LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-21]
(W.e.f Academic Year 2024-25)

B.E.VII - Semester

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours / Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U21CM701	PCC	Information Security	3	0	0	3	40	60	3	3
2	U21CM702	PCC	Deep Learning Techniques	3	0	0	3	40	60	3	3
3	-	PEC	Professional Elective – III	3	0	0	3	40	60	3	3
4		OEC	Open Elective – II	3	0	0	3	40	60	3	3
5	-	OEC	Open Elective – III	3	0	0	3	40	60	3	3
Practical/Laboratory Course											
7	U21CM7L1	PCC	Information Security Lab	-	0	2	2	25	50	3	1
8	U21CM7L2	PCC	Deep Learning Techniques Lab	-	0	3	3	25	50	3	1
8	U21CM7P1	PCC	Major Project Phase – I	-	0	3	3	25	50	3	2
Total				**15**	**0**	**8**	**23**	**275**	**450**	**24**	**19**

L: Lecture *(Hrs/Wk/Sem)* **T**: Tutorial *(Hrs/Wk/Sem)* **P**:Practical **D**:Drawing*(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
CM: CSE-AIML **OEC**: Open Elective Course
PEC: Professional Elective Course **PROJ:** Project **AM:** AI&ML

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours , however it can be extended wherever necessary, to enable the student to complete the experiment

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-21]
(W.e.f Academic Year 2024-25)

B.E.VIII- Semester

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	CIE	SEE	Durationin Hours	
Theory Course											
1	-	PCC	Professional Elective – IV	3	0	0	3	40	60	3	3
2	-	PEC	Professional Elective – V	3	0	0	3	40	60	3	3
3	-	OEC	Open Elective – IV	3	0	0	3	40	60	3	3
Practical/Laboratory Course											
8	U21CM8P1	PROJ	Technical Seminar	0	0	4	4	100	-	-	2
8	U21CM8P2	PROJ	Major Project Phase – II	0	0	16	16	50	150	-	8
Total				**9**	**0**	**20**	**29**	**270**	**330**	**-**	**19**

L: Lecture*(Hrs/Wk/Sem)* **T**:Tutorial*(Hrs/Wk/Sem)* **P**:Practical **D**:Drawing*(Hrs/Wk/Sem)*
CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
CM: CSE-AIML **OEC**: Open Elective Course
PEC: Professional Elective Course **PROJ:** Project **AM:** AI&ML

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-21]

PROFESSIONAL ELECTIVE COURSES

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21CM504	PEC1	Graph Theory	3	0	0	3	40	60	3	3
	U21CM505		Web and Internet Technologies	3	0	0	3	40	60	3	3
	U21CM506		Foundation Of Data Science	3	0	0	3	40	60	3	3
	U21CM507		Software Engineering	3	0	0	3	40	60	3	3
2	U21CM604	PEC2	Artificial Neural Networks	3	0	0	3	40	60	3	3
	U21CM605		Mobile Application Development	3	0	0	3	40	60	3	3
	U21CM606		R- For Data Science	3	0	0	3	40	60	3	3
	U21CM607		Compiler Design	3	0	0	3	40	60	3	3
3	U21CM703	PEC3	Fuzzy Logic	3	0	0	3	40	60	3	3
	U21CM704		Parallel and Distributed Systems	3	0	0	3	40	60	3	3
	U21CM705		Mobile Computing	3	0	0	3	40	60	3	3
	U21CM706		Computer Graphics and 3D Design & Printing	3	0	0	3	40	60	3	3
4	U21CM801	PEC4	Optimization Techniques	3	0	0	3	40	60	3	3
	U21CM802		Cloud Computing	3	0	0	3	40	60	3	3
	U21CM803		Social Media And Data Analytics	3	0	0	3	40	60	3	3
	U21CM804		Multimedia & Animation	3	0	0	3	40	60	3	3
5	U21CM805	PEC5	Machine Vision	3	0	0	3	40	60	3	3
	U21CM806		Internet of Things	3	0	0	3	40	60	3	3
	U21CM807		Big Data Analytics	3	0	0	3	40	60	3	3
	U21CM808		Virtual, Augmented and Mixed Reality	3	0	0	3	40	60	3	3

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-21]
PROFESSIONALELECTIVEWITH 4 THREADS

S No.	PE1	PE2	PE3	PE4	PE5
1	Graph Theory	Artificial Neural Networks	Fuzzy Logic	Optimization Techniques	Machine Vision
2	Web and Internet Technologies	Mobile Application Development	Parallel and Distributed Systems	Cloud Computing	Internet of Things
3	Foundation Of Data Science	R- For Data Science	Mobile Computing	Social Media And Data Analytics	Big Data Analytics
4	Software Engineering	Compiler Design	Computer Graphics and 3D Design & Printing	Multimedia & Animation	Virtual, Augmented and Mixed Reality

Course Code	Course Title						Core/Elective
U21CM701	Information Security						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Computer Networks	3	-	-	-	40	60	3

Course Objectives:

This course will enable students to

1. Learn legal and technical issues in building secure information systems
2. Provide an understanding of network security
3. Expose the students to security standards and practices

Course Outcomes:

On completion of this course, the students are able to

1. Describe the steps in Security Systems development life cycle (SecSDLC)
2. Understand the legal and ethical issues, common threats and attack to information systems
3. Identify security needs using risk management and choose the appropriate risk control strategy based on business needs
4. Use the basic knowledge of security frameworks in preparing security blue print for the organization
5. Usage of reactive solutions, network perimeter solution tools such as firewalls, host solutions such as antivirus software and Intrusion Detection techniques and knowledge of ethical hacking tools

UNIT-I -

Introduction: History, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.

Need for Security: Business Needs, Threats, Attacks, and Secure Software Development

Unit-II

Legal, Ethical and Professional Issues: Law and ethics in Information Security, Relevant U.S. Laws, International Laws and Legal Bodies, Ethics and Information Security.

