Centenary Celebrated Sharnbasveshwar Vidya Vardhak Sangha's

Sharnbasva University

ಶರಣಬಸವ ವಿಶ್ವವಿದ್ಯಾಲಯ

A Private University enacted by Govt. of Karnataka as "Sharnbasva University Act 2012" Karnataka Act No. 17 of 2013. Notification No. ED 144 URC 2016 dated 29/07/2017
www.sharnbasvauniversity.edu.in Kalaburagi-585 103 - Karnataka - India Email : sharnbasvauniversity@gmail.com

Faculty of Engineering and Technology (Exclusively for Women)
Department of Computer Science and Engineering
B. Tech. 4th year (VII and VIII Semester)
Scheme of Teaching and Examination

Outcome Based Education (OBE) & Choice Based Credit System (CBCS)
(Effective from the academic year 2018-19)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs) of the Department

PEO1 PEO 1: Graduates will possess a strong foundation in Computer Science and Engineering that are required for problem solving to excel and succeed in their profession.

PEO2 PEO 2: Graduates will have scientific and engineering breadth to comprehend, analyze, design and solve real life problems using the acquired skills and life long learning

PEO3 PEO 3: Graduates will have exposure to emerging cutting edge technologies and adequate training with opportunity to work on multidisciplinary projects.

PEO4 PEO 4: Graduates will be professional with ethical attitude,effective communication skills, teamwork capability and relate engineering issues to braoder social context

PROGRAMME OUTCOMES (POs) COMPUTER SCIENCE AND ENGINEERING (UG)

PO1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - 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.

PO3 - 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.

PO4 - 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.

PO5 - 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.

PO6 - 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.

PO7 - Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - 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.

PO11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12 - Life-long learning: Recognize the need for, and have the preparation and ability to engage independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of the B. Tech. (Computer Science & Engineering) degree the graduates will be able to

PSO1: Apply principles of basic sciences and Engineering fundamentals in the field of Computer Science and Engineering

PSO2: Apply computational, algorithmic, and programming skills to implement solutions for real-life problems in diverse domain adapting to emerging technologies through lifelong learning

PSO3: Develop practical abilities, ethical understanding, effective communication and leadership skills for successful careers in industry or academia

Sharnbasva University, Kalaburagi **Scheme of Teaching and Examination 2018-19** **Outcome Based Education (OBE) and Choice Based Credit System (CBCS** (Effective from the academic year 2018-19)
Program: B. Tech -Computer Science & Engineering
VII SEMESTER

Sl. No.	Course Code		Course Title		Teaching Hours/w eek			
					L	T	P	Dura on n in hour
1.	PCC	18CS71	Artificial Intelligenc e and Machine Learning	CSE	3	1		3
2.	PEC	18CS72	Big Data Analytics	CSE	3	1		3
3.	PEC	18CS73X	Profession al Elective –IV	CSE	3			3

4.	OEC	18XX74X	Open E lective – III	CSE	3			3
5.	PCC	18CSL75	Artificial Intelligence and Machine Learning Lab	CSE			2	3
6.	PEC	18CSL76	Big Data Analytics Lab	CSE			2	3
7.	PEC	18CSL77	AWS Cloud Lab	CSE			2	3
8.	PRJ	18PRJ78	Research Project/Field Project – 7	CSE			2	3
9.	HSMC	18HSM79	Industry Psychology and Organizational Behavior	Humanities	1			3
Total					**13**	**2**	**26**	
	PCC-Professional Core, PEC- Professional Elective, OEC- Open Elective, HSMC-Humanity and Sc							

Professional Elective – V		**Open Elective – III**	
Sub. Code	**Sub. Name**	**Sub. Code**	**Sub. Name**
18CS731	Data Mining and Data Warehousing	18CS741	Internet of Things
18CS732	Adhoc Networks	18CS742	Blockchain Techno
18CS733	System Modelling and Simulation	18CS743	Wireless Sensor Ne
18CS734	Storage Area Network	18CS744	Neural Networks an

Sharnbasva University, Kalaburagi
Scheme of Teaching and Examination 2018-19
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018-19)

B. Tech. -Computer Science & Engineering

VIII SEMESTER

Sl.No	Course Code	Course Title	Teaching Dept. & Paper Setting Board	Credits				
				P	Duration in ho	CIE Marks	Total Marks	

						urs			
1.	Project	18PRJ84	Project Work		2	3	50	100	08
2.	Internship	18CSI86	Internship		-	3	50	100	13
	-				**2**	**100**		**300**	**21**

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING **[As per Choice Based Credit System (CBCS) scheme]** **(Effective from the academic year 2021-2022)** **SEMESTER – VII**			
Subject Code	**18CS71**	**CIE Marks**	**50**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**50**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**
CREDITS – 04			
Course objectives: This course will enable students			

- To Understand the Basic principles of Artificial Intelligence.
- Become familiar with AI toward problem solving, inference, perception, knowledge representation, and learning.
- To interpret the different supervised classification methods and tree-based models
- To understand concept learning, ANN, Bayes classifier, k nearest neighbor.

