



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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

www.sathyabama.ac.in

SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

1.1.3 Courses having focus on employability/ entrepreneurship/ skill development

B.E Computer Science and Engineering With Specialization In Artificial Intelligence			
Employability			
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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.

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 - WirelessHart, 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: 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.

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 Multiresolution 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

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.

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

SMEA400 1	RESOURCES MANAGEMENT TECHNIQUES	L	T	P	Credits	Total Marks
		3	0	0	3	100

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.

Queueing 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.

- C02:** To analyze various types of deterministic models like linear programming, transportation model etc.
- C03:** To develop Mathematical skills for formulating networks & Scheduling.
- C04:** To apply various types of inventory models in industrial applications.
- C05:** Apply various types of models like Inventory model, Queuing model, Replacement model & simulation.
- C06:** To facilitate quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.

TEXT/REFERENCE BOOKS

1. Panneerselvam R, Operation research, 2nd Edn., Prentice Hall, 2011.
2. Sharma S.D, Operation research Theory, Methods and Application, 17th Edn., Kedar Nath Ram Nath Publication, 2010.
3. Nita H Shah, Ravi M Gor & Hardik Soni, Operation research, 4th Edn., PHI, 2010.
4. Hamdy A.Taha, Operation 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

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:
 - 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 $\geq$ 17, state==TN.
- Write a menu driven C program for library management system with ten entries:
 - . (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
		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 5 PRINCIPLES 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	PROGRAMMING IN PYTHON	L	T	P	EL	Credits	Total Marks
		3	0	2	1		

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, 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 & ALGORITHMS	L	T	P	E	L	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 Exercise:

1. Python program to find the sum of all elements of an array
2. Python program to find a series in an array consisting of characters
3. Python program to find the occurrence of a particular number in an array
4. Python program to find the largest element in an array
5. Python program for array rotation

UNIT 2 LINKED LIS 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 Exercise:

1. Program to implement operations on a Singly linked list.
2. Program to implement operations on a doubly linked list

UNIT 3 STACKS & QUEUE 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 Exercise:

1. Program to implement a Stack using an array and Linked list.
2. Program to implement Queue using an array and Linked list.
3. 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 Exercise:

1. Program to convert an infix expression to postfix expression.
2. Program to implement BFS and DFS
3. Program to implement N Queens problem.
4. Program to implement Binary Tree Traversal
5. Program to implement Travelling Salesman Problem

UNIT 5 ALGORITHM DESIGN TECHNIQUES & 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 Exercise:

1. Program to sort the elements using insertion sort.
2. Program to sort the elements using quick sort.
3. Program to sort the elements using merge sort.
4. Program to find an element using Linear and Binary Search.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, 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.