Risk Management: Overview, Risk Identification, Risk Assessment, Risk Control Strategies, selecting a Risk Control Strategy, Quantitative versus Qualitative Risk Control Practices, Risk Management Discussion Points.

Unit-III

Planning for Security: Security policy, Standards and Practices, Security Blue Print, Security Education, Continuity strategies.

Security Technology: Firewalls and VPNs: Physical Design, Firewalls, Protecting Remote connections.

Unit-IV

Security Technology: Intrusion Detection, Access Control, and other Security Tools: Intrusion Detection and Prevention Systems-Scanning, and Analysis Tools- Access Control Devices.

Cryptography: Foundations of Cryptology, Cipher methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communications, Attacks on Cryptosystems

Unit-V

Implementing Information Security: Information security project management, technical topics of implementation, Non-Technical Aspects of implementation, Security Certification and Accreditation.

Information Security Maintenance: Security management models, Maintenance model

Suggested Readings:

1. Michael E Whitman and Herbert J Mattord, *Principles of Information Security*, Cengage Learning, 6 th Edition 2018
2. Atul khate, Cruptographu and Network Security" 4 th edition , Tata Mc Graw Hill , 2019
3. Nina Godbole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices" Second Edition, WILEY 2017
4. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi
5. V.K. Pachghare, "Cryptography and Information Security", PHI Learning

Course Code	Course Title						Core/Elective
U21CM702	**Deep Learning Techniques**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Python programming	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Understand the concept of neural networks, convolutional neural networks, and recurrent neural networks.
2. Implement deep learning algorithms, and learn how to train deep networks.
3. Gain in-depth knowledge of Tensor Flow along with its functions, operations, and the execution pipeline.
4. Understanding the major Architectures of Neural Networks and getting into the Convolutional neural Networks.
5. Understand the applications of implementing deep learning such as image processing, natural language processing

Course Outcomes:

On completion of this course, the students are able to

1. Understand the fundamentals of deep learning.
2. Understand deep learning algorithms and design neural network.
3. Train and implement a neural network.
4. Gain knowledge about convolutional neural networks.

Apply neural networks in various fields.

UNIT - I

What is deep learning? Artificial intelligence, Machine learning, and Deep learning - Artificial intelligence - Machine learning – Learning representations from data - The "deep" in deep learning -Understanding how deep learning works, in
three figures -What deep learning has achieved so far- The promise of AI.

UNIT - II

Getting started with neural networks - Anatomy of a neural network - Layers: the building blocks of deep learning - Models: networks of layers - Loss functions and optimizers: keysto configuring the learning process The Neural Network-Building Intelligent Machines, The Limits of Traditional Computer Programs, The Mechanics of Machine Learning, The Neuron, Expressing Linear Perceptrons as Neurons, Feed-Forward Neural Networks, Linear Neurons and Their Limitations, Sigmoid, Tanh.

UNIT- III

Training Feed-Forward Neural Networks - The Fast-Food Problem - Gradient Descent - The Delta Rule and Learning Rates - Gradient Descent with Sigmoidal Neurons – The Back propagation Algorithm - Stochastic and Minibatch Gradient Descent - Test Sets, Validation Sets, and Overfitting - Preventing Overfitting in Deep Neural Networks

UNIT -IV

Introduction to Major Architectures of Deep Networks–Unsupervised Pretrained Networks (UPNs), Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks

UNIT -V

Convolutional Neural Networks -Neurons in Human Vision - The Shortcomings of Feature Selection - Vanilla Deep Neural Networks Don't Scale - Filters and Feature Maps – Full Description of the Convolutional Layer - Max Pooling - Full Architectural Description of Convolution Networks - Closing the Loop on MNIST with Convolutional Networks - Accelerating Training with Batch Normalization.

Suggested Readings:

1. Fundamentals of Deep Learning : Designing Next-Generation Machine Intelligence Algorithms, Nikhil Buduma and
2. Nicholas Locascio, First Edition - O'Reilly , 2017
3. Deep Learning with Python ,Francois Chollet, Second Edition, Manning Publications,2017.
4. Deep Learning: A Practitioner's Approach , Josh Patterson and Adam Gibson, First Edition - O'Reilly , 2017.

Course Code	Course Title						Core/Elective
U21CM703	Fuzzy Logic						PE - III
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

This course will enable students to

1. Develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. Learn about the fuzzification of scalar variables and the defuzzification of membership functions.
3. Learn three different inference methods to design fuzzy rule-based system.
4. Develop fuzzy decision making by introducing some concepts and also Bayesian decision methods.
5. Learn different fuzzy classification methods.

Course Outcomes:

On completion of this course, the students are able to

1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.
2. Understand the basic features of membership functions, fuzzification process and defuzzification process.
3. Design fuzzy rule-based system.
4. Know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision-making process.
5. Gain the knowledge about fuzzy C-Means clustering.

UNIT I

Classical sets: Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets. Classical and Fuzzy relations: Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and composition, Fuzzy tolerance and equivalence relations, value assignments and other format of the composition operation.

UNIT II

Fuzzification and Defuzzification: Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, - cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, Other forms of the implication operation.

UNIT III

Fuzzy Systems: Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference, Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories.

UNIT IV

Fuzzy decision making: Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions.

UNIT V

Fuzzy Classification: Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition.

Suggested Readings:

1. Timothy J.Ross - Fuzzy logic with engineering applications, 3rd edition, Wiley,2010.
2. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi,1995.
3. S.Rajasekaran, G.A.Vijayalakshmi - Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications, PHI, New Delhi,2003.

