VI SEM

ARTTIFICIAL INTELLIGENCE

Course Code	18IS61	Credits	3
Course type	PC	CIE Marks	50 marks
Hours/week: L-T-P	3-0-0	SEE Marks	50 marks
Total Hours:	44	SEE Duration	3 Hours for 100 marks

Course Learning Objectives:

1. To study the fundamentals of Artificial intelligence and agent technology
2. To understand searching strategy and optimizations for problem solving
3. To understand various logic representations to specify reasoning and planning tasks
4. To understand various methods for Knowledge Representation

Prerequisites: Design of Algorithms, Discrete Mathematical Structure

UNIT I 9 Hours

Introduction: What Is AI? ; The Foundations of Artificial Intelligence; Weak AI; Strong AI;
Intelligent Agents: Agents and Environments; Good Behavior- The Concept of Rationality: Rationality, Omniscience, learning, and autonomy;
The Nature of Environments: Specifying the task environment, Properties of task environments;
The Structure of Agents: Agent programs, Simple reflex agents, Model-based reflex agents, Goal-based agents, Utility-based agents, learning agents,
How the components of agent programs work; Agent Architectures;

UNIT II 9 Hours

Problem-Solving Agents; Example Problems: Toy problems, Real-world problems;
Infrastructure for search algorithms,;
Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search ; Greedy best-first search;
Local Search Algorithms and Optimization Problems: Optimal Decisions in Games:
The minimax algorithm, Alpha-Beta Pruning: Move ordering

UNIT III 8 Hours

Knowledge-Based Agents; The Wumpus World; Logic; Propositional Logic: A Very Simple Logic: Syntax, Semantics, A simple knowledge base, A simple inference procedure;
Syntax and Semantics of First-Order Logic; Using First-Order Logic

UNIT IV 8 Hours

Definition of Classical Planning: Example: Air cargo transport, Example: The spare tire problem, Algorithms for Planning as State-Space Search: Forward (progression) state-space search, Backward (regression) relevant-states search, Heuristics for planning;

UNIT V 10 Hours

Knowledge Representation: Ontological Engineering; Categories and Objects ; Events; Mental Events and Mental Objects; Reasoning Systems for Categories
Uncertain knowledge: Acting under Uncertainty; Basic Probability Notation; Inference Using Full Joint Distributions; Bayes' Rule and Its Use;
Representing Knowledge in an Uncertain Domain; Semantics of Bayesian Networks

Text Books:

1. Stuart Russel, Peter Norvig: Artiificial Intelligence A Modern Approach, Pearson 3rd

edition 2013.

Reference Books:

1. Elaine Rich Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition 2013.
2. Ben Coppin, Artificial Intelligence Illuminated, Jones and Bartlett Publishers, 1st Edition, 2004.

At the end of the course, the student will be able to	Bloom's Level
1. Define and explain fundamentals of Artificial Intelligence and Agent Technology	L2
2. Apply AI techniques on Game Playing and Logic building	L3
3. Apply AI techniques for problem solving, reasoning and planning	L3
4. Apply Knowledge Representation for uncertain domain and knowledge	L3

	Program Outcome of this course (POs)	PO No.
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	PO1
2.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3.	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4.	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	PO6
5.	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10

Course delivery methods

1. Lecture & Board
2. Power-point Presentation
3. Online Videos / Learning

Assessment methods

1. Assignments
2. Quizzes
3. Internal Assessment Tests
4. Course Project (Mini project)
5. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

DATA SCIENCE

Course Code	18IS62	**Credits**	4
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	4 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	40	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To introduce the concepts of data science and big data
2. To explore different statistical methods used for analysis in data science
3. To understand and apply machine learning algorithms on to applications
4. To explore the R language for statistical data analysis

Pre-requisites : Linear algebra

Unit – I — 8 Hours

Introduction: Big data overview, State of the practice in Analytics, Key role for the new big data ecosystem, Examples of big data analytics, the five steps of data science, data science life cycle

Unit – II — 8 Hours

Statistical analysis: What are statistics, how do we obtain sample data, statistics measure, Point estimates, sampling distributions, Confidence intervals, exploratory data analysis, statistical methods for evaluation

Unit – III — 8 Hours

Analytical theory and methods 1: Overview of clustering, K means, additional algorithms, Linear regression, Logistic regression, Reasons to choose and cautions, Addition regression models.

Unit – IV — 8 Hours

Analytical theory and methods 2: Overview of time series analysis, ARIMA model, Text analysis steps, A text analysis example, Collecting raw text, Representing text, Term frequency, determining sentiments.

Unit – V — 8 Hours

Fundamentals of R Programming: Introduction to R studio, Basics of R programming, Math Variables and Strings, Vectors and Factors, Vector Operations, Reading CSV, Excel, and Built-in Datasets, Reading Text (.txt) files in R, Writing and Saving to files in R, String Operations in R, The Date Format in R, Regular Expressions in R, Packages and libraries, External packages, CRAN, Downloading and installation of desired packages from CRAN.

Text Books

1. EMC^2 education services, "Data science and big data analytics", 2017
2. Sinan Ozdemir, "Principles of data science", 2016, Packt publishers

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Explain thr basic concepts in understanding data science model	L2
2. Explain the various statistical model used in data science	L2
3. Apply the machine learning algorithms to a given application	L3
4. Demonstrate R programming for statistical analysis in data science	L3

	Program Outcome of this course (POs)	PO No.
1.	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2.	**Conduct investigations of complete problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data,synthesis of the information to provide valid conclusions.	**4**
3.	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	**5**
4.	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**10**

Course delivery methods	**Assessment methods**
1. Chalk and talk	1. Quiz
2. Power Point Presentations	2. Assignment
3. Demos	3. IA Test
4. Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

DISTRIBUTED COMPUTING SYSTEM

Course Code	18IS63	Credits	04
Course type	PC	CIE Marks	50 marks
Hours/week: L-T-P	4-0-0	SEE Marks	50 marks
Total Hours:	45 Hrs	SEE Duration	3 Hours for 100 marks

Course learning objectives

1. To learn Basic Concepts of Distributed Systems.
2. To understand File Sharing, Distributed File System implementation.
3. To understand the concepts of Cryptanalysis, Access control.
4. To learn Basic concepts of Cloud Computing.

Pre-requisites: Basic Computer Concepts, Operating Systems.

Unit – I **09 Hours**

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Challenges: Heterogeneity, Openness, Security, Scalability, Failure Handling.
System Model: Architectural Models, Fundamental models.

Self learning topics: Security Models

Unit – II **09 Hours**

Inter Process Communication: Introduction, API for Internet Protocols, External Data Representation and Marshalling, Client – Server Communication.

Distributed Object and RMI: Introduction, Communication between Distributed Objects, RPC, Events and Notifications.

Unit – III **09 Hours**

Distributed File System: Introduction, File Service architecture.

Security in distributed systems: Introduction, Overview of security techniques: Cryptography, Certificates, Access control. Cryptographic Algorithm: Symmetric: Ex Substitution algorithm. , Asymmetric: RSA.

Unit – IV **09 Hours**

Time and Global States: Introduction, Clocks, events and process status, Synchronizing physical clocks, Logical time and logical clocks, Global states.

Coordination and Agreement: Introduction, Distributed mutual exclusion-The central server algorithm ,A ring-based algorithm

Unit – V **09 Hours**

Introduction to Cloud Computing: Introduction, Network Centric computing and Network Centric Content, Peer to Peer Systems, Cloud Computing :An old idea Whose Time has Come, Cloud Computing: Delivery Models and Services, Ethical Issues in Cloud Computing, Cloud Vulnerabilities, Major Challenges Faced by Cloud Computing.

