principles of Cryptocurrencies.

CO5 - Apply security features in blockchain technologies.

CO6 - Use smart contract in real world applications.

TEXT / REFERENCE BOOKS

1. Tapscott, Don, Tapscott, Alex,” Blockchain Revolution How the Technology Behind Bitcoin and Other Cryptocurrencies Is Changing the World”.
2. MerunasGrincalaitis, “Mastering Ethereum: Implement Advanced Blockchain Applications using Ethereum-supported Tools, Services, and Protocols”, Packt Publishing.
3. Raj, Pethuru Saini, KavitaSurianarayanan, Chellammal,” Blockchain Technology and Applications”.
4. Melanie Swan,” Blockchain Blueprint for a New Economy”.
5. Shiho Kim, Ganesh Chandra Deka,” Advanced Applications of Blockchain Technology”.
6. Rajneesh Gupta,” Hands-On Cybersecurity with Blockchain Implement DDoS protection, PKI-based identity, 2FA, and DNS security using Blockchain”.
7. Martin Quest,” Cryptocurrency Master Everything You Need to Know About Cryptocurrency and Bitcoin Trading, Mining, Investing, Ethereum, ICOs, and the Blockchain”.
8. Narayanan, Bonneau, Felten, Miller and Goldfeder, “Bitcoin and Cryptocurrency Technologies A Comprehensive Introduction”, Princeton University Press.
9. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

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 of internal choice; each carrying 16 marks **80 Marks**