Course Code	Course Title						Core/Elective
U21CM704	**Parallel and Distributed System**						**PE - III**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Learn about different parallel computing models.
2. Study various parallel algorithms and techniques for solving common computational problems efficiently in parallel environments.
3. Explore the principles of distributed systems, including communication protocols, distributed file systems

Course Outcomes:

On completion of this course, the students are able to

1. Understanding of the fundamental concepts, principles, and characteristics of parallel and distributed computing systems.
2. Proficiency in designing, analyzing, and implementing parallel algorithms for various computational tasks.
3. Understanding of distributed systems principles, including communication protocols, distributed file systems, distributed databases, and distributed consensus algorithms.
4. Apply parallel and distributed computing techniques to real-world problems across various domains.
5. Understand & apply logics of high level language

UNIT – I

Basic Concepts: Introduction to parallel processing, parallel processing terminology, decomposition, complexity, throughout, speedup, measures, data dependence, resource dependence, Bernstein's conditions levels of parallelism in programs. Program flow-control flow, data flow, Distributed systems – Introduction, advantages, and tightly-coupled loosely-coupled systems. Hardware and software requirements, design issues.

UNIT- II

Parallel Processing: Structure & Organization: Taxonomy of parallel processes: granularity, basic architectures, multiprocessors, vector processors, pipeline:-both linear as well as non-liner pipeline ,optimal design, Arithmetic pipeline, Instruction pipeline, Pipeline hazards and their solution ,reservation table, scheduling.

UNIT- III

Distributed Computing-introduction, definition , its history; Distributed Computing system definition and its evolution, reasons for its popularity, Strength and weaknesses of distributed computing, Different forms of Computing: Minicomputer model, workstation model, workstation server model, Processor pool Model; Cluster:- definitions, reasons for its popularity cluster computer system architecture, Windows cluster, Solaris cluster, Linux cluster; Using cluster, distributed Computing System models: Distributed operating system, Introduction to DCE, architecture of Distributed Applications.

UNIT- IV

Clock: Types of Clock, Synchronization of clocks, types of Clock synchronization algorithms, lamport time stamps, Message passing: Computer Usage / Software Requires: introduction, desirable features of a good message passing system, Issues in IPC by Message passing, synchronization, Buffering, Multi datagram messages, Encoding and decoding of message data, Process addressing, Failure handling, IPC, Distributed Election, types of election algorithms.

UNIT – V

Parallel & Distributed Programming: Parallel Programming environments, models, synchronous asynchronous programming, modulla-2, occamm, FORTRAN, DAP FORTRAN, C-linda, Actus, data flow programming, VAL etc,. MPI, Open MP

Suggested Readings:

1. Michael J. Quinn, “Parallel Computing – Theory and Practice, 2nd Edition, McGraw Hill, 1994
2. Kai Hwang, “Advanced Computer Architecture – Parallelism, Scalability, Programmability”, McGraw Hill Inc, 1993.
3. Wilkinson, “Parallel Programming using networked computer” , Pearson Education India, 20006
4. S. Lakshmivardhan and S.K. Dhall, “Analysis and design of parallel algorithm – arithmetic and matrix problems”, McGraw Hill, 1990
5. J. M. Crichlow, “An introduction to distributed and parallel computing”, PHI, 1988
6. Pradeep K. Sinha,” Distributed Systems”

Course Code	Course Title						Core/Elective
U21CM705	**Mobile Computing**						**PE - III**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Understand the concept of mobile computing paradigm, novel applications.
2. Impart knowledge on the typical mobile networking Infrastructure through a popular GSM protocol.

Course Outcomes:

On completion of this course, the students are able to

1. Infer knowledge about mobile communications and its services.
2. Identifying several communication access techniques.
3. Determine the functionality of MAC, Network layer and identifying a routing protocol for given Adhoc Networks.
4. Identify and solve database issues using hoarding techniques.

UNIT I

Introduction to Mobile Computing - Architecture of Mobile Computing - Novel Applications – Limitations. GSM - GSM System Architecture - Radio Interface – Protocols - Localization and Calling - Handover - Security - New Data Services.

UNIT II

Medium Access Control Protocol - Wireless MAC Issues - Hidden and exposed terminals - near and far terminals – SDMA – FDMA – TDMA – CDMA - Tunnelling Cellular Mobility - IPv6.

UNIT III

Mobile IP – Goals – Assumption - Entities and Terminology - IP Packet Delivery - Agent Advertisement and Discovery – Registration - Tunnelling and Encapsulation – Optimizations -Dynamic Host Configuration Protocol.

UNIT IV

Traditional TCP - Indirect TCP - Snooping TCP - Mobile TCP - Fast Retransmit and Fast Recovery - Transmission /Time-Out Freezing - Selective Retransmission - Transaction Oriented TCP.

UNIT V

Hoarding Techniques - Caching Invalidation Mechanisms - Client Server Computing with Adaptation- Power Aware and Context Aware Computing - Transactional Models - Query Processing – Recovery - and Quality of Service Issues.

Suggested Readings:

1. Jochen Schiller, “Mobile Communications”, Second edition Addison-Wesley, 2008.
2. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, Cambridge University Press, October 2004.
3. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden, Schwiebert, Loren, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional, 2005.
4. Hansmann, Merk, Nickolas, Stober, “Principles of Mobile Computing”, second edition, Springer, 2003.Martyn Mallick, “Mobile and Wireless Design Essentials”, Wiley DreamTech, 2003.
5. Ivan Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002.

Course Code	Course Title						Core/Elective
U21CM706	**Computer Graphics and 3D Design & Printing**						**PE - III**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Understand the principles and fundamentals of computer graphics.
2. Gain proficiency in 3D modeling and rendering techniques.
3. Explore the principles and technologies of 2D printing and additive manufacturing.
4. Apply graphic design principles and techniques to create visually appealing digital artwork.