Modules	Hours
Module I	
What is artificial intelligence? Problems, problem spaces and search, Heuristic search techniques	10
Module II	
Knowledge representation issues, Predicate logic, Representation knowledge using rules. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Candidate Elimination Algorithm, Inductive bias of Candidate Elimination Algorithm.	10
Module III	
Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems, ID3 algorithm. Artificial Neural Network: Introduction, NN representation, Appropriate problems, Perceptions, Back propagation algorithm.	08
Module IV	
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting, MDL principle, Bates optimal classifier, Gibbs algorithm, Navie Bayes classifier, BBN, EM Algorithm	10
Module V	
Instance-Base Learning: Introduction, k-Nearest Neighbor Learning, locally weighted regression, Radial basis function, Case-Based reasoning. Reinforcement Learning: Introduction, The learning task, Q-Learning.	10

Course Outcomes (COs):

CO1	Demonstrate Fundamental Understanding of Artificial intelligence and Expert Systems.
CO2	Apply basic Principles of Artificial Intelligence in Problem Solving inference perceptron, Knowledge representation issues and concept learning.
CO3	Analyze and use different Supervised learning methods and tree based models.
CO4	Develop and implement Bayesian learning using bayes theorem, naive bayes classifier and EM Algorithm.
CO5	Explore the fundamentals of Instance based learning and reinforcement learning.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	3	2
CO3	2	3	2	-	-	-	-	-	-	-	-	-	2	2	2
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	3	3
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	3	2

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Elaine Rich, Kevin K and S. B. Nair, “Artificial Intelligence”, 3rd Edition, McGraw Hill Education, 2017.

2. Tom M Mitchell, “Machine Lerning”,1st Edition, McGraw Hill Education, 2017.

Reference Books:

1. Saroj Kaushik, Artificial Intelligence, Cengage learning
2. Stuart Rusell, Peter Norving, Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
3. AurÈlienGÈron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd edition, springer series in statistics.
5. EthemAlpaydın, Introduction to machine learning, second edition, MIT press.
6. Srinvivasa K G and Shreedhar, ― Artificial Intelligence and Machine Learning‖, Cengage

BIG DATA AND ANALYTICS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
Semester– VII

Course Code	**18CS72**	**CIE Marks**	50
Number of Contact Hours/Week	03	**SEE Marks**	50
Total Number of Contact Hours	48	**Exam Hours**	03

CREDITS –04

Course Learning Objectives: This course will enable students to:

- Understand Hadoop Distributed File system and examine MapReduce Programming
- Explore Hadoop tools and manage Hadoop with Ambari
- Appraise the role of Business intelligence and its applications across industries
- Assess core data mining techniques for data analytics
- Identify various Text Mining techniques

Module I	**Hours**
Hadoop Distributed File System Basics, Running Example Programs and Benchmarks, Hadoop MapReduce Framework, MapReduce Programming	**10**
Module II	
Essential Hadoop Tools, Business Intelligence Concepts and Application, Data Warehousing, Data Mining	**10**
Module III	
Data Visualization, Decision Trees, Regression, Artificial Neural Networks	**08**
Module IV	
Cluster Analysis, Association Rule Mining, Text Mining, Naïve- Bayes Analysis	**10**
Module V	
Support Vector Machines, Web Mining, Social Network Analysis	**10**

Course Outcomes (COs):

CO1	Understand the concepts of HDFS and MapReduce framework.
CO2	Analyze Hadoop related tools for Big Data Analytics and Recognize the role of Business Intelligence & Data warehousing.
CO3	Adapt the data visualization in decision making & Decision Trees for data analysis.
CO4	Apply the Cluster analysis and association rules for data analytics.
CO5	Interpret Support Vector Machines, Web Mining, Social Network Analysis.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	-	-	-	-	1	2	2
CO2	2	2	2	1	2	-	-	-	-	-	-	-	1	2	2
CO3	2	2	2	1	3	-	-	-	-	-	-	-	1	2	2
CO4	2	2	2	1	2	-	-	-	-	-	-	-	1	2	2
CO5	2	2	2	1	2	-	-	-	-	-	-	-	1	2	2

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1.Elaine Rich, Kevin K and S. B. Nair, “Artificial Intelligence”, 3rd Edition, McGraw Hill Education, 2017.

2.Tom M Mitchell, “Machine Lerning”,1st Edition, McGraw Hill Education, 2017.

Reference Books:

1.Saroj Kaushik, Artificial Intelligence, Cengage learning
2.Stuart Rusell, Peter Norving, Artificial Intelligence: A Modern Approach, Pearson Education 2nd Edition
3.AurÈlienGÈron, “Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, Shroff/O'Reilly Media, 2017.
4.Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, 2nd edition, springer series in statistics.
5.EthemAlpaydın, Introduction to machine learning, second edition, MIT press.
6.Srinvivasa K G and Shreedhar, — Artificial Intelligence and Machine Learning‖, Cengage

DATA MINING AND DATA WAREHOUSING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CS731**	**CIE Marks**	50
Number Lecture Hour/Week	**3**	**SEE Marks**	50
Number of Lecture Hours	**40**	**Exam Hours**	03

CREDITS-03

Course Objectives

Define multi-dimensional data models.
Explain rules related to association, classification and clustering analysis.
Compare and contrast between different classification and clustering algorithms

Module I	**Hours**
Data Warehousing & modeling: Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations	8
Module II	
Data warehouse implementation& Data mining: Efficient Data Cube computation: An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP:Introduction: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity	8
Module III	
Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FPGrowth Algorithm, Evaluation of Association Patterns.	8
Module IV	
Classification: Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.	8
Module V	

Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms.	8

Course Outcomes (COs):

CO1	Understand and analyze the architecture, models, and operations of data warehousing
CO2	Understand and apply data cube computation, OLAP indexing, and server architectures, data mining fundamentals, preprocessing, and measures.
CO3	Analyze and apply association analysis techniques,with a focus on the FP-Growth algorithm and the evaluation of association patterns.
CO4	Understand and apply various classification techniques for effective data classification.
CO5	Understand and implement various clustering techniques for data analysis.