Self learning topics: Case Studies: Amazon Web Studies.

Books

Text Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems Concepts and Design, Pearson Education, Third edition.
2. Dan Marinescu : Cloud Computing Theory and Practice, ELSEVIER

Reference Books:

1. Kai Hwang, Geofrey C, Fox, Jack J, Dongarra: Distributed and Cloud Computing From Parallel processing to the Internet of Things.
2. Sunita Mahajan, Seema Shah: Distributing Computing, Published by Oxford University press 2010.

1 **E-resourses (NPTEL/SWAYAM.. Any Other):** https://nptel.ac.in/courses/106106168/

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	Discuss the importance of distributed Systems with examples.	L2
2.	Differentiate between the various client server communications technologies.	L4
3.	Analyze mechanisms to manage security in Distributed systems.	L4
4	Compare the different algorithms that are used for synchronizing physical clocks.	L4
5	Explain the importance of cloud computing.	L2

	Program Outcome of this course (POs)	PO No.
1.	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2.	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**2**
3.	**Design/Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**3**

Course delivery methods	Assessment methods
1. Lecture	1. Assignments
2. PPT	2. Internal Tests
3.	3. Quiz
4.	4. Course Activity

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks

Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

DATA MINING

Course Code:	18IS641	**Credits:**	3
Course Type:	PE	**CIE Marks:**	50
Hours/week: L – T – P	2 – 0 – 2	**SEE Marks:**	50
Total Hours:	40	**SEE Duration:**	3 Hours for 100 Marks

Sl. No.	**Course Learning Objectives (CLOs)**
1.	To understand data warehouse concepts, architecture, business analysis and tools.
2.	To understand data pre-processing and data visualization techniques.
3.	To study algorithms for finding hidden and interesting patterns in data.
4.	To understand and apply various classification and clustering techniques using tools.

Prerequisites

1 Statistics
2 DBMS

Unit I **08 Hours**

Data Mining:
Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications.

Unit II **08 Hours**

Association Analysis: Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns.

Unit III **08 Hours**

Association Analysis: Advanced Concepts: Handling Categorical Attributes, Handling Continuous attributes,Handling Concept hierarchy, Sequential patterns, subgraph patterns, infrequent patterns.

Unit IV **08 Hours**

Classification:
Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers. Bayesian Classifiers.`+.104”

Unit V **08 Hours**

Clustering Techniques:
Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis.

Modern Tool usage: WEKA tool for realizing various processes involved in Data Mining.

List of Experiments:

1. Build Data Warehouse and Explore WEKA
2. Perform data preprocessing tasks and Demonstrate performing association rule mining on given data sets.
3. Demonstrate performing classification on given data sets.
4. Demonstrate performing clustering on given data sets

5. Demonstrate performing Regression on given data sets

Text Books

1. Pang-NingTan,MichaelSteinbach,VipinKumar:IntroductiontoDataMining,Pearson Education,2005.MauroPezze,MichalYoung:SoftwareTestingandAnalysis–Process, Principles and Techniques, Wiley India, 2008.
2. Jiawei Han and MichelineKamber, ―Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

Reference Books

1. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi,2009.
2. JiaweiHanandMichelineKamber:DataMining-ConceptsandTechniques,2ndEdition, Morgan Kaufmann Publisher,2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing, McGrawHill Publisher,1997.

Online Courses

1. **NPTEL Course URL**: https://nptel.ac.in/courses/106/105/106105174/
2. **edX Course URL:** https://www.edx.org/learn/data-mining
3. **Courser Course URL:**https://www.coursera.org/specializations/data-mining

Sl. No.	Course Outcomes (COs)	Bloom's Level
1.	Exemplify, terminologies related to Data Warehousing and Data Mining.	**L2**
2.	Apply suitable pre-processing and visualization techniques for data analysis.	**L3**
3.	Apply frequent pattern and association rule mining techniques for data analysis. And able to apply appropriate classification and clustering techniques for data analysis.	**L3**
4.	Evaluate the techniques of clustering, classification, finding, feature selection and visualization for the real world data using modern tools.	**L5**
5.	Design algorithms to solve related problems in the domain of data mining.	**L3**

Sl. No.	Program Outcomes (POs)	PO No.
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**PO1**
2.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**PO2**

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes thatmeet the specified needs with appropriate consideration for the public healthand safety, and the cultural, societal, and environmental considerations. **PO3**
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. **PO4**
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. **PO5**
6. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. **PO10**

Course delivery methods	**Assessment methods**
1. Chalk and talk	1. Quiz
2. Power Point Presentations	2. Assignment
3. Demonstrations / Animations	3. IA Test
4. Audio and Videos	4. Course Project/Seminar

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

NETWORK PROGRAMMING

Course Code	18IS642	**Credits**	3

Course type	PE	**CIE Marks**	50 marks
Hours/week: L-T-P	3-0-0	**SEE Marks**	50 marks
Total Hours:	40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To understand the various network protocols.
2. Demonstrate programming with TCP and UDP.
3. To understand the concept of Unicast, Multicast and Broadcast technologies and networking applications.

Pre-requisites : Unix system Programming and Computer Network

Unit - I **8 Hours**

Introduction to Network Programming: OSI model, UDP, TCP, STCP, TCP connection establishment and termination: Three-way handshake, TCP options, TCP connection termination, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Unit - II **8 Hours**

Basic Concepts, Protocols and Terminology: Clients, Servers and Peers, Ports and Sockets, The Internet and IP Addresses, Internet Services, URLs and DNS.
Network Programming in Java: The InetAddress Class, Using Sockets: TCP Sockets, UDP Sockets.

Unit - III **8 Hours**

UDP: The UDP Protocol, UDP Clients, UDP Servers, The DatagramPacket Class, The DatagramSocket Class, Socket Options, Applications using UDP.

Unit - IV **8 Hours**

Broadcasting: Introduction, Broadcast Addresses, Unicast vs Broadcast, dg_cli Function using Broadcasting, Race Conditions.

Multicasting: Introduction, Multicast Addresses, Multicast vs Broadcast on a LAN, Multicast on a WAN, Source-Specific Multicast, Multicast Socket Options

Unit – V **8 Hours**

Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.

Books

Text Books:

1. Java Network Programming, 4th Edition by Elliotte Rusty Harold Released October 2013 Publisher(s): O'Reilly Media, Inc.ISBN: 9781449365936

2. Introduction to Network Programming with Java, 3rd Edition by Jan Graba, Publisher: Springer

Reference Books:

1. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff: "UNIX Network Programming". Volume 1, Third Edition, Pearson 2004 and onwards.
2. Computer Networking: A Top-Down Approach, J. F. Kurose and K. W. Ross, 6th Edition, 2013, Addison-Wesley Publishing, ISBN: 978-0132856201

Course Outcome (COs)

Outcomes usually follow the format: "At the end of the course, students will be able to '*insert action verb here + insert knowledge, skills, or attitudes the student is expected to develop']* (Highlight the **action verb** representing the Bloom's level.)