Course Outcomes:

On completion of this course, the students are able to

1. Understanding of the principles and concepts of computer graphics, including raster and vector graphics, image processing, and 3D modeling.
2. Proficiency in 3D modeling techniques using software tools such as Autodesk Maya or Blender, including creating and manipulating 3D objects, texturing, and shading.
3. Knowledge of various 3D printing technologies, materials, and processes, and understand the considerations for designing models for 3D printing.

UNIT – I

An Introduction Graphics System: Computer Graphics and Its Types, Application of computer graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software.

UNIT – II

Output Primitives and Attributes of Output Primitives: Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Attributes of Output Primitives: Line Attributes, Color and Grayscale Levels, Area fill Attributes, Character Attributes, Bundled Attributes, Antialiasing.

UNIT - III

Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing: The viewing Pipeline, Window to view port coordinate transformation.

UNIT – IV

Three-Dimensional Concepts: Three-Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

UNIT – V

Overview of 3D printing technologies, Types of 3D printers and materials, Preparing models for 3D printing (e.g., file formats, slicing software), Case studies of computer graphics and 3D printing in various industries (e.g., architecture, healthcare, entertainment), Future trends and developments in the field.

Suggested Readings:

1. Computer Graphics: Principles and Practice" by John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley.
2. Fundamentals of Computer Graphics" by Peter Shirley, Steve Marschner

Course Code	Course Title						Core/Elective
U21CM7L1	**Information Security Lab**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Computer Networks	**-**	**-**	**-**	**2**	**25**	**50**	1

Course Objectives:

Students will try to learn:

1. Learn to implement the algorithms DES, RSA, MD5, SHA-1
2. Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

Course Outcomes:

On completion of this course, the students are able to

1. Implement the cipher techniques
2. Develop the various security algorithms
3. Use different open source tools for network security and analysis
4. Apply network security concepts in various real world scenarios.

LIST OF EXPERIMENTS:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts
   a) Caesar Cipher
   b) Playfair Cipher
   c) Hill Cipher
   d) Vigenere Cipher
   e) Rail fence – row & Column Transformation
2. Implement the following algorithms
   a) DES
   b) RSA Algorithm
   c) Diffiee-Hellman
   d) MD5
   e) SHA-1
3. Implement the Signature Scheme - Digital Signature Standard
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG)
5. Setup a honey pot and monitor the honeypot on network (KF Sensor)
6. Installation of rootkits and study about the variety of options.

Course Code	Course Title						Core/Elective
U21CM7L2	**Deep Learning Techniques Lab**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Python Programming	**-**	**-**	**-**	**2**	**25**	**50**	**1.5**

Course Objectives:

Students will try:

1. Understand the concepts of Artificial Neural Networks and Deep Learning concepts.
2. Implement ANN and DL algorithms with Tensor flow and Keras.
3. Gain knowledge on Sequence learning with RNN.
4. Gain knowledge on Image processing and analysis with CNN
5. Get information on advanced concepts of computer vision.

Course Outcomes:

On completion of this course, the students are able to

1. Develop ANN without using Machine Learning/Deep learning libraries.
2. Understand the Training ANN model with back propagation.
3. Develop model for sequence learning using RNN.
4. Develop image classification model using ANN and CNN.
5. Generate a new image with auto-encoder and GAN.

List of Experiments:

1. Create Tensors and perform basic operations with tensors.
2. Create Tensors and apply split & merge operations and statistics operations.
3. Design single unit perceptron for classification of iris dataset without using predefined models
4. Design, train and test the MLP for tabular data and verify various activation functions and optimizers tensor flow.
5. Design and implement to classify 32x32 images using MLP using tensorflow/keras and check the accuracy.
6. Design and implement a simple RNN model with tensorflow / keras and check accuracy.
7. Design and implement LSTM model with tensorflow / keras and check accuracy.
8. Design and implement GRU model with tensorflow / keras and check accuracy.
9. Design and implement a CNN model to classify multi category JPG images with tensorflow / keras and check accuracy. Predict labels for new images.
10. Design and implement a CNN model to classify multi category tiff images with tensorflow / keras and check the accuracy. Check whether your model is overfit / underfit / perfect fit and apply the techniques to avoid overfit and underfit like regulizers, dropouts etc.
11. Implement a CNN architectures (LeNet, Alexnet, VGG, etc) model to classify multi category Satellite images with tensorflow / keras and check the accuracy. Check whether your model is overfit / underfit / perfect fit and apply the techniques to avoid overfit and underfit.
12. Implement an Auto encoder to de-noise image.
13. Implement a GAN application to convert images.

Suggested Readings:

1. Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan, C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education, 2004.

Course Code	Course Title						Core/Elective
U21CM7P1	**Major Project Phase – I**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
_	**-**	**-**	**-**	**2**	**25**	**50**	**1.5**

Course Objectives:

This course will enable students to

1. To enhance practical and professional skills
2. To familiarize tools and techniques of systematic literature survey and documentation
3. To expose the students to industry practices and team work.
4. To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes:

On completion of this course, the students are able to

1. Possess a solid understanding of project management principles and methodologies applicable to engineering projects.
2. Demonstrate proficiency in conducting literature reviews, research, and preliminary design activities.
3. Develop comprehensive project proposals that effectively communicate project objectives, methodologies, and timelines.
4. Apply engineering tools and software for modeling, simulation, and analysis in the context of their project requirements.
5. Communicate project ideas, progress, and findings clearly and persuasively through written reports, presentations, and other media.
6. Adhere to ethical guidelines and professional standards in all aspects of project planning and execution.