CO-PO-PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	3	-	1	-	-	-	-	-	1	3	-
CO2	3	3	3	-	3	2	1	2	-	-	-	-	1	3	1
CO3	3	3	3	-	3	2	1	2	-	-	-	-	1	3	1
CO4	3	3	3	-	3	2	1	2	-	-	-	-	1	3	1
CO5	3	3	3	-	3	2	2	2	-	-	-	-	1	3	1

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression,2014.
2. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.

Reference Books:

1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson,Tenth Impression,2012.
2. Michael J Berry, Gordon S Linoff: Mastering Data Mining , Wiley Edition, second edtion,2012.

ADHOC NETWORKS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CS732**	**CIE Marks**	50
Number Lecture Hour/Week	**3**	**SEE Marks**	50
Number of Lecture Hours	**40**	**Exam Hours**	03

CREDITS-03

Course Objectives

To understand the basics of Ad-hoc Networks.
To learn various fundamental and emerging protocols
To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc networks.
To understand the nature and applications of Ad-hoc networks.

Module I	**Hours**
Ad-hoc Wireless Networks: Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention- Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas.	8
Module II	
Routing Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols	8
Module III	
Multicast Routing in Ad-hoc Wireless Networks: Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols.	8
Module IV	

Transport Layer and Security Protocols for Ad-hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challengesin Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.	8
Module V	
Quality of Service and Energy Management in Ad-hoc Wireless Networks: Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad-hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes.	8

Course Outcomes (COs):

CO1	Analyze the issues of ad-hoc wireless network
CO2	Evaluate the existing network and improve its quality of service
CO3	Choose appropriate protocol for various applications and design the architecture
CO4	Examine security measures present at different levels and identify the possible improvements for the latest version of the ad hoc network
CO5	Analyze energy consumption and management in ad-hoc wireless networks

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											2	1	

CO2	3	2	1										2	1	
CO3	3	2											2	1	
CO4	3	2											2	1	
CO5	3	2	1										2	1	

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1.Ad-hoc Wireless Networks, C. Siva Ram Murthy& B. S. Manoj, Pearson Education, 2nd Edition, 2011.

Reference Books:

1. Ad-hoc Wireless Networks, Ozan K. Tonguz and John Wiley, 2007 ,Gianguigi Ferrari
2. Ad-hoc Wireless Networking. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du, Kluwer Academic Publishers, 2004
3. Ad-hoc Mobile Wireless Networks- Protocols and Systems, C.K. Toh, Pearson Education, 2002

System Modelling and Simulation
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER –VII

Course Code	**18CS733**	**CIE Marks**	50
Number of Contact Hours/Week	**03**	**SEE Marks**	50
Total Number of Contact Hours	**40**	**Exam Hours**	03

CREDITS –03

Course Objectives: This course will enable students to:

- Explain the basic system concept and definitions of system
- Discuss techniques to model and to simulate various systems
- Analyze a system and to make use of the information to improve the performance

Modules	Hours
Module I	
Introduction: When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation; Areas of application, Systems and system environment; Components of a system; Discrete and continuous systems, Model of a system; Types of Models, Discrete-Event System Simulation examples: Simulation of queuing systems. General Principles.	**8**
Module II	
Statistical Models in Simulation: Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process, Empirical distributions. **Queuing Models**: Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems, Long-run measures of performance of queuing systems, Steady-state behavior of M/G/1 queue, Networks of queues	**8**
Module III	
Random-Number Generation: Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers, Random **Variate Generation:** Inverse transform technique Acceptance-Rejection technique.	**8**

Module IV	
Input Modeling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models. **Estimation of Absolute Performance:** Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation	**8**
Module – V	
Measures of performance and their estimation, Output analysis for terminating simulations Output analysis for steady-state simulations. **Verification, Calibration and Validation:** Optimization: Model building, verification and validation, Verification of simulation models, Verification of simulation models, Calibration and validation of models, Optimization via Simulation.	**8**

Course Outcomes (COs):

CO1	Explain the system concept and apply functional modeling method to model the activities of a static system. Develop solutions for application problems using manual simulation and Time Advance algorithm on discrete event simulation.
CO2	Describe the behavior of a dynamic system and create ananalogous model for a dynamic system. Understand the concepts of Statistica lmodels and queuing models.
CO3	Simulate the operation of a dynamic system and make improvement according to the simulation results. Apply acceptance rejection technique and inverse transform technique to generate Random Variates and Random numbers using LCM.
CO4	Understand the useful model of input data, absolute performance and estimation with respect to output analysis
CO5	Understand the model building,verification,calibration,validationof models and optimization

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5 th Edition, Pearson Education, 2010.

Reference Books:

1.Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006.

