Academic Program: UG

Academic Year 2023-24

Syllabus

VII & VIII Semester B.E.

Information Science and Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,

DHARWAD – 580 002

(An Autonomous Institution approved by AICTE & Affiliated to VTU, Belagavi)

Ph: **0836-2447465 Fax:0836-2464638** **Web:** www.sdmcet.ac.in

SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for **VII & VIII** semester of UG program in **Information Science & Engineering** is recommended by Board of Studies of **Information Science & Engineering** Department and approved by the Academic Council, SDM College of Engineering &Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2023-24 till further revision.

Principal Chairman BoS & HoD

SDM College of Engineering & Technology, Dharwad

Department of **Information Science & Engineering**

(Our motto: Innovation through Information Technology)

College Vision and Mission

Vision:

To develop competent professionals with human values.

Mission:

1. To have contextually relevant Curricula.
2. To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
3. To enhance Research Culture.
4. To involve Industrial Expertise for connecting classroom content to real life situations.
5. To inculcate Ethics and impart soft-skills leading to overall Personality Development.

SDMCET- Quality Policy

- In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

SDMCET- Core Values

- Competency
- Commitment
- Equity
- Team work and
- Trust

DEPARTMENT VISION AND MISSION

Vision:

To develop competent Information Technology Engineers having complete

knowledge and skills in contemporary Information Technology practices.

Mission:

- To develop contemporary curriculum in information technology delivered
- To provide facilities for relevant research and expose students to the best
- To inculcate the best moral values and professional ethics in students

Program Educational Objectives (PEOs):

- Develop into Information Technology Professionals with expertise in providing solutions to Information Engineering problems
- Pursue higher studies with the sound knowledge of basic concepts and skills in basic science, humanities and Information Technology disciplines
- Exhibit professionalism and team work by providing the environment for exploring current technology trends through collaborative and complementary work ethics

POs and PSOs

PO 1.**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO 2.**Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3.**Design/Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4.**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5.**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6.**The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7.**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.

PO 8.**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9.**Individual and Team work:** Function effectively as an individual and as a member or leader in diverse teams and individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10.**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, and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11.**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and 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.

PO 12. **Life-long Learning:** long learning: Recognize the need for and have the Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-13. An ability to develop logical reasoning, coding skills, analysis and mathematical modeling.

PSO-14. An ability to modify, debug, test and adapt software modules for varied applications.

Scheme for VII Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs./Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration in Hrs.
18UISC700	PC	Big Data Analytics	3-2-0	4	50	100	3	-	-
18UISC701	PC	Storage Management	4-0-0	4	50	100	3	-	-
18UISO7XX	PE	Program Elective-4	3-0-0	3	50	100	3	-	-
18UISE7XX	OE	Open Elective	3-0-0	3	50	100	3	--	--
18UISL702	PC	Big Data Analytics Lab	0-0-2	1	50	--	--	50	3
18UISL703	PC	Major Project Phase-1	0- 0 -4	2	50	--	--	50	3
18UISL704	PC	Internship	4 weeks	2	50	--	--	50	3
Total			**13-2-6**	**19**	**350**	**400**		**150**	

CIE: Continuous Internal Evaluation **SEE**: Semester End Examination* **L**: Lecture **T**: Tutorials **P**: Practical
*SEE for theory courses is conducted for 100 marks and reduced to 50 marks
PC- Program Core
Elective

Code	Elective – 4	Code	Open Elective
18UISE711	Digital Image Processing	18UISO721	Cloud Computing
18UISE712	Mobile Communication and Computing	18UISO722	Supply Chain Management
18UISE713	Deep Learning	18UISO723	Virtual Reality and Augmented Reality

Scheme for VIII Semester

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs./Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration in Hrs.
18UISC800	PC	Cryptography and Cyber Security	4-0-0	4	50	100	3	-	-
18UIS8XX	PE	Program Elective-5	3-0-0	3	50	100	3	-	-
18UISO8XX	OE	Open Elective	3-0-0	3	50	100	3	--	--
18UISL801	PC	Technical Seminar	0-0-2	1	50	--	--	--	--
18UISL802	PC	Major Project Phase-2	0-0 -12	7	50	--	--	50	3
Total			**10-0-14**	**18**	**250**	**300**	**--**	**50**	**--**

PC- Program Core
PE-Program Elective
OE- Open Elective

Total Credits offered for the Fourth year: 37

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Elective

Code	Program Elective-5	Code	Program / Open Elective
18UISE811	Wireless Sensor Networks	18UISO821	DevOps
18UISE812	Block Chain Management	18UISO822	Data Sciences
18UISE813	Data Compression	18UISO823	Computer Vision

VII Semester

18UISC700	Big Data Analytics	(3-2-0) 4

Contact Hours: **52**

Course Learning Objectives (CLOs): Students should understand big data for business intelligence, to learn business case studies for big data analytics To Manage big data without SQL, to understand map-reduce analytics using Hadoop and related tools to explore more on Hadoop related tools

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Illustrate** big data and use cases from selected business domains	-	1	-
CO-2	**Illustrate** NoSQL big management	-	1	2
CO-3	**Interpret, configure** Hadoop and HDFS	-	2,5	-
CO-4	**Demonstrate** map-reduce analytics using Hadoop	-	1,5	13
CO-5	**Apply** Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics.	-	5	1,14

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	1.75	1.5	-	-	2.0	-	-	-	-	-	-	-	1.0	1.0

Prerequisites:

1) Knowledge of data structure, data bases and basic statistics,
2) Some programming experiences.