Guidelines:

- **Project Topic Selection and Allocation:**
  1. Project topic selection Process to be defined and followed:
  2. Project orientation can be given at the end of sixth semester.
  3. Students should be informed about the domain and domain experts whose guidance can be taken before selecting projects.
  4. Students should be recommended to refer papers from reputed conferences/ journals like IEEE, Elsevier, ACM etc. which are not more than 3 years old for review of literature.
  5. Students can certainly take ideas from anywhere but be sure that they should evolve them in a unique way to suit their project requirements. Students can be informed to refer Digital India portal, SIH portal or any other hackathon portal for problem selection.
- **Topics can be finalized with respect to following criterion:**
  1. Topic Selection: The topics selected should be novel in nature (Product based, Application based, or Research based) or should work towards removing the lacuna in currently existing systems
  2. Technology Used: Use of the latest technology or modern tools can be encouraged.
  3. Students should not repeat work done previously (work done in the last three years).
  4. Project work must be carried out by a group of at least 2 students and a maximum of 4.
  5. The project work can be undertaken in a research institute or organization/Industry/any business establishment. (Out-house projects)
  6. The project proposal presentations can be scheduled according to the domains and should be judged by faculty who are experts in the domain.
  7. The head of department and senior staff along with project coordinators will take decision regarding final selection of projects.
  8. Guide allocation should be done, and students have to submit weekly progress reports to the internal guide.
  9. Internal guide has to keep track of the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks.
  10. In the case of industry/ out-house projects, a visit by internal guide will be preferred and external members can be called during the presentation at various levels.

Project Report Format:

A project report should preferably contain at least following details:

- Abstract
- Introduction
- Literature Survey/ Existing system
- Limitation Existing system or research gap
- Problem Statement and Objective
- Proposed System
- Analysis/Framework/ Algorithm
- Design details
- Methodology (your approach to solve the problem) Proposed System
- Experimental Set up
- Details of Database or details about input to systems or selected data
- Performance Evaluation Parameters (for Validation)
- Software and Hardware Set up
- Implementation Plan for Next Semester
- Timeline Chart for Term1 and Term-II (Project Management tools can be used.)
- References

Term Work:

Distribution of marks for term work shall be done based on following:

1. Weekly Log Report
2. Project Work Contribution
3. Project Report (Spiral Bound) (both side print)
4. Term End Presentation (Internal)

Oral and Practical:

The Oral and Practical examination (Final Project Evaluation) of Major Project Phase - I should be conducted by Internal and External examiners approved by Institute at the end of the semester.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
SCHEME OF INSTRUCTIONS & EXAMINATIONS [LR-21]
(W.e.f Academic Year 2024-25)

B.E.VIII- Semester

S.No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	CIE	SEE	Durationin Hours	
Theory Course											
1	-	PCC	Professional Elective – V	3	0	0	3	40	60	3	3
2	-	OEC	Open Elective – III	3	0	0	3	40	60	3	3
3	-	OEC	Open Elective – IV	3	0	0	3	40	60	3	3
Practical/Laboratory Course											
8	U21CM8P1	PROJ	Technical Seminar	0	0	4	4	100	-	-	2
8	U21CM8P2	PROJ	Major Project Phase – II	0	0	16	16	50	150	-	8
Total				**9**	**0**	**20**	**29**	**270**	**330**	**-**	**19**

L: Lecture*(Hrs/Wk/Sem)* **T**:Tutorial*(Hrs/Wk/Sem)* **P**:Practical **D**:Drawing*(Hrs/Wk/Sem)*
CIE: Continuous Internal Evaluation **SEE**: Semester End Examination
CM: CSE-AIML **OEC**: Open Elective Course
PEC: Professional Elective Course **PROJ:** Project **AM:** AI&ML

Note:

1. Each contact hour is a Clock Hour.
3. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title						Core/Elective
U21CM707	**Optimization Techniques**						**PE - IV**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Machine Learning	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Introduction to optimization techniques using both linear and non-linear programming.
2. Introduction to linear algebra and probability theory, students will learn to frame engineering minima maxima problems in the framework of optimization problems.

Course Outcomes:

On completion of this course, the students are able to

1. Comprehend the techniques and applications of Engineering optimization.
2. Analyze characteristics of a general linear programming problem.
3. Analyze optimization methods based on the behaviour of biological and swarm of insects.
4. Analyze and appreciate variety of performance measures for various optimization problems.
5. Apply various classical optimization techniques

UNIT-I

Introduction to Classical Methods & Linear Programming Problems Terminology, Design Variables, Constraints, Objective Function, Problem Formulation. Calculus method, Kuhn Tucker conditions, Method of Multipliers.

UNIT-II

Linear Programming Problem, Simplex method, Two-phase method, Big-M method, duality, Integer linear Programming, Dynamic Programming, Sensitivity analysis.

UNIT-III

Optimality Criterion, Bracketing Methods, Region Elimination Methods, Interval Halving Method, Fibonacci Search Method, Golden Section Method. Gradient Based Methods: Newton-Raphson Method, Bisection Method, Secant Method, Cubic search method.

UNIT-IV

Multi Variable and Constrained Optimization Technique, Optimality criteria , Direct search Method, Simplex search methods, Hooke-Jeeve‘s pattern search method, Powell‘s conjugate direction method, Gradient based method, Cauchy‘s Steepest descent method, Newton‘s method, Conjugate gradient method. Kuhn - Tucker conditions, Penalty Function, Concept of Lagrangian multiplier, Complex search method, Random search method

UNIT-V

Introduction to Intelligent Optimization, Genetic Algorithm: Types of reproduction operators, crossover & mutation, Simulated Annealing Algorithm, Particle Swarm Optimization (PSO), Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

Suggested Readings:

1. S. S. Rao, Engineering Optimisation: Theory and Practice , Wiley, 2008.
2. K. Deb, Optimization for Engineering design algorithms and Examples , Prentice Hall, 2 nd edition 2012.
3. C.J. Ray, Optimum Design of Mechanical Elements , Wiley, 2007.
4. R. Saravanan, Manufacturing Optimization through Intelligent Techniques , Taylor & Francis Publications, 2006.
5. D. E. Goldberg, Genetic algorithms in Search, Optimization, and Machine Learning , Addison-Wesley Longman Publishing, 1989.