2.Averill M. Law: Simulation Modeling and Analysis, 4 th Edition, Tata McGraw-Hill, 2007

STORAGE AREA NETWORK
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CS734**	**CIE Marks**	50
Number Lecture Hour/Week	**3**	**SEE Marks**	50
Number of Lecture Hours	**40**	**Exam Hours**	03

CREDITS-03

Course Objectives

Evaluate storage architectures.
Define backup, recovery, disaster recovery, business continuity, and replication
Examine emerging technologies including IP-SAN
Understand logical and physical components of a storage infrastructure
Identify components of managing and monitoring the data center
Define information security and identify different storage virtualization technologies

Modules	**Hours**
Module I	
Storage System: Introduction to Information Storage: Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing. Data Center Environment: Application Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application	8
Module II	
Data Protection - RAID: RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison. Intelligent Storage Systems: Components of an Intelligent Storage System, Types of Intelligent Storage Systems. Fiber Channel Storage Area Networks - Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN.	8
Module III	
IP SAN and FCOE: iSCSI, FCIP, Network-Attached Storage: General-Purpose Servers versus NAS Devices, Benefits of NAS, File Systems and Network File Sharing, Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, Factors Affecting NAS Performance	8
Module IV	

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life Cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions, Backup and Archive: Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operations, Backup Topologies, Backup in NAS Environments	8
Module -5	
Local Replication: Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas. Remote Replication: Modes of Remote 08 Replication, Remote Replication Technologies. Securing the Storage Infrastructure: Information Security Framework, Risk Triad, Storage Security Domains.	8

Course Outcomes (COs):

CO1	Identify various fundamental concepts, components and techniques of storage area networks.
CO2	Design SAN infrastructures including various topologies.
CO3	Configure and manage SAN devices, integrate with other data center.
CO4	Troubleshoot and optimize SAN performance.
CO5	Implement data protection and disaster recovery strategies

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. EMC Education Services, “Information Storage and Management”, Wiley India Publications

Reference Books:

1. Paul Massiglia, Richard Barker, "Storage Area Network Essentials: A Complete Guide to Understanding and Implementating SANs Paperback", 1st Edition, Wiley India Publications, 2008.

INTERNET OF THINGS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021 -2022)
SEMESTER – VII

Subject Code	**18CS741**	**CIE Marks**	50
Number of Lecture Hours/Week	**3**	**SEE Marks**	50
Total Number of Lecture Hours	**40**	**Exam Hours**	03

CREDITS –03

Course Objectives: This course will enable students to

- Define and explain basic issues, policy and challenges in the IoT
- Illustrate Mechanism and Key Technologies in IoT
- Explain the Standard of the IoT
- Explain resources in the IoT and deploy of resources into business.

Modules	**Hours**
Module I	
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	8
Module II	
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	8
Module III	
IP as the IoT Network Layer, The Business Case fo r IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	8
Module IV	
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment	8
Module V	
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Using Pi, DS18B20 Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from DS18B20 sensors, Remote access to RaspberryPi, Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture,Smart City Security Architecture, Smart City Use-Case Examples.	8

Course Outcomes (COs):

CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
CO2	Illustrate the smart objects and the technologies to connect them to network.
CO3	Assess different protocols for IoT.
CO4	Infer the role of Data Analytics and Security in IoT.
CO5	Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	3	2
CO2	1	1	3	1	-	-	-	-	-	-	-	-	1	3	2
CO3	1	2	2	-	-	-	-	-	-	-	-	-	1	3	2
CO4	1	2	3	2	2	-	-	-	-	-	1	-	1	3	2
CO5	1	2	3	3	2	-	-	-	-	-	1	-	1	3	2

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. 1 David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 9789386873743)

2. Srinivasa K G, “Internet of Things”, CENGAGE Leaning India, 2017

Reference Books:

1. 1. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224).

BLOCKCHAIN TECHNOLOGY

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CS742**	**CIE Marks**	**50**
Number Lecture Hour/Week	**03**	**SEE Marks**	**50**
Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS-04

Course Objectives:

- Define and explain the fundamentals of Blockchain
- Illustrate the technologies of blockchain
- Describe the models of blockchain
- Analyze and demonstrate the Ethereum

Modules	Hours
Module I	
Blockchain 101: Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.	8
Module II	
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Foundations: Cryptographic primitives, Asymmetric cryptography, Public and private keys	8
Module III	
Bitcoin and Alternative Coins A: Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash	8
Module IV	
Smart Contracts and Ethereum 101: Smart Contracts: Definition, Ricardian contracts.Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.	8
Module V	
Alternative Blockchains: Blockchains Blockchain-Outside of Currencies: Internet of Things ,Government, Health, Finance, Media	8

Course Outcomes (COs):

CO1	Define and Explain the fundamentals of Blockchain.
CO2	Illustrate the technologies of blockchain and cryptography.
CO3	Understand the modern currencies and its market usage.
CO4	Analyse and demonstrate the Ethereum.
CO5	Analyse and demonstrate IOT.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	2	-	-	-	-	-	-	-	1	-	-
CO2	3	1	-	-	1	-	-	-	-	1	-	1	1	-	-
CO3	3	1	-	-	2	-	-	2	-	1	-	1	1	2	-
CO4	3	1	1	-	2	1	-	2	-	1	-	1	1	2	-
CO5	3	1	-	-	2	-	1	-	-	1	-	1	1	2	-

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Imran Bashir, Packet Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017.

Refernce Books:

1. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph

Bonneau, Edward Felten, 2016.
2. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, A press, First Edition, 2017.
3. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014

WIRELESS SENSOR NETWORKS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CS743**	**CIE Marks**	**50**
Number Lecture Hour/Week	**3**	**SEE Marks**	**50**
Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS-03

Course Objectives

This course will enable students to:

- Architect sensor networks for various application setups.
- Explore the design space and conduct trade-off analysis between performance and resources.
- Devise appropriate data dissemination protocols and model links cost.
- Determine suitable medium access protocols and radio hardware.
- Applications of wireless sensor networks in commercial components.