Contents:

Unit-I

Introduction to Big Data: What is Analytics? What is Big Data? Characteristics of Big Data, Domain Specific Examples of Big Data, Analytics Flow for Big Data, Big Data Stack, Mapping analytics Flow to Big Data Stack, Case Study: Genome Data Analysis, Case Study: Weather Data Analysis, Analytics Patterns.

Setting up Big Data Stack: Horton works Data Platform (HDP), Cloud era CDH Stack, Amazon Elastic MapReduce (EMR), Azure HD Insight. **8L+4T= 12 Hrs**

Unit-II

Big Data Patterns: Analytics Architecture Components &Design Styles, MapReduce Patterns.

NoSQL: Key-Value Databases, Column Family Data bases, Graph Databases, Neo4j **8L+2T= 10 Hrs**

Unit-III

Data Acquisition: Data Acquisition Considerations, Publish -Subscribe Messaging Frameworks, Big Data Collection Systems, Messaging Queues, Custom Connectors. **7L+3T= 10 Hrs**

Big Data Storage: HDFS, HDFS Architecture, HDFS Usage Examples

Unit-IV

Batch Analysis: Hadoop and MapReduce, Hadoop – Map Reduce Examples, Pig, Case Study: Batch Analysis of News Articles, ApacheOozie, Apache Spark, Search

Real-time Analysis: Stream Processing, Storm Case Studies, In-Memory Processing, Spark Case Studies. **7L+3T= 10 Hrs**

Unit-V

Interactive Querying: Spark SQL, Hive, Amazon Redshift, Google BigQuery.

Serving Databases & Web Frameworks: Relational (SQL)Databases, Non-Relational (NoSQL) Databases, Python Web Application Framework - Django, Case Study: Django application for viewing weather data, Analytics Algorithms, Data Visualization **9L+1T= 10 Hrs**

Reference Books:

1) Vijay Madisetti, Arshdeep Bahga, ”Big Data Science & Analytics: A Hands-On Approach”, Published by VPT (2016)
2) Tom White, "Hadoop: The Definitive Guide", 3/e, O'Reilley, 2012.
3) Eric Sammer, "Hadoop Operations", 1/e, O'Reilley, 2012.
4) VigneshPrajapati, Big data analytics with R and Hadoop, 1/e, SPD 2013.
5) E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", 1/e, O'Reilley, 2012.

6) Lars George, "HBase: The Definitive Guide", 1/e, O'Reilley, 2011.
7) Alan Gates, "Programming Pig", 1/e, O'Reilley, 2011.

18UISC701	Storage Management	(4-0-0) 4

Contact Hours: **52**

Course Learning Objectives (CLOs): The main objective of this course is to provide an understanding of storage architectures its logical and physical components including storage subsystems, RAID and Intelligent storage systems,storage networking technologies such as FC-SAN, NAS,and data archival solution – CAS. Identifying different storage virtualization backup technologies, storage security domains its management and their benefits.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain storage architecture Its logical and physical components of a storage infrastructure including storage subsystems, Different RAID techniques	-	4	1,13,14
CO-2	Describe the intelligent storage systems including different networking technologies such as FC-SAN and Virtualization in SAN	2	-	12
CO-3	Describe the different network attached storage systems its components and its implementations	1	-	13,14
CO-4	Explain the different back up technologies.	-	4	5,13,14
CO-5	Describe the storage security aspects and explain the different parameters of managing and monitoring storage infrastructure.	3	-	12,13,14

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2.0	3.0	3.0	2.0	1.0	-	-	-	-	-	-	1.0	1.0	1.0

Prerequisites:

1) Computer Networks

Contents:

Unit-I

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, Disk Native Command Queuing, Introduction to Flash Drives, Concept in Practice: VMware ESXi. Data Protection: RAID:RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID levels, RAID Impact on Disk Performance, RAID Comparison. **12 Hrs**

Unit-II

Intelligent Storage Systems: Components of an Intelligent Storage System, Storage Provisionin, Types of intelligent Storage Systems, Concepts in Practice: EMC Symmetrix and VNX. Fibre Channel Storage Area Networks: Fibre Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre Channel Architecture, fabric Services, Switched fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN. **10 Hrs**

Unit-III

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, File-Level Virtualization, Concepts in Practice: EMC Isilon and EMC VNX gateway. Object-Based and unified Storage: Object-Based Storage Devices, Content- Addressed Storage. **10 Hrs**

Unit-IV

Backup and Archive : Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operation, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture. **10 Hrs**

Unit-V

Securing the Storage Infrastructure: Information Security Framework, Risk Triad, Storage Security Domains, Security implementations in Storage Networking, Securing Storage Infrastructure in Virtualized and Cloud Environments, Concepts in practice: RSA and VMware Security Products. Managing the Storage Infrastructure: Monitoring the Storage Infrastructure, Storage Infrastructure Management Activities. **10 Hrs**

Reference Books:

1) EMC^2 : Information Storage and Management, Willey India 2013.
2) Marc Farley, “Building Storage Networks”, Tata McGrawHill, Osborne, 2001
3) EMC Corporation, Information Storage and Management, Wiley, India. ISBN-13: 978-8126537501, August 2012.
4) Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill, Osborne, 2003.