Course Code	Course Title						Core/Elective
U21CM708	**Cloud Computing**						**PE - IV**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. This course provides an insight into cloud computing
2. Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.

Course Outcomes:

On completion of this course, the students are able to

1. Understand various service delivery models of a cloud computing architecture.
2. Understand the ways in which the cloud can be programmed and deployed.
3. Gain knowledge of cloud applications
4. Design various cloud service models
5. Explore some important cloud computing driven commercial systems

UNIT - I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT - II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT - III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT - IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud.

Suggested Readings:

1. Essentials of cloud Computing: K. Chandrasekharan, CRC press, 2014
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
3. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
4. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

Course Code	Course Title						Core/Elective
U21CM709	**Social media and Data Analytics**						**PE - IV**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

1. Understand the role of social media in engineering and its impact on society.
2. Learn data analytics techniques for analyzing social media data.
3. Explore methods for extracting insights and trends from social media data.
4. Develop skills in using data analytics tools and software for social media analysis.
5. Apply data analytics techniques to engineering problems in the context of social media.

Course Outcomes:

On completion of this course, the students are able to

1. Understanding of various social media platforms, including their functionalities, user demographics, and engagement metrics.
2. Collect and process data from social media platforms using appropriate tools and techniques.
3. Interpret the results of data analysis and draw insights from social media data to inform decision-making processes.
4. Develop skills in developing and implementing social media strategies for engineering projects.
5. Analyze the emerging problems of social media analytics with sentiment analysis and opinion mining

UNIT – I

Overview of social media platforms and their impact on society, Introduction to data analytics and its applications in engineering, Ethical and legal considerations in social media data analysis.

UNIT – II

Methods for collecting data from social media platforms (e.g., APIs, web scraping), Data preprocessing techniques (e.g., cleaning, filtering, normalization), Introduction to data management tools (e.g., SQL databases)

UNIT – III

Exploratory data analysis (EDA) techniques for social media data, Statistical analysis methods (e.g., hypothesis testing, correlation analysis), Introduction to machine learning algorithms for social media analysis

UNIT – IV

Text mining techniques for analyzing social media text data (e.g., sentiment analysis, topic modeling), Network analysis methods for analyzing social media networks (e.g., centrality measures, community detection), Visualization techniques for presenting social media insights.

UNIT – V

Case studies and applications of social media data analytics in engineering fields (e.g., product design, marketing, customer feedback analysis)

Suggested Readings:

1. Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Instagram, GitHub, and More" by Matthew A. Russell.
2. Social Media Data Mining and Analytics" by Gabor Szabo, Oscar Boykin

Course Code	Course Title						Core/Elective
U21CM710	**Multimedia and Animation**						**PE - IV**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Understand the principles and fundamentals of multimedia design and animation.
2. Learn animation principles and techniques for creating engaging animations.
3. Develop skills in 3D modeling and visualization for engineering applications.
4. Apply multimedia and animation techniques to communicate engineering concepts effectively.

Course Outcomes:

On completion of this course, the students are able to

1. Understanding of multimedia design principles and concepts, including the integration of text, graphics, audio, video, and animation.
2. Gain proficiency in using industry-standard multimedia authoring software tools.
3. Acquire skills in audio and video editing, including editing, mixing, and assembling audio and video clips using software tools like Adobe Premiere Pro.
4. Introduction to 3D modeling and animation concepts, learning to create and manipulate 3D models.
5. Explore the applications of multimedia and animation in engineering fields

UNIT – I

Overview of multimedia concepts and applications, Digital media fundamentals: image, sound, video, and animation, Multimedia authoring tools and software, Basics of digital imaging and graphics creation, Introduction to graphic design software (e.g., Adobe Photoshop, GIMP), Creating and manipulating digital images and graphics.

UNIT – II

Principles of animation: timing, spacing, squash and stretch, anticipation, Introduction to animation software (e.g., Adobe Animate, Blender), Creating simple animations using keyframe animation techniques, Advanced animation techniques: rigging, inverse kinematics, dynamics, Character animation: walk cycles, facial expressions, lip-syncing, Applying animation principles to engineering simulations and visualizations

UNIT – III

Principles of 2D animation, Creating and editing animation sequences, Introduction to Adobe Animate for 2D animation, Basics of 3D modeling, Creating and editing 3D models, Introduction to Autodesk Maya or Blender for 3D modeling and animation.

UNIT – IV

Integrating multimedia elements into interactive presentations, Introduction to multimedia authoring tools with interactive capabilities (e.g., Adobe Flash, Unity), Applications of multimedia and animation in engineering fields, Case studies of multimedia use in engineering design, simulation, and visualization

UNIT – V

Ethical and legal considerations in multimedia creation and distribution, Copyright, fair use, and licensing issues, Collaborative multimedia project in engineering application domain, Case studies on different animation techniques

Suggested Readings:

1. Multimedia: Making It Work" by Tay Vaughan
2. The Animator's Survival Kit" by Richard Williams
3. ACM Transactions on Multimedia Computing, Communications, and Applications (TOMCCAP)
4. IEEE Transactions on Visualization and Computer Graphics (TVCG)

Course Code	Course Title						Core/Elective
U21CM801	**Machine Vision**						**PE - V**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Machine Learning	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Understanding of components of vision system.
2. Understanding principles of vision system.
3. Understanding different techniques of Object recognition.
4. Understanding Image processing techniques.
5. Analysis the application of machine vision in industrial application.

Course Outcomes:

On completion of this course, the students are able to

1. Knowledge or gadgets of vision systems
2. Ability to understand the image capturing and processing techniques
3. Ability to apply the vision system in other machines
4. Knowledge for recognizing the objects
5. Knowledge in application of vision and image processing in robot operations.