Modules	**Hours**
Module I	
Introduction, Basic overview of the Technology, Applications of Wireless Sensor Networks: Introduction, Background, Range of Applications, Examples of Category 2 WSN Applications, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology.	8
Module II	
Basic Wireless Sensor Technology and Systems: Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends, Wireless Transmission Technology and Systems: Introduction, Radio Technology Primer, Available Wireless Technologies.	8
Module III	
MAC and Routing Protocols for Wireless Sensor Networks: Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case Study, IEEE 802.15.4 LR-WPANs Standard Case Study	8
Module IV	
Routing Protocols for Wireless Sensor Networks: Introduction, Background, Data Dissemination and Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs.	8
Module V	

Applications Of WSN: WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.	8

Course Outcomes (COs):

CO1	Explore the technology and apply the principles of Wireless Sensor Networks across various domains.
CO2	Develop applications of wireless sensor actuator networks.
CO3	Analyze various routing protocols for wireless sensor networks.
CO4	Analyze various design issues in wireless sensor networks.
CO5	Apply the WSN in applications like, building automation, industrial automation, medical applications, military applications, etc.

CO-PO-PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	--						3		
CO2	3	3	3										3		
CO3	3	3											3		
CO4	3	3											3		
CO5	3												3		

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. KAZEM SOHRABY, DANIEL MINOLI, TAIEB ZNATI, "Wireless Sensor Networks: Technology, Protocols and Applications:, WILEY , Second Edition (Indian) , 2014.
2. Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.
3. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.

Reference Books:

1. .K. Akkaya and M. Younis, "A survey of routing protocols in wireless sensor networks", Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325--349
2. Anna Ha´c, "Wireless Sensor Network Designs", John Wiley & Sons Ltd.
3. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

NEURAL NETWORKS AND DEEP LEARNING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CS744**	**CIE Marks**	**50**
Number Lecture Hour/Week	**3**	**SEE Marks**	**50**
Number of Lecture Hours	**40**	**Exam Hours**	**03**

CREDITS-03

Course Objectives

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

Implement deep learning algorithms and solve real-world problems.
Execute performance metrics of Deep Learning Techniques

Modules	**Hours**
Module I	
Introduction to ANN: Biological to Artificial neuron, Training an MLP, training a DNN with Tensor Flow, Fine tuning NN Hyper Parameters Up and Running with TensorFlow.	8
Module II	
Deep Neural network: Introduction, Vanishing Gradient problems, Reusing Pretrained layers, Faster optimizers, avoiding over fitting through regularization.	8

Module III	
Distributing Tensor flow across devices and servers: Multiple devices on a single machine, multiple servers, parallelizing NN on a Tensor Flow cluster Convolution Neural Network: Architecture of the visual cortex, Convolutional layer, Pooling layer, CNN architecture	8
Module IV	
Recurrent Neural Network: Recurrent neurons, Basic RNN in Tensor Flow, Training RNN, Deep RNNs, LSTM Cell, GRU Cell, NLP	8
Module V	
Autoencoders: Efficient data representation, Performing PCA, Stacked autoencoders, Unsupervised pretraining using SA, Denoising, Sparse autoencoders, variational and other autoencoders. Reinforcement Learning: Learning to optimize rewards, policy search, Introduction to Open AI Gym, Neural network polices, Evaluating actions, Policy gradients, Markov decision processes, TDL and Q-learning, Learning to play Ms.Pac-man using Deep Q Learning**.**	8

Course Outcomes (COs):

CO1	Demonstrate The Basics Of Deep Learning For A Given Context.
CO2	Design And Train Feed Forward Neural Networks For Classification.
CO3	Adapt Optimization Algorithms To Effectively Train The Neural Networks.
CO4	Identify Various Challenges Involved In Designing And Implementing Convolution Algorithms.
CO5	Relate The Deep Learning Algorithms For Recursive Neural Networks and Generative AI.

CO-PO-PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	-	-	-	-	2	2	1
CO2	3	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO4	3	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO5	3	2	2	-	1	-	-	-	-	-	-	-	2	2	2

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
  The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Hands on Machine Learning with Scikit-Learn &TensorFlow, Aurelien Geron, O'Reilly, 2019

Reference Books:

1.Deep Learning Lan Good fellow and Yoshua Bengio and Aaron Courville MIT Press2016.
2.Neural Networks and Deep Learning, Charu C. Aggarwal, Springer International Publishing, 2018

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CSL75**	**CIE Marks**	50
Number of Lecture Hours/Week	**02**	**SEE Marks**	50
Total Number of Lecture Hours	**30**	**Exam Hours**	03

CREDITS – 01

Course Objectives: This course will enable students

- Implement and evaluate AI and ML algorithms in and Python programming language.
- Understand the evaluation of different algorithms.

1. Implement AO* Search algorithm.

2. .Implement A* Search algorithm

3. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

4 Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

5. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

6. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

7.Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

8. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9. Implement the non-parametric Locally Weighted Progressional gorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

Course Outcomes (COs):

CO1	Demonstrate theoretical knowledge of Artificial Intelligence And Machine Learning by conducting a series of hands-on experiments.
CO2	Develop a Program using Jupyter Notebook.
CO3	Debug and troubleshoot issues effectively.
CO4	Analyze the data and interpret the results.
CO5	Prepare a well-organized laboratory report.