At the end of the course, the student will be able to — Bloom's Level

1.	**Explain** the concept of layered task and the use of different protocols.	**L2**
2.	**Develop** networking applications that communicate with each other using TCP and UDP	**L3**
3.	**Compare** Unicast, Multicast and Broadcast technologies and its application.	**L4**
4.	**Discuss** the various application of remote login.	**L2**

	Program Outcome of this course (POs)	**PO No.**
1.	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2.	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	**2**
3.	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**3**
4.	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**10**

Course delivery methods	Assessment methods
1. Chalk and talk	1. Quiz
2. Power Point Presentations	2. Assignment
3. Demos	3. IA Test
4. Audio and Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

SYSTEM SOFTWARE

Course Code	18IS643/CS643	**Credits**	3
Course type	PE	**CIE Marks**	50 marks

Hours/week: L-T-P	3-0-0	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To distinguish different software into different categories.
2. To introduce the basic functions of various system software.
3. To provide an insight into the design strategy for one-pass and multi-pass assembler.

Pre-requisites : Computer Organization**.**

Unit - I **8 Hours**

Introduction to System Software

Introduction to System Software, System software Vs application software,Different system softwares-Assembler, Linker, Loader, Macro processor,Text editor, debugger, device driver, compiler , interpreter, OS(basic concepts), Machine architecture of SIC/XE, Addressing modes,Instruction set,Machine level representation of programs.

Unit - II **8 Hours**

Assemblers

Basic Assembler Functions-A simple SIC Assembler, Machine Dependent Assembler Features, Machine Independent Assembler Features-Literals, Program blocks, Control sections and programming linking ,assembler design options: Two-pass, one-pass and multi-pass assembler design

Unit - III **8 Hours**

Loaders and Linkers

Basic Loader Functions-Design of an Absolute Loader, A simple Bootstrap Loader, Machine-Dependent and independent Loader Features-Relocation, Program Linking, Algorithm and Data structures for a Linking Loader. Dynamic Linkage.

Unit - IV **8 Hours**

Editors and Debugging Systems

Text Editors-Overview of Editing Process, Editor structure, User Interface, Interactive Debugging Systems-Debugging Functions and Capabilities.Debugging Methods –By induction, Deduction and backtracking

Unit – V **8 Hours**

Macro Processor

Basic Macro Processor , Functions-Macro, Definitions and Expansion,Macro processor Algorithm and Data structures, Machine Independent Macro processor features-Concatenation of Macro parameters, Generation of Unique Labels, Conditional Macro expansion, keyword Macro Parameters.

Books

Text Books:

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd edition onwards, Pearson, 1997.
2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman- Compilers- "Principles, Techniques and Tools", 2/E, Addison-Wesley, 2007.

Reference Books:

1. D.M.Dhamdhere, "System Programming and Operating Systems", 2nd revised edition, Tata McGraw - Hill, 2009 reprint.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Explain** the basic concepts about different system software.	**L2**
2. **Design** and implementation of assembler.	**L3**
3. **Define** the role of linkers and loaders as well as their interactions with hardware.	**L2**

4. **Discuss** the working nature of Editors, Debugging Systems and macro processors. **L2**

	Program Outcome of this course (POs)	PO No.
1.	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2.	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	**2**

Course delivery methods	Assessment methods
1. Chalk and talk	1. Quiz
2. Power Point Presentations	2. Assignment
3. Demos	3. IA Test
4. Audio and Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

CYBER SECURITY

Subject Code:	18IS644	**Credits:**	3
Course Type:	PE	**CIE Marks:**	50
Hours/week: L – T – P	3 – 0 – 0	**SEE Marks:**	50

Total Hours:	40	**SEE Duration:**	3 Hours

Course learning objectives

1. To understand key issues plaguing the information security world
2. To understand Social Engineering techniques
3. To perform vulnerability analysis to identify security loopholes in the target organization's network
4. To understand different types of attacks

Prerequisites: Networks, Information Security, Operating Systems

Unit – I **8 Hours**

Ethical Hacking: Overview of Ethics,Overview of Ethical Hacking,Methodology of Ethical Hacking,Networking

Foundations: Communications Models,Topologies,PhysicalNetworking,IP,TCP,UDP,Internet Control Message Protocol,Network Architectures,Cloud Computing,

Unit – II **8 Hours**

Security Foundations: The Triad,Risk, Policies, Standards, and Procedures, Security Technology, Being Prepared;

Footprinting and Reconnaissance: Open-Source Intelligence,Domain Name System,Passive Reconnaissance,Website Intelligence,Technology Intelligence,

Unit – III **8 Hours**

Scanning Networks: Ping Sweeps,Port Scanning, Vulnerability Scanning

Enumeration: Service Enumeration, Remote Procedure Calls,Server Message Block, Web-Based Enumeration

Unit – IV **8 Hours**

System Hacking: Searching for Exploits,System Compromise,Gathering Passwords, Password Cracking,Client-Side Vulnerabilities,Post Exploitation

Malware: Malware Types,Malware Analysis,Antivirus Solutions, Spoofing Attacks

Unit – V **8 Hours**

Social Engineering: Social Engineering,Physical Social Engineering,Phishing Attacks, Website Attacks

Cryptography: Basic Encryption,Symmetric Key Cryptography, Asymmetric Key Cryptography,

Books

Text Book

1. Ric Messier, CEH v10 Certified Ethical Hacker Study Guide, Sybex, 2019
2. Michael Gregg, Omar Santos, Certified Ethical Hacker (CEH) Version 10 Cert Guide, Pearson IT Certification, 3rd Edition, 2019

Reference Books

1. Matt Walker, CEH Certified Ethical Hacker All-in-One Exam Guide, Fourth Edition, McGraw-Hill, 4th Edition, 2019

Course Outcome (COs)

At the end of the course, the student will be able to	**Bloom's Level**

1.	Perform vulnerability **analysis** to **identify** security loopholes in the target organization's network, communication infrastructure, and end systems.	L4
2.	**Understand** mobile platform attack vector, android vulnerabilities, mobile security guidelines, and tools.	L2

Program Outcome of this course (POs)	PO No.
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**2**
3 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	**8**

Course delivery methods	Assessment methods
1. Chalk and talk	1. Quiz
2. Power Point Presentations	2. Assignment
3. Demos	3. IA Test
4. Audio and Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

ROBOTIC PROCESS AUTOMATION
(Industry Supported Elective)

Subject Code:	18IS645/ CS645		Credits:	03
Course Type:	PE		CIE Marks:	50
Hours/week: L – T – P	3-0-0		SEE Marks:	50
Total Hours:	50		SEE Duration:	3 Hours

Course Learning Objectives:

- To understand Basic Programming concepts and the underlying logic/structure
- To Describe RPA , where it can be applied and how its implemented
- To Describe the different types of variables, Control Flow and data manipulation techniques
- To Understand Image, Text and Data Tables Automation
- To Describe automation to Email and various types of Exceptions and strategies to handle

UNIT I **08 Hours**

PROGRAMMING BASICS & RECAP

Programming Concepts Basics - Understanding the application - Basic Web Concepts - Protocols - Email Clients -. Data Structures - Data Tables - Algorithms - Software Processes - Software Design - Scripting - .Net Framework - .Net Fundamentals - XML - Control structures and functions - XML - HTML - CSS - Variables & Arguments.

UNIT II **08 Hours**

RPA CONCEPTS

RPA Basics - History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Developemt methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Proccess Design Document/Solution Design Document - Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem.

UNIT III **08 Hours**

RPA TOOL INTRODUCTION & BASICS

Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data

UNIT IV **08 Hours**

ADVANCED AUTOMATION CONCEPTS AND TECHNIQUES

Recording and Advanced UI Interaction - Recording Introduction - Basic and Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval - Advanced Citrix Automation challenges - Best Practices - Using tab for Images - Starting Apps - Excel Data Tables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel - Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF.