18UISE711	Digital Image Processing	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): Students will be exposed to the concepts of Digital Image Processing principles and techniques like Image enhancement, segmentation, representation and applications.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Describe** the basic principles of Digital Image Processing for various applications	1	-	12
CO-2	**Describe** the various image sensing and acquisition techniques, Image formation, image representation & relationship between the pixels	1	-	12
CO-3	**Apply** the image enhancement techniques in spatial &frequency domain	1, 2	5, 13,14	12
CO-4	**Apply** mathematical approaches to extract the characteristic features of image.	1, 2	5, 13,14	12
CO-5	**Demonstrate** different segmentation techniques	1, 2	5, 13, 14	12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	3.0	-	-	2.0	-	-	-	-	-	-	1.0	2.0	2.0

Pre-requisites:

1. Statistics and probability
2. Linear Algebra, Data Structures
3. Programming Language

Contents:

Unit-I

Digital Image Fundamentals - Introduction, Applications, Fundamental Steps in Digital Image Processing, Elements of visual perception, Image sensing and acquisition, Image Sampling and Quantization, Basic relationships between pixels. **08 Hrs**

Unit-II

Intensity Transformations and Spatial Filtering - Basic Intensity Transformation Functions, Histogram Processing; Enhancement Using Arithmetic/Logic Operations Fundamentals of Spatial Filtering., Smoothing and Sharpening Spatial filters. **08 Hrs**

Unit-III

Filtering in the Frequency Domain - The Discrete Fourier Transform (one variable and two variables), Basics of Filtering in the Frequency Domain, Image Smoothing and Sharpening Using Frequency Domain Filters. **08 Hrs**

Unit-IV

Morphological Image Processing - Erosion and Dilation, Opening and Closing, Hit or Miss Transforms, Basic Morphological Algorithms. Morphology. **08 Hrs**

Unit-V

Image Segmentation - Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Different Segmentation Methods.
Representation and Description- Image Representation, Boundary and Regional Descriptors. **07 Hrs**

Reference books:

1) Rafel C Gonzalez and Richard E Woods, “Digital Image Processing”, 3rdEdition, Pearson Education.
2) Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, 2nd Ed, Thomoson Learning, Brooks/Cole.
3) Anil K Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall of India Pvt. Ltd.
4) B.Chanda, D DuttaMajumder, “Digital Image Processing and Analysis”, Prentice-Hall, India.

18UISE712	Mobile Communication and Computing	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): The main objective is to understand the basic concepts of mobile computing, be familiar with the network protocol stack, learn the basics of mobile telecommunication system, and Gain knowledge about different mobile platforms and application development.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Comprehend** the basics of mobile Computing	1, 2	3	12
CO-2	**Express** the functionality of Mobile IP and Transport Layer	1, 2	-	12
CO-3	**Classify** different types of mobile telecommunication systems	-	2	-
CO-4	**Explain** the database issues in mobile environments & data delivery models	1	-	-
CO-5	**Use** mobile operating systems in developing mobile applications	1	2	13,14

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.5	2.0	-	-	-	-	-	-	-	-	1.0	1.0	1.0

Prerequisites:
1) Mobile OS
2) Network concepts

Contents:

Unit-I

Introduction: Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications –Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes. **08 Hrs**

Unit-II

Mobile Internet Protocol And Transport Layer: Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance. **08 Hrs**

Unit-III

Mobile Telecommunication System: Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) –Universal Mobile Telecommunication System (UMTS). **07 Hrs**

Unit-IV

Mobile Databases: Issues in transaction processing, Transaction processing environment, Data dissemination, Transaction processing, Processing in mobile environment, Data replication, Mobile transaction models, Roll back process, Two phase commit protocol, Query processing, Recovery **08 Hrs**

Unit-V

Mobile Platforms And Applications: Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, and Windows Phone – M Commerce– Structure – Pros & Cons – Mobile Payment System – Security Issues. **08 Hrs**

Reference Books:

1) Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012.
2) Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi,2007.
3) Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
4) Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

5) William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,Tata Mc Graw Hill Edition ,2006.
6) C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.

18UISE713 Deep Learning (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Deep Learning is one of the most highly sought after skills in AI. In this course, you will learn the foundations of Deep Learning, understand how to build neural networks, and learn how to lead successful machine learning projects. You will learn about Convolution networks, RNNs, LSTM, Adam, Dropout, and more.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Write** program using Scikit-learn, TensorFlow, PyTorch, Keras, etc.	1, 2	3	12
CO-2	**Build, train, and apply** fully connected deep neural networks; implement efficient neural networks; identify key parameters in a neural network's architecture; and apply deep learning to your own applications.	1, 2	5	4, 12
CO-3	**Implement** Time Series Forecasting and Recurrent Neural Networks	1, 3, 13	5	6
CO-4	**Demonstrate** object detection, image segmentation, and visual interpretation of convolutions.	1	2	6
CO-5	**Apply** deep learning knowledge and expertise to a real-world challenge. Develop and test a deep learning model.	4	1	12

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	2.8	2.66	2.5	2.0	2.0	1.0	-	-	-	-	-	1.0	3.0	-

Prerequisites:

1) Linear algebra
2) Statistics and probability

Contents:

Unit-I

Introduction to Deep Learning: Discover the basic concepts of deep learning such as neural networks and gradient descent. Implement a neural network in NumPy and train it using gradient descent with in-class programming exercises. Build a neural network to predict student admissions.