UNIT – I

Vision System: Basic Components – Elements of visual perception, Lenses: Pinhole cameras, Gaussian Optics-cameras-computer interfaces.

UNIT – II

Vision Algorithms: Fundamental Data Structures: Images, Regions, Sub-pixel Precise Contours – Image Enhancement: Gray value transformations, image smoothing, Fourier Transform – Geometric Transformation - Image segmentation – Segmentation of contours, lines, circles and ellipses – Camera calibration – Stereo Reconstruction.

UNIT – III

Object Recognition: Object recognition, Approaches to Object Recognition, Recognition by combination of views – objects with sharp edges, using two views only, using a single view, use of dept values.

UNIT – IV

Applications: Transforming sensor reading, Mapping Sonar Data, aligning laser scan measurements - Vision and Tracking: Following the road, Iconic image processing, Multiscale image processing, Video Tracking - Learning landmarks: Landmark spatiograms, K-means Clustering, EM Clustering.

UNIT – V

Robot Vision: Basic introduction to Robotic operating System (ROS) - Real and Simulated Robots - Introduction to OpenCV, Open NI and PCL, installing and testing ROS camera Drivers, ROS to OpenCV - The cv bridge Package.

Suggested Readings:

1. Rafael C. Gonzalez and Richard E.woods, “Digital Image Processing”, Addition - WesleyPublishing Company, New Delhi, 2007.
2. Shimon Ullman, “High-Level Vision: Object recognition and Visual Cognition”, A Bradford Book,USA, 2000.
3. Damian m Lyons,“Cluster Computing for Robotics and Computer Vision”, World Scientific, Singapore 2021.

Course Code	Course Title						Core/Elective
U21CM802	**Internet of Things**						**PE - V**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Impart necessary and practical knowledge of components of Internet of Things
2. Develop skills required to build real-life IOT based projects.

Course Outcomes:

On completion of this course, the students are able to

1. Understand Internet of Things and its hardware and software components
2. Interface I/O devices, sensors & communication modules
3. Remotely monitor data and control devices
4. Develop real life IOT based projects
5. Summarize the genesis and impact of IoT applications, architectures in real world.

UNIT – I

Introduction to IOT: Definition, Characteristics of IOT, Physical Design of IOT, Logical Design of IOT, IOT Levels and Deployment Templates, IOT Sensors and Actuators. IOT Applications: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.

UNIT – II

Arduino Programming: Arduino and ESP8266 boards. Arduino IDE programming, working with sensors and actuators, libraries, digital interfaces. Interfacing with analog and digital devices, working with Bluetooth and Wi-Fi modules.

UNIT – III

IOT Enabling Technologies: RFID and NFC, Bluetooth Low Energy (BLE), Wi-Fi, 6LowPAN, ZigBee, Z-Wave, LoRa, Protocols- HTTP, WebSocket, MQTT, CoAP, XMPP, Node- RED

UNIT – IV

IOT & M2M: M2M, Differences between IOT and M2M, SDN and NFV for IOT IOT System Management: Need for IOT System management, SNMP, NETCONF, YANG, IOT system management with NETCONF-YANG.

UNIT – V

IOT Platforms: IBM Watson IOT, Bluemix, Eclipse IOT, AWS IOT, Microsoft Azure IOT Suite, Google Cloud IOT, Thing Worx, GE Predix, Xively.

Suggested Readings:

1. Vijay Madisetti, Arshdeep Bahga, İnternet of Things, “A Hands on Approach”, University Press.
2. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, 1st Edition, 2007, CRC Prefer
3. Raj Kamal, “Internet of Things: Architecture and Design”, 2nd Edition, 2022, McGraw Hill
4. Cuno Pfister, “Getting Started with the Internet ofThings”, 2011, O Reilly Media

Course Code	Course Title						Core/Elective
U21CM803	**Big Data Analytics**						**PE - V**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
DBMS	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Understand big data for business intelligence.
2. Identify business case studies for big data analytics.
3. Defend big data Without SQL.
4. Discuss the process of data analytics using Hadoop and related tools.

Course Outcomes:

On completion of this course, the students are able to

1. Demonstrate big data and use cases from selected business domains.
2. Apply the knowledge of NoSQL big data management and experiment with Install, configure, and run Hadoop and HDFS.
3. Analyze map-reduce analytics using Hadoop.
4. Adapt Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics.
5. Devise solutions for real world use cases using appropriate big data concepts.

UNIT-1

Understanding Big Data: Characteristics of Data, Introduction to Big Data and its importance, Challenges posed by Big Data, Big data analytics and its classification, Big data applications: big data and healthcare – big data in banking – advertising and big data, big data technologies.

Unit 2

Hadoop Distributed File System: Hadoop Ecosystem, Hadoop Architecture, HDFS Concepts, Blocks, Name nodes and Data nodes, Hadoop File Systems, The Java Interface, Reading Data from a Hadoop URL, Writing Data, Querying the File System, Deleting Data.

Unit 3

NOSQL Data Management: Introduction to NOSQL – aggregate data models, aggregates key value and document data models, relationships – graph databases, schema less databases, Sharding - map reduce – partitioning and combining – composing map-reduce calculations.

Unit 4

Map Reduce and Yarn: Hadoop Map Reduce paradigm, Map and Reduce tasks, Job and Task trackers, Mapper, Reducer, Map Reduce workflows, classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – Map Reduce types – input formats – output formats

Unit 5

Pig: Installing and Running Pig, an Example, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators. Hive: The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data.