UNIT V **08 Hours**

EMAIL AUTOMATION & EXCEPTIONAL HANDLING

Email Automation - Email Automation - Incoming Email automation - Sending Email automation - Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.

TEXT BOOK:

1 Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018ISBN: 9781788470940

REFERENCES:

1 Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation.

2 Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant

3 SrikanthMerianda,Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation

4 https://www.uipath.com/rpa/robotic-process-automation

Course delivery methods	**Assessment methods**
1. Lecture and Board	1. Internal Assessments
2. Power point presentations	2. Assignments
3. Videos	3. Quiz/ Seminar/ Course Project
4. Classroom Exercises	4.

Course Outcome (Cos):

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

1. Design Neural Network to solve problems in a variety of engineering domains[L6].
2. Design systems that employ fuzzy control approach[L6].
3. Device systems that employ genetic algorithm and demonstrate their working[L3].

Program Outcome of this course (POs)	**PO No.**
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**2**
3 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	**8**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Addition of two assignments	Seminar/ Mini Project	Total Marks	Final marks
Theory	30+30	10+10	20	100 **(reduced to 50)**	50

- Writing two IA test is compulsory.
- **Minimum marks required to qualify for SEE : 20 out of 50**

Self Study topics shall be evaluated during CIE (Assignments and IA tests) and 10% weightage shall be given in SEE question paper.

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

CLOUD COMPUTING

Course Code	18IS651	**Credits**	03
Course type	PE	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	40	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To understand various basic concepts related to cloud computing technologies.
2. To learn how to use Cloud Services and provide solutions for business process management.
3. To understand the concepts related to virtualization technology.
4. To get acquainted with various cloud management services and offerings.

Pre-requisites: Distributed Computing.

Unit – I **8 Hours**

Introduction: Business and IT perspective, Cloud and virtualization, Cloud services requirements, cloud and dynamic infrastructure, cloud computing characteristics, cloud adoption.
Cloud Deployment models: Cloud characteristics, Measured Service, Cloud deployment models, security in a public cloud, public verses private clouds, cloud infrastructure self-service.

Unit – II **8 Hours**

Cloud as a service: Gamut of cloud solutions, principal technologies, cloud strategy, cloud design and implementation using SOA, Conceptual cloud model, cloud service defined.
Cloud solutions: Cloud ecosystem, cloud business process management, cloud service management, cloud stack, computing on demand, cloud sourcing.

Unit – III **8 Hours**

Cloud virtualization technology: Virtualization defined, virtualization benefits, server virtualization, virtualization for x86 architecture, Hypervisor management software, Logical partitioning, VIO server, Virtual infrastructure requirements. Storage virtualization, storage area networks, network attached storage, cloud server virtualization.

Unit – IV **8 Hours**

Cloud Management: Resiliency, Provisioning, Asset management, cloud governance, high availability and disaster recovery, charging models, usage reporting, billing and metering.

Unit – V **8 Hours**

Cloud Infrastructure: Deep Drive: Introduction, Storage Virtualization, Storage Area Network, Network Attached Storage, Cloud Server Virtualization, Networking Essential to Cloud

Text Books

1. Cloud Computing by Dr. Kumar Saurabh, Wiley India, 2011 and onwards.

Reference Book

1. Cloud Computing Principles and Paradigms by RajkumarBuyya, Wiley India 2011 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to	**Bloom's Level**
1. **Discuss** cloud computing and control considerations within cloud computing environments.	**L2**
2. **Identify** various cloud services.	**L2**
3. **Explain** various concepts related to virtualization.	**L2**
4. **Apply** specific cloud management strategy and offerings for given scenario.	**L3**
5. **Demonstrate** working of cloud simulator.	**L3**

Program Outcome of this course (POs)	**PO No.**
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**2**
3 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	**8**

Course delivery methods

1. Chalk and board
2. PPT
3. Video lectures

Assessment methods

1. Internal assessment
2. Assignment
3. Quiz
4. Seminar / project

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

BIG DATA MANAGEMENT

Course Code	18IS652	**Credits**	3
Course type	PE	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	40	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To understand Big data dimensions, its applications and analyze business case studies in Big Data Analytics
2. To explore Hadoop framework and architecture
3. To understand basics of NoSQL
4. To understand the importance of MapReduce framework
5. To explore Big Data Tools and Technologies : Pig and Hive

Pre-requisites :
Database Management System, Unix Shell Programming

Unit – I 8 Hours

Introduction: Big Data Definition, History of Data Management-Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data, Use of Big Data in Social Networking, Use of Big Data in Preventing Fraudulent Activities; Use of Big Data in Retail Industry

Unit – II 8 Hours

Hadoop Ecosystem: Understanding Hadoop Ecosystem, Hadoop Distributed File System:HDFS Architecture,Concept of Blocks in HDFS Architecture, NameNodes and Data Nodes, The Command-Line Interface, Using HDFS Files, Hadoop-Specific File System Types, HDFS Commands, The org.apache.hadoop.io package, HDFS High availability:Features of HDFS.

Unit – III 8 Hours

NoSQL: Introduction to NoSQL: Why NoSQL, Characteristics of NoSQL, History of NoSQL, Types of NoSQL Data Models: Key-Value Data Model, Column-Oriented Data Model, Document Data Model, Graph Databases, Schemaless Databases, Materialized views, Distribution Models: CAP Theorem, Sharding.

Unit – IV 8 Hours

Understanding MapReduce**:** The MapReduce Framework: Exploring the Features of MapReduce,Working of MapReduce, Exploring Map and Reduce Functions, Uses of MapReduce.
YARN Architecture: Background; Advantages of YARN;YARN Architecture

Unit – V 8 Hours

Hive: Introducing Hive, Getting started with Hive, Hive Services, Data types in Hive, Built-in Functions in Hive
Analyzing Data with Pig: Introduction to Pig: The Pig Architecture, Benefits of Pig, Properties of Pig

Text Book:

1. DT Editorial Services, "Big Data:Black Book ,Comprehensive Problem Solver", Dreamtech Press. 2016 Edition [Chapters - 1,2,4,5,11,12,13,15]

Reference Book:

1. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, Understanding Big Data – Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilly, 2012.

Course Outcome (COs)

At the end of the course, the student will be able to	**Bloom's Level**
1. **Outline** the importance of Big Data, its characteristics and use of Big Data in Retail Industry	**L1**
2. **Explain** the ecosystem of Hadoop Distributed File System(HDFS)	**L3**
3. **Apply** basics of NoSQL in Big Data	**L2**
4. **Apply** map reduce framework in analyzing the data and relate to YARN	**L2, L3**
5. **Demonstrate** tools in analyzing the data and managing Big Data	**L2**

Program Outcome of this course (POs)	**PO No.**
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**2**
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**3**
4 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**10**

Course delivery methods	**Assessment methods**
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
	4. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

INTRODUCTION TO SALESFORCE
(Industry Supported Elective)

Course Code	**18IS653/ CS653**	**Credits**	3
Course type	PE	**CIE Marks**	50 marks
Hours/week: L-T-P	2-0-2	**SEE Marks**	50 marks
Total Hours	40	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To introduce fundamentals of Salesforce and its components used for multiple domains.
2. To gain an understanding of the Salesforce terminologies and the different operations involved in constructing an informative system
3. To develop ability to access or populate tables as an object in Salesforce database to create new processes based on the demands by users.
4. To provide a solution to real world problems with the help of lightning tools and extensions using reusable components.