Introduction to PyTorch and TensorFlow **07 Hrs**

Unit-II

Deep Learning with PyTorch and TensorFlow: Build your first neural network to classify images of clothing. Work through a set of Jupyter Notebooks to learn the major components of PyTorch. Load a pre-trained neural network to build a state-of-the-art image classifier.

Convolution Neural Networks: Build Convolution Neural Networks for state-of-the-art computer vision applications. Train a convolution network to classify dog breeds from images of dogs. **09 Hrs**

Unit-III

Time Series Forecasting: Learn how to perform time series forecasting using deep learning and TensorFlow.

Recurrent Neural Networks: Build recurrent neural networks with PyTorch that can learn from sequential data such as natural language. Implement a network that learns from Tolstoy's Anna Karenina to generate new text based on the novel. **08 Hrs**

Unit-IV

Natural Language Classification: Implement a recurrent neural network that can classify text. Use your network to predict the sentiment of movie reviews.

Deploying with PyTorch / PyTorch : Build a chatbot and compile the network for deployment in a production environment. **08 Hrs**

Unit-V

Introduction to TensorFlow Lite: Learn how to deploy your models on Android, and IoT devices.

Capstone Project with Deep Learning using scikit-learn, TensorFlow, pytorch, etc. **07 Hrs**

Reference books:

1) Ian Good felllow, YoshuaBenjio, Aaron Courville, Deep Learning-, The MIT Press 2016.
2) Andrew W. Trask ,Grokking Deep Learning, Manning Publications, 2019.
3) Richard O. Duda, Peter E. Hart, David G. Stork, John Pattern Classification- Wiley & Sons Inc.
4) Raúl Rojas Neural Networks: Asystematic Introduction 1996.
5) Chirstopher Bishop, Pattern Recognition and machine Learning 2007.
6) Course era/EDX/Udacity Courses:
   a. Deep Learning with TensorFlow
   b. Deep Learning with Pytorch

18UISO721	Cloud Computing	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): Cloud computing is one of the hottest technical topics today, with broad-ranging effects across IT, Information Architecture, Business, Software Engineering, and Data Storage. It covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, Software as a Service, and Physical Systems as a Service. For different layers of the cloud technologies, practical solutions such as Google, Amazon, Microsoft, SalesForce.com, etc.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Illustrate** the architecture and infrastructure of cloud computing.	1, 2	-	12
CO-2	**Explain** the core issues of cloud computing.	1	4	12
CO-3	**Choose** the appropriate technologies, algorithms, and approaches for the cloud related issues.	2	4, 5	13, 14
CO-4	**Illustrate** the appropriate cloud computing solutions and recommendations according to the applications used.	1	4	13, 14
CO-5	**Illustrate** recent advances in cloud computing.	1, 2	13, 5	12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	3.0	-	2.0	2.0	-	-	-	-	-	-	1.0	1.33	1.0

Prerequisites:

1) Programming in C++ / Java
2) Computer Networks.
3) Web 2.0

Contents:

Unit-I

Introduction to Cloud Computing: Introduction, Characteristics of Cloud Computing, Cloud Models, Cloud Services Examples, Cloud-based Services & Applications

Cloud Concepts & Technologies: Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, Software Defined Networking, Network Function Virtualization, Map Reduce, Identity and Access Management, Service Level Agreements, Billing. **08 Hrs**

Unit-II

Cloud Services & Platforms: Compute Services, Storage Services, Database Services, Application Services, Content Delivery Services, Analytics Services, Deployment & Management Services, Identity & Access Management Services, Open Source Private Cloud Software

Hadoop & Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, and Hadoop Cluster Setup. **07 Hrs**

Unit-III

Cloud Application Design: Introduction, Design Considerations for Cloud Applications, Reference Architectures for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes **08 Hrs**

Unit-IV

Python for Cloud: Python for Amazon Web Services, Python for Google Cloud Platform, Python for Windows Azure, Python for Map Reduce, Python Packages of Interest, Python Web Application Framework - Django, Designing a RESTful Web API.

Cloud Application Development in Python: Design Approaches, Image Processing App, Document Storage App, MapReduce App, Social Media Analytics App **08 Hrs**

Unit-V

Introduction to advanced topics: Big Data Analytics, Multimedia Cloud, Cloud Application Benchmarking & Tuning, Cloud Security, Cloud for Industry, Healthcare & Education, Containers, Dockers, and Kubernetes **08 Hrs**

Beyond the Syllabus Coverage (Suggestive):

1. Students' Survey papers related to Cloud Computing
2. Laboratory Experiments
3. Seminar

Reference Books:

1) Arshadeep Bahga and Vijay Madisetti, “Cloud Computing: A Hands-On Approach”, Universities Press India, 2014
2) Dan C Marinescu, “Cloud Computing Theory and Practice”, 1/e, Elsevier (MK) 2013.
3) RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing Foundations and Applications Programming”, 2/e, Morgan Kaufmann, 2013
4) Anthony T. Velte, "Cloud Computing A Practical Approach", 1/e, McGraw Hill, 2010
5) Tom White “Hadoop: The Definitive” 3/e, O'Reilly, 2013