CO-PO-PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3	2
CO4	3	3	2	-	-	-	-	-	-	-	-	-	2	3	2
CO5	1	1	1	-	-	-	-	-	-	-	-	-	2	2	1

Conduct of Practical Examination:

- Experiment distribution
- For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

- For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Courseed to change in accoradance with university regulations)
- For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+30+5 = 50 Marks
- For laboratories having PART A and PART B

Part A – Procedure + Execution + Viva = 7 + 20 + 3 = 30 Marks

iv. Part B – Procedure + Execution + Viva = 6 + 12 + 2= 20 Marks

BIG DATA ANALYTICS LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CSL76**	**CIE Marks**	50
Number of Lecture Hours/Week	**02**	**SEE Marks**	50
Total Number of Lecture Hours	**30**	**Exam Hours**	03

CREDITS-01

Course Objectives: This course will enable students to

Implement and evaluate BIG DATA AND ANALYTICS Problems

1. Installation of Single Node Hadoop Cluster on Ubuntu
2. Hadoop Programming: Word Count MapReduce Program Using Eclipse
3. Implementing Matrix Multiplication Using One Map-Reduce Step.
4. Implementing Relational Algorithm on Pig.
5. Implementing database operations on Hive.
6. Implementing Bloom Filter using Map-Reduce
7. Implementing Frequent Item set algorithm using Map-Reduce.
8. Implementing Clustering algorithm using Map-Reduce
9. Implementing Page Rank algorithm using Map-Reduce

Course Outcomes (COs):

CO1	Demonstrate theoretical concept of big data analytics through series of experiment**.**
CO2	Develop a Program using hadoop, pig and hive software tools.
CO3	Debug and troubleshoot issues effectively.
CO4	Analyze the data and interpret the results.
CO5	Prepare a well-organized laboratory report.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	-	1	3	2
CO2	2	3	2	-	3	-	-	-	-	-	-	-	1	3	2
CO3	2	3	-	-	3	-	-	-	-	-	-	-	1	3	2
CO4	2	3	2	-	2	-	-	-	-	-	-	-	1	3	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	1	3	2

Conduct of Practical Examination:

- Experiment distribution
- For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.
- For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Courseed to change in accoradance with university regulations)
- For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+30+5 = 50 Marks
- For laboratories having PART A and PART B

Part A – Procedure + Execution + Viva = 7 + 20 + 3 = 30 Marks

vi. Part B – Procedure + Execution + Viva = 6 + 12 + 2= 20 Marks

AWS CLOUD LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CSL77**	**CIE Marks**	50
Number of Lecture Hours/Week	**02**	**SEE Marks**	50
Total Number of Lecture Hours	**30**	**Exam Hours**	03

CREDITS – 01

Course Objectives: This course will enable students
A comprehensive understanding of the foundational services offered by AWS including compute, storage, networking, database, and identity & access management (IAM).

PART A

Illustration of the following services.

- Application Auto Scaling
- Amazon Aurora
- AWS Cloud9
- Amazon CloudFormation
- Amazon CloudFront
- AWS Cloud Shell
- AWS CloudTrail
- Amazon CloudWatch
- AWS Code Commit
- Amazon Cognito
- Amazon Comprehend
- AWS Deep Racer
- Amazon DynamoDB
- Amazon EC2 Auto Scaling
- AWS Elastic Beanstalk
- Amazon Elastic Block Store (EBS)
- Amazon Elastic Compute Cloud (EC2)
- Amazon Elastic Container Registry (ECR)
- Amazon Elastic File System (EFS)
- Amazon Elastic Inference
- Elastic Load Balancing
- Amazon Event Bridge
- Amazon Forecast
- AWS Glue
- AWS Glue Data Brew
- AWS Identity and Access Management (IAM)
- AWS Key Management Service (KMS)
- AWS Lambda
- Amazon Lex
- Amazon LightSail
- Amazon Marketplace Subscriptions (Amazon ML)
- Amazon Polly
- Amazon Recognition
- Amazon Relational Database Service (RDS)
- AWS Resource Groups & Tag Editor
- AWS Robemakers
- Amazon Sage Maker
- AWS Secrets Manager
- AWS Security Token Service (STS)
- AWS Service Catalog
- Amazon Simple Notification Service (SNS)
- Amazon Simple Queue Service (SQS)
- Amazon Simple Storage Service (S3)
- Amazon Simple Storage Service Glacier (S3 Glacier)
- AWS Step Functions
- AWS Systems Manager (SSM)
- Amazon Extract
- Amazon Translate
- AWS Trusted Advisor
- Amazon Virtual Private Cloud (Amazon VPC)
- AWS Well-Architected Tool

PART B

1. Introduction to AWS IAM
2. Build Your VPC and Launch a Web Server
3. Introduction to Amazon EC2
4. Working with Amazon EBS
5. Build Your DB Server and Interact with Your DB Using an App.

Course Outcomes (COs):

CO1	Demonstrate various AWS services
CO2	Implement different scenario of real world problem using AWS service.
CO3	Debug and troubleshoot issues effectively.
CO4	Analyze the data and interpret the results.
CO5	Prepare a well-organized laboratory report.