Pre-requisites: Software Industry and common sales parameters, Web Programming, basics of object-oriented Programming techniques

Unit – I **8 Hours**

Introduction: Getting Around the App, Salesforce Platform Basics: Get started with salesforce platform. Discover Use Cases for the Platform, Understand the Salesforce Architecture, Navigate Setup, Power Up with AppExchange, Data Model: Understand Custom & Standard Objects, Create Object Relationships, Work with Schema Builder, Lightning Experience: Get Your Bearings, Navigate Around, Work with List Views, Work with Your Data, Company-Wide Org Settings: Learn About Regional Settings, Discover Multiple Currency Settings

Unit – II **8 Hours**

Getting Your Organization Ready for Users: Lightning Experience Productivity: Elevate Your Daily Productivity, Work with Notes and Files, Manage Your Tasks, Events, and Email, Find Your Stuff with Search, Collaborate with Feeds and Groups, Analyze Your Data with Reports and Dashboards, Configuring Search Settings: Choose the Right Search Solution, Optimize Search Results, Setting Up

Chatter (Classic): Get Started with Chatter, Enable Feed Tracking, Create Publisher Actions, Approve Records from the Feed, Develop a Rollout Strategy, Support a New Business Unit: Manage User Access, Manage Chatter, Modify Your Data Model, Configure an Email Letterhead and Template, Automate Your Business Process, Mobile Access with Salesforce1.

Unit – III **8 Hours**

Elementary SCTP Sockets: Interface Models, shutdown function, Notifications.
Setting Up and Managing Users: Managing Users and Introduction to Data Security, Activity Management: Activities: Tasks, Events, and Calendars Documentation.
Security and Data Access: Data Security, Who Sees What.
Object Customizations: Creating Picklist and Picklist Administration, Creating Formula Fields and Validation Rule, Working with Page Layouts, Working with Record Types, Introduction to Business Process, Maintaining Data Quality.
Managing Data: Import Wizards, Export Wizards, Use Data Loader To Export Data, Data Loader To Import.

Unit – IV **8 Hours**

Lightning Experience Customization: Customize the Lightning Experience user interface without writing any code, Reports and Dashboards: Introduction to Reports and Dashboards, Creating New Reports with the Report Builder, Running and Modifying Reports, Format Reports with Summary, Tabular, Matrix and Joined, Building Dashboards, Email Templates and Letterheads: Email Templates and LetterHeads, Automation: Difference Between Workflow Rules and Process Builder, Process Builder, Lead Automation.

Unit – V **8 Hours**

Managing the Support Process: Managing and Resolving Cases, Customizing a Support Process, Automating Support, Understanding the Salesforce Console for Service, Collaborating in the Service Cloud, Analyzing Support Data, Lightning App Builder: Build custom pages for Lightning Experience and the Salesforce mobile app quickly with point-and-click tools.

Books

Text Book

1. Salesforce CRM - The Definitive Admin Handbook,4th Edition, Paul Goodey, Copyright © 2016 Packt Publishing

Reference Books

1. Basics of salesforce- Salesforce Docs @salesforcedocs 19 Dec 2019
2. Best Practices for Implementing Salesforce CRM- SalesforceDocs @ salesforcedocs Dec 2019
3. Salesforce Solutions Help & Training by Bruce F. Magwn © 2012 Integration Technologies, Inc.

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	**Understand** the Salesforce terminologies to make use for products of different commodity	L1
2.	**Describe** the uses of Salesforce in the business world as a good promotional means for marketing the products.	L2
3.	**Apply** the techniques to retrieve the customer needs by means of Salesforce designs and options	L3
4.	**Categorize** and **build** the solutions with suitable mode of representation for the domain requirements using the lightning trends.	L3, L4

	Program Outcome of this course (POs)	PO No.
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	1
2.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2
3.	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural,	3

societal, and environmental considerations.

4. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. 6
5. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. 10

Course delivery methods	**Assessment methods**
1. Lecture	1. Assignments
2. PPT	2. Internal Tests
3. Workshop-1– Salesforce (3 days)	3. Quiz
4. Workshop-2-Lightning (2 days)	4. Course Activity

Scheme of Continuous Internal Evaluation (CIE):
The Total marks of CIE shall be 50 (Two tests of 30 marks (15 Marks Descriptive + 15 Marks Objective) each, Course project of 20 marks). The weight-age of CIE is as shown in the table below.

Component	**2 IA-Tests (30 marks each) Average of two IA**	**Course Project (Assignment)**	**Total Marks**
Maximum marks	30	20	50

1. **Writing two IA tests is compulsory.**
2. **Minimum qualifying marks for CIE: 20 marks.**

Scheme of Semester End Examination (SEE):	
1.	Industry Project Evaluation for 100 Marks. Examination of 100 marks for 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2.	Minimum marks required in SEE to pass:40 marks
3.	Industry project marks calculated by taking an average of both internal and industry side guides assessments.

CIE	**SEE**	**TOTAL**
50 Marks (30 IA Avg + 20 Course Project)	50 Marks (Industry assigned Project evaluation for 100 Marks which will be reduced to 50 Marks)	100 MARKS

COMPLIER DESIGN

Course Code	18IS654	**Credits**	3
Course type	PE	**CIE Marks**	50 marks
Hours/week: L-T-P	3-0-0	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To familiarize the structure of a compiler and activities of different phases of compilation process.
2. To provide an insight into the design strategy for front end of a compiler.
3. To learn to implement code generator.

Pre-requisites : Basic knowledge of programming and Finite Automata and Formal Languages**.**

Unit - I **8 Hours**

Introduction and Lexical Analysis

Overview of the Translation Process, A Simple Compiler, Difference between interpreter, assembler and compiler. Types of Compiler, The Phases of a Compiler.

Lexical Analysis: The Role of Lexical Analyzer, Input Buffering, Specifications of tokens,Recognition of Tokens.

Self learning: Applications of compiler technology.

Unit - II **8 Hours**

Syntax Analysis-1 :

Introduction, Context free Grammar, Writing Grammar, ambiguity, associativity, precedence, Un ambiguous Grammars,Top-down Parsing.

Unit - III **8 Hours**

Syntax Analysis-2 :

Bottom-up Parsing, Simple LR, More Powerful LR Parsers (upto constructing LALR parsing tables)

Unit - IV **8 Hours**

Syntax Directed Translation and Intermediate Code Generation:

Syntax Directed Translation: Syntax-directed Definitions, Evaluation Order for SDD, Application of Syntax-directed translation: Construction of Syntax trees(Only S-attributed SDD).

Intermediate Code Generation: Intermediate Languages, Declarations, Assignments, Boolean Expressions.

Unit – V **8 Hours**

Code Generation

Issues in the design of code generator, the target language, Basic blocks and Flow graphs, optimization of basic blocks, a simple code generator .

Books

Text Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman- Compilers- Principles, Techniques and Tools", 2/E, Addison-Wesley, 2007

Reference Books:

1. D.M.Dhamdhere, "System Programming and Operating Systems", 2nd revised edition, Tata mc-Graw Hill,2007.
2. Andrew W Apple, Modern Compiler Implementation in C, Cambridge University Press,1997
3. Kenneth C Louden , Compiler Construction Principles & Practice, Thomson Education, 1997.McGraw - Hill, 2009 reprint

E-Resources(NPTEL/SWAYAM)

1. https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Analyze** and categorize the given grammar to build suitable parser.	**L4**
2. **Apply** the concept of syntax directed translation schemes to aid intermediate code generation.	**L3**
3. **Develop** intermediate code for any high level construct and generate optimized target code .	**L3**

Program Outcome of this course (POs)	PO No.
1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	**2**
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**3**

Course delivery methods	Assessment methods
1. Chalk and talk	1. Quiz
2. Power Point Presentations	2. Assignment
3. Demos	3. IA Test
4. Audio and Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

JAVA PROGRAMMING BASICS

Course Code	18IS661	**Credits**	03
Course type	OE	**CIE Marks**	50 marks
Hours/week: L-T-P	2-0-2	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs;	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To Understand the fundamentals of object-oriented programming in Java.
2. To introduce the concept of Methods and classes in Java .
3. To demonstrate the applications of inheritance in Java.
4. To Understand the concept of packages and interfaces in Java.