18UISO722	Supply Chain Management	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): The student will be able to: Understand the basic concepts of Supply Chain Management and identify SC drivers. Discuss the role of each SC drivers play and their impact on SC performance. Take simple SC and analyze it using concepts of SCM.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Know** the basic concepts of SCM and list out the important drivers of SC.	1	-	12
CO-2	**Demonstrate** Management of Supply chain and its usage	2	4	10
CO-3	**Design** of supply chain components	3	5	13
CO-4	**Understand** tradeoffs, decisions and Revenue model in supply chain	3	6	8
CO-5	**Implement** IT Solutions and Co-ordination in supply chain.	5	9	14

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	3.0	3.0	2.0	3.0	2.0	-	-	2.0	1.0	-	1.0	1.0	1.0

Prerequisites:

Data base, Data analytics

Contents:

Unit-I

Introduction to supply chain management: Supply chain basics (Definition of SC, Objectives of SC, SC stages, SC flows, SC Examples), decision phases in a supply chain (SC Strategy or Design, SC Planning and SC Operation), supply chain efficiency and responsiveness. Process view of a supply chain (Cycle view, Push/Pull View), Supply Chain Macro Processes in a firm, drivers of supply chain performance (Facilities, Inventory, Transportation, Information and Sourcing), Supply Chain performance: Competitive and supply chain strategies, achieving strategic fit**.** **08 Hrs**

Unit-II

Planning and Managing Inventories in a Supply Chain: Review of inventory concepts, Role of cycle inventory in a SC, Economies of scale to exploit fixed costs, Economics of scale to exploit quantity discounts, short-term discounting (Trade promotions). Role of safety inventory in a SC, safety inventory determination, Impact of supply uncertainty, aggregation and replenishment policies on safety inventory. **07 Hrs**

Unit-III

Designing distribution networks in a SC: Role of distribution in the SC, factors influencing distribution network design, Design options for distribution network, E-Business and the distribution network.

Transportation in a SC: Role of Transportation in a SC, Modes of transportation and their performance characteristics, Design options for a transportation network, tailored transportation, Trade-offs in transportation design, Risk management in transportation. **08 Hrs**

Unit-IV

Sourcing decisions in a SC: Role of sourcing in a SC, In-house and Outsource, supplier scoring & assessment, Supplier selection – Auctions and Negotiations, Contracts, Role of IT in sourcing.

Pricing and Revenue Management in a SC: Role of Pricing and Revenue Management in a supply chain, Pricing and Revenue management for Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts, Role of IT in pricing and revenue management. **08 Hrs**

Unit-V

Information Technology in a SC: The role of IT in a Supply Chain, The Supply Chain IT framework, CRM, ISCM, SRM, Transaction Management Foundation (TMF), Future of IT in 24 SC. The role of E-business in a supply chain, E-business framework, E-business in practice. Case discussion.

Co-ordination in a SC: Lack of SC Co-ordination and the Bullwhip effect, effect on performance of lack of co-ordination, Obstacles to Co-ordination in a SC. Managerial levers to achieve co-ordination. **08 Hrs**

Reference Books:

1) Sunil Chopra & Peter Meindl," Supply Chain Management – Strategy, Planning & Operation", Pearson Education Asia, ISBN: 9788120331587.
2) Robert B Hand field, Ernest L Nichols , Supply Chain Redesign – Transforming Supply Chains into Integrated Value Systems, 2002, Pearson Education Inc, ISBN: 81-297-0113-8
3) Jeremy F Shapiro, Duxbury, Modeling the Supply Chain, -Thomson Learning - 2002, ISBN 0-534-37363.
4) David Simchi Levi, Philip Kaminsky& Edith Simchi Levi, Designing & Managing the Supply Chain - -McGraw Hill.

Software:

1) Introduction to Microsoft 365 and e2open software for supply chain management.

18UISO723	Virtual Reality	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLO's): The objective of the course is to provide an understanding to the students the fundamentals of virtual reality systems. Aim is to summarize the 3D interaction techniques and its importance to provide design guidelines to develop and analyze the real world applications of virtual reality.

Course Outcome (CO's):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Explain** fundamentals of virtual reality systems. Analyze the applications of virtual reality.	1	2	-
CO-2	**Summarize** the hardware and software of the virtual reality.	1	2	-
CO-3	**Explain** the 3D Interaction Techniques design guidelines for a virtual reality system.	-	3	-
CO-4	**Summarize** the design guidelines for a virtual reality system	-	-	3
CO-5	**Summarize** the future technologies	4	-	-

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	2.0	3.0	-	-	-	-	-	-	-	-	-	-

Contents:

Unit-I

Virtual Reality Applications: Introduction, Modern VR Experiences, History Repeats, Virtual Reality Applications: Engineering, Architecture, Education, Medicine, Entertainment, Science, Training. **08 Hrs**

Unit-II

Hardware Technologies For 3d User Interfaces- Visual Displays, Auditory displays, choosing Output devices for 3D User Interfaces. 3D USER INTERFACE INPUT HARDWARE: Input device characteristics, Desktop input devices, Tracking Devices, 3D Mice, Special Purpose Input Devices SOFTWARE TECHNOLOGIES: Database – World Space, World Coordinate, World Environment, Objects – Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment – VR Database, Tessellated Data, Lights and Cameras, Scripts, Interaction – Simple, Feedback, Graphical User Interface, Control Panel, VR toolkits..