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	1	-	-	-	-	-	-	2	-	1	3	-	3
CO2	3	1	3	-	3	-	-	-	-	-	-	1	1	3	3
CO3	3	1	-	-	3	-	-	-	-	2	-	1	2	-	3
CO4	3	-	-	-	3	-	-	-	-	-	-	1	2	1	3
CO5	3	-	1	-	-	-	-	-	-	2	-	-	2	-	-

Conduct of Practical Examination:

- Experiment distribution
- For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

- For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.
- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Courseed to change in accoradance with university regulations)
- For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+30+5 = 50 Marks
- For laboratories having PART A and PART B

Part A – Procedure + Execution + Viva = 7 + 20 + 3 = 30 Marks

viii. Part B – Procedure + Execution + Viva = 6 + 12 + 2= 20 Marks

PROJECT VII
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VII

Subject Code	**18CSP78**	**CIE Marks**	50
Number of Lecture Hours/Week	**02**	**SEE Marks**	50
Total Number of Lecture Hours	**48**	**Exam Hours**	03

CREDITS – 01

Course Objectives: This course will enable students

- Identify real-world problems across programming, databases, and networking domains and understand their business and technical implications.
- Apply systematic methodologies to design, implement, and optimize solutions.
- Resolve technical challenges through debugging, research, and collaboration.
- Take responsibility for specific roles in a team and collaborate effectively to achieve project goals.
- Present project progress and findings clearly and confidently to both technical and non-technical audiences.
- Document the entire project in a structured, professional laboratory report.

Project Guidelines:

- Project work shall preferably be batch wise.
- Evaluation is based on concept clarity, system design, implementation, testing, presentation, and documentation quality, with a focus on proper coding standards, teamwork, and effective communication.
- Viva-voce examination in project work shall be conducted batch-wise.
- Minimum requirement of CIE marks for Project work shall be 50% of the maximum marks.
- Students failing to secure a minimum of 50% of the CIE marks in Project work shall not be eligible for the SEE Project examination.
- For a pass in a Project/Viva-voce examination, a student shall secure a minimum of 40% of the maximum marks prescribed.

Course Outcomes (COs):

CO1	Identify the topic from various domains (example programming databases, networking) to real world problems.
CO2	Develop methodology for the problem.
CO3	Resolve issues that arise during the project .
CO4	Learn to assign and accept roles and responsibilities within a team and write a good technical reports.
CO5	Exhibit skills in presenting their project findings & progress orally

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	1	1	1	2	2	1	2	2	3	2
CO2	2	2	2	2	2	1	2	1	2	2	1	1	2	2	2
CO3	2	2	2	2	3	1	1	1	2	2	1	1	2	3	2
CO4	-	-	-	-	-	1	-	2	2	3	1	1	1	1	1
CO5	-	-	-	-	1	1	-	2	2	3	1	1	1	1	1

INDUSTRIAL PSYCHOLOGY AND ORGANIZATIONAL BEHAVIOR **[As per Choice Based Credit System (CBCS) scheme]** **(Effective from the academic year 2021-2022)** **SEMESTER – VII**			
Subject Code	**18HSM79**	CIE Marks	50
Number of Lecture Hour/Week	**01**	SEE Marks	50
Total Number of Lecture Hours	**20**	Exam Hours	03
CREDITS-01			

Course Objectives: This course will enable students to:

1. Relating human psychology to science
2. Understand the human psychology
3. Understand the nature of organization and organization models
4. Understand the human social communication
5. Understand the leadership qualities

Modules	Hours
Module I	
Introduction to I/O psychology: Major fields of I/O psychology, brief history of I/O psychology, employment of I/O psychology, ethics in I/O psychology.	**3**
Module II	
Organizational communication: Types of organizational communication, interpersonal communication, improving employee communication skills.	**3**
Module III	
Leadership :Introduction, personal characteristics associated with leadership, interaction between the leadership and the situation specific leader skills, leadership where we are today.	**5**
Module IV	
Group behavior- teams and conflicts Group dynam dynamics, factors affecting performance, group Group performance, individual versus group conflicts.	**5**
ModuleV	
Stress management: Dealing with the demands of life and work, stress defined, predisposition to stress, sources of stress, consequences of stress, stress reduction intervention related to life /work issues.	**4**

Course Outcomes (COs):

CO1	Comprehend the knowledge and concepts of human psychology
CO2	Develop analytical and critical thinking skills and apply their knowledge to solve organizational problem.
CO3	Analyze the leadership characteristics & adopt the leadership qualities
CO4	Communicate with people/group in better way
CO5	Improve the nature of stress management

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	1	-	1	1	2	-	2	-	-	2
CO2	-	1	2	-	-	1	-	1	2	3	-	2	-	-	2
CO3	-	2	1	-	-	1	-	1	2	3	-	2	-	-	2
CO4	-	-	-	-	-	1	-	3	2	3	-	3	-	-	2
CO5	-	-	-	-	-	1	-	1	2	3	-	3	-	-	2

Question paper pattern:

- The question paper will have ten questions.
- There will be 2 questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Book: Michael G.Aamodt, Industrial/Organizational Psychology: An Applied Approach, 6th Edition, Wadsworth Cengage Learning, ISBN: 978-0-495-60106-7.