Suggested Readings:

1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilly, 2012, ISBN -13: 978-1449311520, ISBN-10: 1449311520
2. Pramod Sadalage, Martin Fowler, "NoSQL Distilled - A brief guide to the emerging world of polyglot", Addison Wesley 2013
3. Eric Sammer, "Hadoop Operations", O'Reilly, 2012, ISBN -13 978-1449327057, ISBN-10: 1449327052
4. VigneshPrajapati, Big data analytics with R and Hadoop, 2013, ISBN -13: 978- 1782163282
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilly, 2012, ISBN -13: 978-1449319335

Course Code	Course Title						Core/Elective
PEC844CM	**Virtual, Augmented and Mixed Reality**						**PE - V**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

This course will enable students to

1. Develop a foundational understanding of virtual reality (VR), augmented reality (AR), and mixed reality (MR) technologies.
2. Learn about display technologies, tracking systems, input devices, and immersive audio in the context of virtual environments.
3. Learn to integrate multimedia assets, including graphics, audio, and video, into immersive experiences.
4. Focus on designing intuitive and engaging user interfaces (UI) for VR, AR, and MR applications.

Course Outcomes:

On completion of this course, the students are able to

1. Demonstrate understanding and design of VR/AR technology relates to human perception and cognition.
2. Ability to design 3D interaction techniques.
3. Demonstrate understanding of fundamental computer vision, computer graphics and human-computer interaction techniques related to MR/VR/AR.
4. Demonstrate insights to key application areas for VR/AR.
5. Able to create applications of VR to the conduct of scientific research, training, and industrial design.

UNIT – I

Introduction of Virtual Reality: Introduction, Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality. Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Virtuality and Immersion, Current trends and state of the art in immersive technologies, developing platforms and consumer devices. Scientific Landmark 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modelling, Illumination models, Reflection models, Shading algorithms.

UNIT – II

Interactive Techniques in Virtual Reality: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

UNIT – III

Visual Computation in Virtual Reality: Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

UNIT – IV

Augmented and Mixed Reality: Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

UNIT – V

Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

Suggested Readings:

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
3. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
4. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
5. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

Course Code	Course Title						Core/Elective
U21CM8P1	**Technical Seminar**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**-**	**-**	**-**	**4**	**100**	**-**	**2**

Course Objectives

The course will introduce the students to

1. Prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes.
2. Gain confidence in facing the placement interviews.
3. Enrich the communication skills of the student and presentations of technical topics of interest, this course are introduced.
4. Use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
5. Encourage and motivate the students to read and collect recent and reliable information about their area of interest confined to the relevant discipline, from technical publications.

Course Outcomes

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

1. Develop the habit of referring the journals for literature review
2. Understand the gist of the research paper.
3. Identify the potential for further scope.
4. Present the work in an efficient manner.
5. Write the documentation in standard format

Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20minutes in PowerPoint, followed by Question and Answers session for 10 minutes.

2. Submit the detailed report of the seminar in spiral bound in a précised format assuggested by theDepartment.
Guidelines for awarding marks

S. No	**Description**	**Max. Marks**
1	Contents and relevance	20
2	Presentation skills	20
3	Preparation of PPT slides	10
4	Questions and answers	10
5	Report in a prescribed format	40

.

Note:

1. The seminar presentation should be a gist of at least five research papers from Peer-reviewed or UGC recognized journals.

2. The seminar report should be in the following order: Background of work, literature review, techniques used, prospective deliverables, and discussion on results, conclusions, critical appraisal and reference.

3. At least two faculty members will be associated with the seminar presentation to evaluate and award marks.

4. Attendance of all the students for weekly seminar presentations is compulsory. If the student fails to secure minimum attendance as per O.U. rules, the marks awarded in the seminar presentation shall remain void.

Course Code	Course Title						Core/Elective
U21CM8P1	**Major Project Phase - II**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
_	**-**	**-**	**-**	**2**	**50**	**150**	**8**

Course Objectives:

The Project work facilitates the students

1. To enhance practical and professional skills
2. To familiarize tools and techniques of systematic Literature survey and documentation
3. To expose the students to industry practices and team work.
4. To encourage students to work with innovative and entrepreneurial ideas

Course Outcomes:

By the end of this course, the students will be able to

1. Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the
1. academic program to real-world problems.
2. Evaluate different solutions based on economic and technical feasibility
3. Effectively plan a project and confidently perform all aspects of project management
4. Demonstrate effective written and oral communication skills

Guidelines:

1. Internal guide has to keep track of the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks.

The department will appoint a project coordinator who will coordinate the following:

1. Re-grouping of students - deletion of internship candidates from groups made as part of project Work-I
2. Re-Allotment of internship students to project guides
3. Project monitoring at regular intervals

Project Report Format: At the end of semester, each group needs to prepare a project report as per the guidelines issued by the Institute. Report should be submitted in hardcopy. Also, each group should submit softcopy of the report along with project documentation, implementation code, required utilities, software and user Manuals.

A project report should preferably contain at least following details:

- Abstract
- Introduction
- Literature Survey/ Existing system
- Limitation Existing system or research gap
- Problem Statement and Objective
- Proposed System
- Analysis/Framework/ Algorithm
- Design details
- Methodology (your approach to solve the problem) Proposed System
- Experimental Set up
- Details of Database or details about input to systems or selected data
- Performance Evaluation Parameters (for Validation)
- Software and Hardware Set up
- Results and Discussion
- Conclusion and Future Work
- References

- Appendix – List of Publications or certificates

Desirable:
Students should be encouraged –

- To participate in various project competitions.
- To write minimum one technical paper & publish in good journal.
- To participate in national / international conferences.

Term Work:

- Distribution of marks for term work shall be done based on following:
- Weekly Log Report
- Completeness of the project and Project Work Contribution
- Project Report (Black Book) (both side print)
- Term End Presentation (Internal)

The final certification and acceptance of TW ensures satisfactory performance in the above aspects.

Oral & Practical:
Oral &Practical examination (Final Project Evaluation) of Major Project Phase - 2 should be conducted by Internal and External examiners approved by Institute at the end of the semester.