08 Hrs

Unit-III

3D Interaction Techniques: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines – 3D Travel Tasks, Travel Techniques, System Control, Classification, Graphical Menus, Voice Commands, Gestural Commands, Tools, Multi modal System Control Techniques **08 Hrs**

Unit-IV

Designing And Developing 3D User Interfaces: Strategies for Designing and Developing Guidelines and Evaluation. ADVANCES IN 3D USER INTERFACES: 3D User Interfaces for the Real World, AR Interfaces as 3D Data Browsers, 3D Augmented Reality Interfaces, Augmented Surfaces and Tangible Interfaces, Agents in AR, Transitional AR-VR Interfaces – The future of 3D User Interfaces, Questions of 3D UI Technology, 3D Interaction Techniques, 3D UI Design and Development,3D UI evaluation and other issues. **08 Hrs**

Unit-V

The future of 3D User Interfaces: Questions of 3D UI Technology, 3D Interaction Techniques, 3D UI Design and Development,3D UI evaluation and other issues. **07 Hrs**

Reference Books:

1) Steven M. LaValle., Virtual reality – http://vr.cs.uiuc.edu/book.html,Cambridge, 2016.
2) Alan B Craig, William R Sherman and Jeffrey D Will, “Developing Virtual Reality Applications: Foundations of Effective Design”, Morgan Kaufmann, 2009.

3) Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User Interfaces, Theory and Practice”, Addison Wesley, USA, 2005.
4) Burdea, Grigore C and Philippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India, 2003.
5) William R Sherman and Alan B Craig, “Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)”. Morgan Kaufmann Publishers, San Francisco, CA, 2002.
6) John Vince, “Virtual Reality Systems”, Addison Wesley, 1995.

18UISL702	Big Data Analytics Lab	(0-0-2) 1

Contact Hours: **24**

Course Learning Objectives (CLOs): Students will be exposed to the concepts of managing Big Data, Data mining principles and techniques. They also learn to use open source tools for handling large data

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Illustrate** the concept of Hadoop /Mongo DB for the storage of big data	1, 5	2	12
CO-2	**Interpret** the basic concepts of Map Reduce techniques to analyze the large data.	1, 5	2	12
CO-3	**Conceptualize** and design efficient and effective Algorithms for big data analysis using machine learning techniques.(Using Python/ R language/java/open source tool)	1, 5	2, 3	8, 10, 12,14
CO-4	**Identify** appropriate techniques and tools to solve actual Big Data problems	1	2, 3, 5	6, 10,13

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	2.0	-	2.75	1.0	-	1.0	-	1.0	-	1.0	1.0	1.0

Prerequisites:

1. Knowledge of data structure, data bases and basic statistics.
2. Knowledge of Programming languages (Python/ R language/java).

List of Programs:

1) Install, configure and run Hadoop and HDFS
2) Implement word count / frequency programs using MapReduce
3) Implement an MR program that processes a weather dataset
4) Implement Linear and logistic Regression
5) Implement SVM / Decision tree classification techniques

6) Implement clustering techniques
7) Visualize data using any plotting framework
8) Implement an application that stores big data in Hbase / MongoDB / Pig sing Hadoop / R

Text books:

1) Alan Gates and Daniel Dai, "Programming Pig – Dataflow scripting with Hadoop", O'Reilley, 2nd Edition, 2016.
2) Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, —"An Introduction to Statistical Learning with Applications in R‖", Springer Publications, 2015(Corrected 6th Printing)

Reference books:

1) Hadley Wickham, ‖ggplot2 – "Elegant Graphics for Data Analysis‖", Springer Publications, 2nd Edition, 2016.
2) Lars George, "HBase: The Definitive Guide", O'Reilley, 2015.

18UISL703	**Major Project Phase – I**	**(0-0-4) 4**

Contact Hours: **52**

Course Learning Objectives (CLOs): Understand the domain, analyze through Modeling and Implementation through state of the art technology available. Know Software Engineering Principles: Modeling, Estimation, Design standards and architectural issues through use of Standards etc. To write modular programs and handle exceptions to provide reliable solutions. To test and verify the programs for different scenarios.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Demonstrate** an ability to work in teams and manage the conduct of the research study and Summarize literature review for a given topic.	2, 4, 9	1, 8	12
CO-2	**Identify** problem from literature review.	2	1	12
CO-3	**Define** objectives for the problem and decide on methodology.	-	1, 2	-

CO-4	**Compare** and contrast the several existing methods for solving the chosen problem.	2, 3	5, 13, 14	6, 12
CO-5	**Demonstrate** the use of presentation techniques for effective communication and demonstration of ethics and societal concern in the given solution.	5, 6, 7, 10	8	11, 12
CO-6	**Analyze** requirement of solution for the given problem with teamwork and multidisciplinary approach.	9, 11, 13	3, 8, 14	1

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0	3.0	3.0	2.0	1.0	2.0	2.0

Prerequisites:
Different programming languages / tools.

Contents:
Major project phase-1 in which the students are expected to locate the state of the art technology in his domain of interest by an extensive literature survey and Select a topic from an emerging area relevant to their branch/interdisciplinary and define the problem for the project work. The material collection, survey, visits, data collection, preliminary design, analysis etc. is to be done in this phase. The project shall consist of a team of students not more than 4. Each batch shall be assigned with a guide. A committee consisting of minimum 3 faculty members of which guide is a member shall evaluate at the end for CIE. The weight age of marks shall be 50% for the committee and 50% for the guide. There is a SEE (viva voce) examination which shall be examined by two internal examiners appointed by COE based on the suggestions by the respective HoD.