Reference Books:

1. Blum M.L. Naylor J.C., Horper & Row, Industrial Psychology, CBS Publisher, 1968
2. Luthans, Organizational Behaviour, McGraw Hill, International, 1997
3. Morgan C.t.,King R.A.,John Rweisz &John Schoples, Introduction to Psychology, McHraw Hill, 1966
4. Schermerhorn J.R.Jr., Hunt J.G &Osborn R.N., Managing, Organizational Behaviour, John Willy

RESEARCH PROJECT/FIELD PROJECT-8
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VIII

Subject Code	**18CSP81**	**CIE Marks**	50
Number of Lecture Hours/Week	**02**	**SEE Marks**	50
Total Number of Lecture Hours	**48**	**Exam Hours**	03

CREDITS – 08

Course Objectives: This course will enable students

- Identify real-world problems across programming, databases, and networking domains and understand their business and technical implications.
- Apply systematic methodologies to design, implement, and optimize solutions.
- Resolve technical challenges through debugging, research, and collaboration.
- Take responsibility for specific roles in a team and collaborate effectively to achieve project goals.
- Present project progress and findings clearly and confidently to both technical and non-technical audiences.
- Document the entire project in a structured, professional laboratory report.

Project Guidelines:

- Project work shall preferably be batch wise.
- Evaluation is based on concept clarity, system design, implementation, testing, presentation, and documentation quality, with a focus on proper coding standards, teamwork, and effective communication.
- Viva-voce examination in project work shall be conducted batch-wise.
- Minimum requirement of CIE marks for Project work shall be 50% of the maximum marks.
- Students failing to secure a minimum of 50% of the CIE marks in Project work shall not be eligible for the SEE Project examination.
- For a pass in a Project/Viva-voce examination, a student shall secure a minimum of 40% of the maximum marks prescribed.

Course Outcomes (COs):

CO1	Identify the topic of real word problem, conduct the relevant literature survey and define the objectives on specific area.
CO2	Develop proper methodology for the problem.
CO3	Resolve issues that arise during the project findings.
CO4	Write good quality technical reports.
CO5	Deliver presentations on project findings.

CO-PO-PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	2	2	2	2	-	1	2	2	3	3
CO2	2	2	2	2	2	2	2	1	2	1	2	-	2	3	3
CO3	2	2	2	2	3	2	2	1	2	1	1	-	2	3	3
CO4	-	-	-	-	-	1	1	1	2	3	-	1	2	3	1
CO5	-	-	-	-	-	1	1	1	2	3	-	2	2	3	2

INTERNSHIP
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2021-2022)
SEMESTER – VIII

Subject Code	**18CSI82**	CIE Marks	50
		SEE Marks	50

Total Number of Lecture Hours	12 weeks	Exam Hours	03

CREDITS – 13

- Internship: All the students shall have to undergo mandatory internship of 16 weeks during the 4th semesters. A University examination shall be conducted during semester and the prescribed credit shall be counted in the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements
- Those, who have not pursued /completed the internship, shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

INTERNSHIP GUIDELINES:

Note: Internship Comprises Following Subcomponents:

1. Presentation on Internship (After 8 weeks from the date of commencement) CIE for 25 marks.
2. Evaluation of Internship Report (CIE) for 25 marks.
3. Evaluation and Viva-Voce of Internship (SEE) for 50 marks.

- The internship shall be completed during the period specified in the Scheme of Teaching and Examination.
- The internship can be carried out in any industry/R and D Organization/Research Institute/Educational institute of repute.
- (a) The Department/college shall nominate staff members to facilitate, guide and supervise students under internship. (B) The Internal Guide has to visit place of internship at least once during the student's internship.
- The students shall report the progress of the internship to the guide in regular intervals and seek his/her advice.
- After the completion of Internship, students shall submit a report with completion and attendance certificates to the Head of the Department with the approval of both internal and external guides.
- There will be 50 marks for CIE (Seminar: 25, Internship report: 25) and 50 marks for Viva-Voce conducted during SEE. **The minimum requirement of CIE marks shall be 50% of the maximum marks.**
- The internal guide shall award the marks for seminar and internship report after evaluation. He/she will also be the internal examiner for Viva-Voce conducted during SEE.
- The external guide from the industry shall be an examiner for the viva voce on Internship. Viva-Voce on internship shall be conducted at the college and the date of Viva-Voce shall be fixed in consultation with the external Guide. The Examiners shall jointly award the Viva-Voce marks.
- In case the external Guide expresses his inability to conduct viva voce, the Chief superintended of the college institution shall appoint a senior faculty of the Department of conduct viva-voce along with the internal guide. The same shall be informed in writing to the concerned Chairperson, Board of Examiners (BOE).
- The students are permitted to carry out the internship anywhere in India or abroad. **The University will not provide any kind of financial assistance to any student for carrying out the Internship.**

Course Outcomes (COs):

CO1	Participate in the projects in industries during her internship
CO2	Learn to use advanced tools and techniques encountered during the visit
CO3	Increase skills for understanding and working with people of diverse backgrounds and culture and to work effectively within diverse environments.
CO4	To deal with Industry-Professionals and ethical issues in the work environment
CO5	Prepare professional work reports and presentations

CO-PO-PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	1	-	2	-	-	-	2	3	2
CO2	2	2	2	2	3	2	2	1	2	-	-	2	2	3	1
CO3	2	2	2	2	3	2	1	1	2	3	2	1	2	3	2
CO4	-	-	-	-	-	2	-	3	2	3	2	1	2	3	2
CO5	-	-	-	-	-	-	1	3	2	2	-	1	2	3	-