Pre-requisites: Basics programming concepts.

Unit – I 08 Hours

Java Programming Fundamentals: The Java Language, The Key attributes of a object oriented programming : Encapsulation, Polymorphism, Inheritance, The Java development kit, Sample program.
Introducing Data types and operators: Java's primitive data types, Literals, A closer look at variables, The scope and lifetime of variables, Operators.

Unit – II 07 Hours

Program control statements: Input characters from the keyboard, The if statement, Nested ifs, The if-else-if ladder, The switch statement, Nested switch statement, The for loop, The Enhanced for loop, The while loop, The do-while loop, Use break to exit a Loop, Use break to Form of goto, Use continue.

Unit – III 09 Hours

Introducing classes and objects: Class fundamentals, how objects are created, reference variables and assignment, Methods, Returning a Method, Returning Value, Using Parameters, Constructors, Parameterized constructors.
Methods and classes: Controlling access to class members, Pass objects as methods, How arguments are passed, Returning objects, Method overloading.

Unit – IV 07 Hours

Inheritance: Inheritance basics, member access and inheritance, constructors and inheritance, using super, multilevel hierarchy, when are constructors executed, superclass reference and subclass objects, method overriding, polymorphism, using abstract classes, using final, the Object class.

Unit – V 09 Hours

Interfaces: interface fundamentals, creating an Interface, Implementing an Interface, Using the interface references, Implementing multiple interfaces, Constants in interfaces, Extending interfaces, nested interfaces.
Packages: Package fundamentals: Defining a Package, Finding Packages and Classpath, packages and member access, importing packages, static import.

Books

Text Books:

1. Herbert Schildt& Dale Skrien, "Java Fundamentals A Comprehensive Introduction", TMH. Special Indian edition.

Reference Books:

1. Kathy Sierra & Bert Bates, "Head First Java", O'Reilly, 2nd Edition and onwards.

Course Outcome (Cos)

	At the end of the course, the student will be able to:	Bloom's Level
1	**Explain** the concept of classes and objects.	**L2**
2	**Write** Java application programs using OOP principles and proper program structuring	**L3**
3	**Apply** the inheritance concept for making use of code reusability	**L3**
4	**Write** Java programs on Interfaces and packages	**L3**

	Program Outcome of this course (POs)	PO No.
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**3**
3	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	**12**

Course delivery methods

1. Lecture & Board
2. Power-point Presentation
3. Online Videos / Learning
4. Class Room Exercises

Assessment methods

1. Assignments
2. Quizzes
3. Internal Assessment

Open Ended Programs

1. Write a program to demonstrate the implementation of 2-dimension array.
2. Write a program to demonstrate the implementation of class and its member methods.
3. Write a program to demonstrate the implementation of parameterized:
    a. Methods.
    b. Constructor.
4. Write a program to demonstrate the implementation of inheritance.
5. Write a program to demonstrate the implementation of method:
    a. Overloading.
    b. Overriding.
6. Write a program to demonstrate the implementation of interface.
7. Write a program to demonstrate the implementation of packages.
8. Write a program to demonstrate the implementation of customized exception handling.
9. Write a program to demonstrate the implementation of string handling.
10. Write a program to demonstrate the implementation of JAVA swings.

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

BASICS OF COMPUTER NETWORKS

Subject Code:	18IS662	**Credits:**	03
Course Type:	OE	**CIE Marks:**	50 marks
Hours/week: L – T – P	3 – 0 – 0	**SEE Marks:**	50 marks
Total Hours:	40	**SEE Duration:**	3 Hours for 100 marks

Course Learning Objectives (CLOs):

1. Recognize the importance of networks.
2. Explain the relevance of internetworking.
3. Recognize the need for layered approach in the design of Networks
4. Compare and discuss the use of different types of connecting devices.
5. Explain the functions of Application layer.

Pre-requisites: Fundamentals of basic science and mathematics**.**

Unit – I

8 Hours

Introduction: Data Communications, Components, Data Flow, Networks, Physical Structures, Categories of Networks, Internet, Protocols and Standards, Addressing.

Unit - II

8 Hours

Network Models and Network Security: Layered Tasks, OSI model-Layers in OSI Model, TCP/IP Protocol Suite, Security Threats, Public Key Crypto Systems, Applications for Public Key Crypto Systems, Requirements for Public Key Cryptography, Digital Signatures.

Unit - III

8 Hours

Network Layer: TCP/IP Architecture, Address Resolution Protocol, Reverse Address Resolution Protocol, ICMP, Ipv6 header Format, UDP datagram, UDP pseudo header.

Unit - IV

8 Hours

Connecting Devices and Backbone Networks: Passive Hubs**,** Repeaters, Active Hubs, Bridges, Filtering, Two Layer switches, Three Layer switches, Gateway, Bus Backbone, Star Backbone, Connecting Remote LANs, Virtual LANs and Membership.

Unit - V

8 Hours

Application Layer, Network Tools:, Remote Logging(Telnet), File Transfer Protocol, Firewalls, Virtual Private Networks, Linux Configuration Commands such as ipconfig, ping, traceroute, netstat, dig, route, host. Introduction to Wire Shark networking tool

Text Books:

1. Behrouz Forouzon-Data Communications and Networking, McGraw Hill 4th Edition.

Reference Books:

1. Alberto Leon Garcia & Indra Widjaja - Communication Networks – Fundamental Concepts & key architectures, Tata McGraw Hill 2nd Edition.
2. William Stallings, Cryptography and Network Security, Pearson 6th edition
3. George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems Concepts and Design, Pearson Education, Third edition

4. E-recourses (NPTEL/SWAYAM.. Any Other)- https://nptel.ac.in/courses/106105081/

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Differentiate between the different types of network topological models	L4
2. Explain the different functions of OSI Architectural model.	L2
3. Discuss the advantage of using layered approach and identify the role of different techniques in providing network Security.	L3
4. Differentiate between the different types of connecting devices.	L4
5. Interpret the different functions of Application layer protocols. Apply the theoretical concepts learnt to solve different types of network problems.	L2, L3

Program Outcome of this course (POs)	PO No.
Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	1
Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.	2
Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3

Course delivery methods	Assessment methods
1. Lecture delivery with discussion (black board teaching)	1. Assignments
2. Presentations	2. Quizzes
3. Online Videos/Learning	3. Internal Assessment Tests
4. NPTEL/Edusat	4. Course Seminar

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum Marks: 50	30+30 = 60	20	20	100

- **Writing two IA test is compulsory.**
- **100 marks will be reduced to 50**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

DATABASE APPLICATION DESIGNING

Course Code	18IS663	**Credits**	3
Course type	OE	**CIE Marks**	50 marks
Hours/week: L-T-P	2-0-2	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To discuss and realize the importance of Database Architecture Design notations, ER Modeling, Mapping and Schema design.
2. To gain the knowledge Relational algebra and learn SQL , with various DB softwares/tools
3. To introduce formal database design approach through normalization and discuss various normal forms.
4. To understand the importance of Concurrent Transactions and discuss issues and transaction control algorithms.