General Instructions to Students:

1) Students are expected to perform extensive literature survey, identify problem statements and prepare synopsis in consultation with project guide/supervisor. Students are expected to submit synopsis- Initial (Registration Phase-1) approved by project guide, to the project coordinator as per the schedule notified. A copy is to be maintained with students and the guide. This registration/ Initial synopsis contains the description of the project concept created and acts as a base line for design and Implementation of the system.

2) Notification/schedules and evaluation procedures will be sent to all students in the Google groups created in the department.
3) Evaluation of problem statement/synopsis-Initial (registration phase-1), Literature Survey and SRS (Requirement Analysis Phase-1) are done in the 7th semester.

Sl No	Parameters for Assessment	% of weightage for CIE and SEE
P1	Project Synopsis/ Proposal Evaluation	15
P2	Literature survey/Technology used / Architectural design	15
P3	Requirement Analysis (SRS)	15
P4	Design methodology/Demonstration of tool used for designing	10
P5	Implementation modules	15
P6	Discussion of test cases /Project demonstration	15
P7	Project Report(phase-1 and Phase-2)	10
P8	Paper Publication/Presentation	05

18UISL704	**Internship**	**4 weeks – 3**

Contact Hours: 4 weeks

Course Learning Objectives (CLOs): The internship module aims to provide the student with a practice-oriented and hands-on working experience in the real world or industry, and to enhance the student's learning experience i.e. to integrate theory and practice. It gives an opportunity to develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organizational setting. Also, to further develop and enhance operational, customer service, competency in specific areas related to student's area of career interest, skills in research, analysis and other life-long knowledge and skills in a real-world work environment. Through Internship, students can get pre-employment training and the company or organization can assess the performance of the student and offer the student an employment opportunity after his/her graduation, if it deems fit.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/ PSOs (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Solve** real life challenges in the workplace by analyzing work environment and conditions, and selecting appropriate skill sets acquired from the course.	1, 2	4	12
CO-2	**Communicate and collaborate** effectively and appropriately with different professionals in the work environment.	5,10	8	6,7,11,12
CO-3	**Demonstrate** critical thinking, problem-solving skills and creativity and innovation by analyzing underlying issue/s to challenges.	1,2,3,4,5,13,14	6,7,8	12
CO-4	**Demonstrate** the application of knowledge and skill sets acquired from the course and workplace in the assigned job function/s.	1,2,3,4,5,13,14	6,7,8	12
CO-5	**Demonstrate** an ability to work as a professional in a heterogeneous team environment.	9,10,11	8	12

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	3.0	3.0	2.66	3.0	1.66	1.66	2.0	3.0	3.0	2.0	1.0	3.0	3.0

The students are to undergo internship in Private industries/R&D organizations/Centers of Excellence/Laboratories of Reputed Institutions/Govt. & Semi Govt. organizations, PSUs, construction companies, entrepreneurial organizations, inter departments within the college etc. to get exposure to the external world for a period of 4 weeks in the summer vacation after VI sem and before start of VII semester. The students are to prepare a report on the internship work carried out. The internal faculty shall monitor the student and award CIE marks. There is a SEE in which the student shall present his work before a panel of examiners consisting of HoD, Guide and one faculty member during VII semester. The performance shall be communicated to the COE office and the same shall reflect in the VII semester grade card.

VIII Semester

18UISC800	Cryptography and Cyber Security	(4-0-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs): To help the students design and develop secure solution to provide confidentiality and integrity, user authentication, secure network and transport layer communication, secure wireless communication, defeat vulnerabilities and electronic payment. This fundamental course covers the theory of encryption and standard protocols for data communications and network security. Topics that may be covered include PKI, digital signatures, message authentication codes, hash functions, etc. An examination of network security defenses and countermeasures are also covered.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the concepts of traditional and modern symmetric key ciphers	1		12
CO-2	Illustrate modern block ciphers.	5	2	-
CO-3	Describe secure communication using public key algorithms, digital signatures & cryptographic hash functions.	-	2,5	12
CO-4	Discuss the different key management and authentication protocols. Implement the Firewall Policy in the domain of security.	-	5	2
CO-5	Explain the security aspects at various layers in the network	-	3	5

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	1.6	2.0	-	2.5	-	-	-	-	-	-	1.0	-	-

Prerequisites:
Computer Networks

Contents:

Unit-I

Introduction: Security Goals, Cryptographic Attacks, Services and mechanism.

Traditional Symmetric-Key Ciphers: Symmetric key Ciphers, categories of traditional ciphers, Stream and Block Ciphers. **Introduction to Modern Symmetric-Key Ciphers:** Modern Block Ciphers and its components. **10 Hrs**

Unit-II

Modern Block Ciphers Continued: Product ciphers and its classes, Attacks designed for block ciphers, Mono alphabetic ciphers, Poly alphabetic Ciphers, Elementary Transposition ciphers, other cipher properties, confusion and diffusion, block ciphers and stream ciphers Data Encryption Standard (DES): DES Structure, Security of DES, Advanced Encryption Standard (AES): Transformations, Key expansion, The AES Ciphers. Analysis of AES.. **10 Hrs**