Pre-requisites :

- Basic programming concepts.

Unit – I — 8 Hours

Introduction: Introduction to database, Characteristics of Database approach, Advantages of using DBMS approach, Three-schema architecture and data independence.
Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationships, Relationship types, Roles and Structural Constraints; Weak Entity Types.
CASE STUDY: ER-Modeling Hospital Management and Educational Institute.

Unit – II — 8 Hours

Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION;

Unit – III — 8 Hours

Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms;
Transaction Processing Concepts: Introduction to Transaction processing, Transaction and System concepts, Desirable properties of Transactions and issues with concurrent transactions.

Unit – IV — 8 Hours

SQL :SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL.

Unit – V — 8 Hours

DBMS Tools: SQL Engines, Feature of MySQL, DB2,Oracle, Introduction to PLSQL, NoSQL,

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 3rd edition and onwards.

Reference Books::

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, Mc-GrawHill, 3rd edition and onwards.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, Pearson education, 5th edition and onwards.

E Resources:

3. PL/SQL study material.

Course Outcome (Cos)

At the end of the course, the student will be able to	Bloom's Level
1. **Apply** the database concepts and design database for given application scenario	**L3**
2. **Apply** the concepts of Normalization and design database which eliminates all anomalies	**L3**
3. **Create** database and develop database programming skills in SQL and PLSQL	**L4**
4. **Explain** the issue of concurrency control in transaction processing	**L2**
5. Demonstrate various DB software/tools and explore SQL syntaxes	**L2**

Program Outcome of this course (POs)	PO No.
1. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**PO2**
2. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	**PO3**
3. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	**PO4**
4. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**PO10**
5. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	**PO12**

Course delivery methods	Assessment methods
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
4. NPTEL / Edusat	
5. Class Room Exercises	4. Course Project (Mini project)
	5. Case Studies

LAB TERM WORKS:

PART – A

1. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):
   - the NHL has many teams,
   - each team has a name, a city, a coach, a captain, and a set of players,
   - each player belongs to only one team,
   - each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
   - a team captain is also a player,
   - a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

Design a ER-Model for this application scenario using all the standard notations of ER-Model. Apply the ER-to-Relational Rules and normalization to get the relational schema and do the following :

a. Create the database with all necessary constraints(Primary and Foreign keys)
b. Populate each table with appropriate data
c. Execute queries on the tables created.(open ended)
d. Create graphical user interfaces (GUI) using HTML/PHP/VB.Net/Java

2. Design an ER-Model for an educational institute which is required to record the students attendance and IA performance in all the subjects and inform the same to their parents. The institute will have many department, each with its own faculty and Head of the department. The subjects the students study can be either elective or core. A faculty has to take atleast one subject and atmost 2 subjects and the subjects are not shared. The students take 3 tests and the average is computed by taking average of best two of

the three scores. The model be designed to record only the CIE marks and not SEE marks. After the ER-Model, map it to relational schema by indentifying Primary and Foreign keys. Normalize and do the following.

a. Create the database with all necessary constraints(Primary and Foreign keys)
b. Populate each table with appropriate data
c. Execute queries on the tables created.(open ended)
d. Create graphical user interfaces (GUI) using HTML/PHP/VB.Net/Java

3. Consider the schema for airline flight information Database:

FLIGHTS (*no: integer, fromPlace: string, toPlace: string, distance: integer, Departs: date, arrives: date, price: real*)
AIRCRAFT (*aid: integer, aname: string, cruisingrange: integer*)
CERTIFIED (*eid: integer,aid: integer*)
EMPLOYEES (*eid: integer, ename: string, salary: integer*)

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.
2. For each pilot who is certified for more than three aircrafts, find the eid, ename and the maximum cruising range of the aircraft for which she or he is certified.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.
4. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi

4. Consider the following schema for Order Database:

**SALESMAN (*Salesman_id, Name, City, Commission*) CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*) ORDERS (*Ord_No, Purchase_Amt, Ord_Date, Customer_id,Saleman_id)*

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. Count the customers with grades above Bangalore‘s average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen names and customer names for whom order amount is more than 4000. (Use UNION operation.)
4. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

5. Consider the schema for Movie Database:

ACTOR (*Act_id, Act_Name, Act_Gender*)
DIRECTOR (*Dir_id, Dir_Name, Dir_Phone*)
MOVIES (*Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id*)
MOVIE_CAST (*Act_id,Mov_id, Role*)
RATING (*Mov_id, Rev_Stars*)

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. List the titles of all movies directed by “Sanjay Leela Bansali”.
2. Find the movie names where one or more actors acted in two or more movies.
3. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
4. Update rating of all movies directed by “Ram GopalVerma” to 5.

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

INTERNET OF THINGS - A PRACTICAL APPROACH

Course Code	18IS664	Credits	3
Course type	PC	CIE Marks	50 Marks
Hours/week: L-T-P	2-0-2	SEE Marks	50 Marks
Total Hours:	35	SEE Duration	3 Hours

Course learning objectives

1. To introduce the concepts of designing the Embedded systems using the microcontroller and peripheral circuits.
2. To present the techniques of interfacing the sensors and actuators with IoT development board.
3. To develop the skills of designing and developing the IOT applications

Pre-requisites :

Microprocessors and Microcontrollers, Embedded C and Python programming.

Unit – I 7 Hours

Embedded Computing:

Introduction, Complex Systems and Microprocessors, Embedded Systems Design Process.

Experimental Demonstration on Arduino Uno / Nano / Mega /

Micro Self-Study: CPU Power Consumption.

Unit – II 7 Hours

Introduction To Internet Of Things:
Definition and Characteristics of IoT, physical design of IoT, IoT Protocols, IoT communication models, Communication protocols, IoT Levels and Templates. Overview of Microprocessor and Microcontroller.

Experimental Demonstration on Arduino Uno / Nano / Mega /

Micro Self-Study: Basics of Sensors and actuators.

Unit – III 7 Hours

Prototyping IoT:
IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable Devices, Standard Devices. Software, Technology & Protocols. Domain Specific IoTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.

Experimental Demonstration on Arduino Uno / Nano / Mega / Micro

Self-Study: IoT Key Features, Advantages & Disadvantages, Hardware: Sensors, Smart Wearable Devices, Standard Devices. Software

Unit – IV **7 Hours**

IoT Architecture And Protocols: Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model. Protocols- 6LowPAN, RPL, CoAP, MQTT.

Experimental Demonstration on Raspberry Pi / Orange Pi

Self-Study: Registering a device, De-register a device.

Unit – V **7 Hours**

Cloud Services For IoT: Introduction to Cloud Storage models and communication APIs Web-Server Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API.

Experimental Demonstration on Raspberry Pi / Orange Pi

Self-Study: Amazon Web services for IoT.

Text Book:

4. Wayne Wolf: Computers as Components, Principles of Embedded Computing Systems Design, 2nd Edition, Elsevier, 2008. (UNIT I)
5. Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-on-Approach)" **,** 1st Edition, VPT, 2014. (UNIT 2,4,5)
6. Internet of Things Quick Guide - PDF https://www.tutorialspoint.com/internet_of_things/internet_of_things_quick_guide.htm (UNIT 3)

Reference Book:

3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.
4. Marco Schwartz, "Internet of Things with Arduino: Build Internet of Things Projects With the Arduino Platform**".**

Course Outcome (COs):

At the end of the course, the student should be able to:	Blooms Level
1. **Illustrate** the functionality of Microprocessors, Complex Systems, Embedded System and IoT.	**L2**
2. **Identify** the skills of interfacing sensors and actuators with IoT systems, using IoT protocols and communication models.	**L2**
3. **Design** software programs Domain Specific IOT applications.	**L3**
4. **Apply** Architecture Reference Models for IoT applications	**L3**
5. **Analyze** the Cloud Storage models and Web services for IoT.	**L4**

Program Outcome of this course (POs)	PO No.
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**PO1**
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**PO2**
3. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	**PO5**
4. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	**PO9**
5. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	**PO10**

Course delivery methods	Assessment methods
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
4. NPTEL / EDUSAT	4. Course Seminar
5. Class Room Exercises	5. Course Project (Mini project)

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codes related to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

EMPLOYABILITY SKILLS - II

Course Code		**Credits**	MNC
Course type	MNC	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	-
Total Hours:	Lecture = 30 Hrs; Tutorial = 00Hrs Total = 30 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. The course is designed to develop the employability skills of a student.

Unit - I **6 Hours**

Quantitative Aptitude: Time, Speed and Distance (3)
Verbal Ability: Change of Speech and Voice (3)

Unit – II **6 Hours**

Quantitative Aptitude: Permutation and Combination (2)
Logical Reasoning: Coding and Decoding (1), Syllogisms (1.5)
Soft Skills: Interview Skills (1.5)

Unit - III 6 Hours

Quantitative Aptitude: Probability (2),
Logical Reasoning: Data Sufficiency (1), Clocks (1.5), Calendars (1.5)

Unit – IV **6 Hours**

Quantitative Aptitude: Alligation and Mixtures (2), Data Interpretation (1)
Logical Reasoning: Cubes (1)
Verbal Ability: Closet Test (2)

Unit - V **6 Hours**

Quantitative Aptitude: Simple and Compound Interest (2), Ages (1)
Soft Skills: Resume Writing (1.5), Group Discussions – Mock (1.5)

Books

Text Books:

1. How to prepare for Quantitative Aptitude for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 4th Edition, 2018.
2. How to prepare for Logical Reasoning for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 8th Edition, 2018.
3. How to prepare for Verbal Ability and Reading Comprehension for CAT & other Management

Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 8th Edition, 2018.

4. How to prepare for Data Interpretation for CAT & other Management Examinations, Arun Sharma, McGraw Hill Education(India) Private Limited, 5th Edition, 2018.

Course Outcome (COs)

At the end of the course, the student will be able to	**Bloom's Level**
1. Clear the Aptitude round of recruiters during placements	
2. Perform confidently during the GD and Interview process	
3. Develop resumes that are grammatically correct and written in Business English	
4. Develop behaviors that are appropriate for a professional	

Program Outcome of this course (POs)	**PO No.**
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	1
2. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3
3. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9

Course delivery methods	**Assessment methods**
1. Black Board Teaching	1. Internal Assessment
2. Power Point Presentation	2. Assignment
3. Class Room Exercise	3. Quiz

Scheme of Continuous Internal Evaluation (CIE):

Components	Average of best two IA tests out of three	Average of two Online Tests	Class Participation	Total Marks
Maximum Marks: 50	25	15	10	50

- **Writing two IA tests is compulsory.**
- **Minimum marks required to qualify for SEE : 20 out of 50**

Self Study topics shall be evaluated during CIE (Assignments and IA tests) and 10% weightage shall be given in SEE question paper.

Scheme of Semester End Examination (SEE):	
1.	It will be conducted for 100 marks of 3 hours duration. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2.	**Minimum marks required in SEE to pass: 40 (out of 100)**
3.	Question paper contains two questions from each unit each carrying 20 marks. Students have to answer one full question from each unit.

DATA SCIENCE LABORATORY
(Lab)

Course Code	18ISL67	**Credits**	1.5
Course type	LAB	**CIE Marks**	25 marks
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25 marks
Total Hours:	40	**SEE Duration**	3 Hours for 50 marks

Course learning objectives

1. To study and analyze various Data set for application and apply modeling technique.
2. To understand different machine learning algorithm used.

Prerequisites: Any programming language

List of experiments(Using appropriate data analytical tools)

1. Predict the price of a house by applying linear regression to using suitable dataset of real estate business.
2. Apply k-nearest neighbor algorithm to classify and analyze the ionosphere data.
3. Classify the messages as spam and ham using naïve bayes algorithm on sms dataset.
4. Implement logistic regression algorithm on the iris flower dataset to classify the flower into different types.

Text Books:

Cathy O'Neil, Rachel Schutt " Doing Data Science",: O'Reilly Media, Inc.

Reference Books:

Sinan Ozdemir , " Principles of Data Science",Packt publisher December 2016.

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Analyze data set and Model for specific applications	L3
2. Apply machine learning algorithm to a application	L4

Program Outcomes of the course	POs
1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems	**PO1**
2. **oblem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	**PO2**
3. **nduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusion.	**PO4**
4. **odern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of limitations.	**PO5**

Assessment methods

1. Regular Journal Evaluation & Attendance Monitoring.
2. Lab Internal Assessment.

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3.	Initial write up	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4.	Viva voce is conducted for individual student and not in group		
5.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

ARTIFICIAL INTELLIGENCE LAB

Course Code	18ISL68	Credits	1.5
Course type	LAB	CIE Marks	25 marks
Hours/week: L-T-P	0 – 0 – 3	SEE Marks	25 marks
Total Hours:	30	SEE Duration	3 Hours for 50 marks

Course learning objectives

1. Understand the standards and syntax of PROLOG programming language
2. Explore various searching algorithms
3. Understand the working of Expert systems

Pre-requisites : DAA

List of experiments

Part A

1. Study PROLOG standards and syntaxes.
2. Wrte a POLOG PROGRAM to FIND PERMUTATION OF A SET, CONCATENATE TWO SETS and to FIND MEMBER OF A SET.
3. Wrte a POLOG to PERFORM INTERSECTION OF TWO LISTS,INTERSECTION OF TWO LIST and.UNION OF TWO LISTS
4. Wrte a POLOG for a MENUDRIVEN PROGRAM FOR MEMBER, CONCATENATION, ADD, DELETE AND PERMUTATION FUNCTIONS.
5. Design an algorithm for **TO SOLVE EIGHT QUEENS PROBLEM and develop a PROLOG program for the same.**
6. Design an algorithm for **TO** IMPLEMENT DEPTH FIRST SEARCH **and develop a PROLOG program for the same.**
7. Design an algorithm for **TO** IMPLEMENT BREADTH FIRST SEARCH **and develop a PROLOG program for the same.**
8. Design an algorithm for **TO** TO SOLVE MONKEY BANANA PROBLEM **and develop a PROLOG program for the same**

Part B

The students will design and implement their proposed project on Expert systems.

Text Books:

1. Stuart Russel, Peter Norvig: Artiificial Intelligence A Modern Approach, Pearson 3rd edition 2013.

At the end of the course, the student will be able to	Bloom's Level
1. Implement fundamentals of PROLOG programming	**L3**
2. Develop PROLOG programs for Logic building, problem solving, reasoning	**L3**
3. Develop PROLOG programs for and Expert system	**L3**

Program Outcome of this course (POs)	PO No.
1. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations	**4**
2. **Use of engineering tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations	**6**
3. **Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.	**12**

Assessment methods

1. Periodic journal evaluation
2. Execution of lab experiments.

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3.	Initial write up	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4.	Viva voce is conducted for individual student and not in group		
5.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		