Unit-III

Asymmetric-Key Cryptography: Introduction, RSA Cryptosystems. Integrity and Authentication: Message integrity, Message authentication, Digital Signature- Process, Services, Attacks on Digital Signature, DSS.
Cryptographic hash functions: MD4, SHA-512. **10 Hrs**

Unit-IV

Entity Authentication: Entity Authentication and Message Authentication, Password- based Authentication, Challenge-Response Protocols.
Key Management: Symmetric-Key Distribution, Kerberos, Symmetric Key Agreement, Public-Key Distribution. Firewalls: Basics of Firewall Functionality, policies and access control lists, firewall types, practical issues, placement of firewalls, firewall configuration. **10 Hrs**

Unit-V

Security at the Application Layer: PGP, S/MIME. **Security at the Transport Layer:** Security service at Transport Layer, SSL Architecture- Four protocols.
Security at Network Layer: IP Security, Modes of IPSec, Two Security Protocols. **System Security:** IDS. **12 Hrs**

Reference Books:

1) Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw Hill, E/2, 2019.
2) William Starling, Cryptography and Network Security, 5th Edition, Pearson.
3) Cryptography and Network Security, 3rd Edition, Atul Kahate, 2017

18UISE811	Wireless Sensor Networks	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): Students will be able to understand the fundamentals of wireless sensor networks and its application to critical real time scenarios, To study the various protocols at various layers and its differences with traditional protocols, To understand the issues pertaining to sensor networks and the challenges involved in managing a sensor network.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Comprehend** the Fundamentals of wireless communication technology	1	-	-
CO-2	**Identify** different issues in wireless ad hoc and sensor networks.	-	1	-
CO-3	**Analyze** MAC Protocols Adhoc wireless networks	-	2	-
CO-4	**Analyze** routing protocols developed for ad hoc and sensor networks	-	2	4,13
CO-5	**Explain** Issues and Challenges in providing QoS for sensor networks	1	-	-

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	2.0	-	1.0	-	-	-	-	-	-	-	-	1.0	-

Prerequisites:
1. Network concepts

Contents:

Unit-I

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet. **08 Hrs**

Unit-II

Introduction to Adhoc/sensor networks: Key definitions of Adhoc / sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in Adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering. **08 Hrs**

Unit-III

MAC Protocols : Issues in designing MAC protocols for Adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4. **07 Hrs**

Unit-IV

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols **08 Hrs**

Unit-V

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes. **09 Hrs**

Reference Books:

1) C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.
2) Feng Zhao and LeonidesGuibas, "Wireless sensor networks ", Elsevier publication - 2004.
3) Jochen Schiller, "Mobile Communications", Pearson Education, 2/e, 2003.
4) William Stallings, "Wireless Communications and Networks ", Pearson Education – 2004.

18UISE812	Block Chain Management	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): To help the students design and develop secure solution to provide confidentiality and integrity, user authentication, secure network and transport layer communication, secure wireless communication, defeat vulnerabilities and electronic payment. Block chain is a distributed, decentralized public ledger. Block chain simply means chain of blocks. It means digital information ("the block") stored in a public database ("the chain"). Blocks on a Blockchain have three parts:

First Blocks show information like date, time and amount. Second Blocks store information about who carried out the transaction by using digital signature instead of identifiable names. Third Blocks store information that makes them different from other blocks by the use of a unique code called HASH.

This fundamental course covers the theory of Block chain and standard protocols for data communications and network security. Topics that may be covered include Supply Chain and Logistics, digital signatures, message authentication codes, hash functions, etc. An examination of network security defenses and countermeasures are also covered.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1,12)/ PSO (13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify** and inspect vulnerabilities In Block chain Concepts.	1	-	12
CO-2	**Apply** and **analyze** different cryptographic algorithms for secure data transmission using recent Tools. Block chain Application Components.	5	2	-
CO-3	**Analyze** the basics of Ethereum Development Tools	-	2	14
CO-4	**Discuss** electronic payment with help of Authentication and Authorization. Externally Owned Account(EOAs), Key pairs	-	-	2
CO-5	**Implementing** the Cryptographic algorithms Compiling and Deploying a Contract. Working with EOA Accounts	-	-	5,13

PO's	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	2.0	-	-	3.0	-	-	-	-	-	-	-	1.0	1.0

Prerequisites:
Network Security and Cryptography

Contents:

Unit-I

Introduction: Block chain Concepts, Block chain Evolution, Block chain structure, Block chain characteristics, Block chain Application example Escrow, Block chain stack, Block chain Decentralized Computation Platform-Ethereum, Decentralized Storage platform-Swarm, Decentralized Massaging platform-Whisper, Smart Contracts, Decentralized Applications, Tools and Interfaces, from Web 2.0 to the next generation decentralized web, Domain specific Block chain Applications, FinTech, Internet of Things, Industrial and Manufacturing, Registry of Assets and Inventory, energy, Supply Chain and Logistics, Records and Identities, Healthcare, Block chain Benefits and Challenges **08 Hrs**

Unit-II

Blockchain Application Templates: Block chain Application Components, Blockchain Application Components, Design Methodology for Block chain Applications, Blockchain Application Templates: Many-to-One, Many-to-One for IoT Applications, Many-to-Many or Peer-to-Peer, One-to-One for Financial Applications. **08 Hrs**

Unit-III

Block chain Components and Applications: Setting up Ethereum Development Tools, Ethereum Clients, Go-Ethereum Clien, Python Ehtereum Client(Python App), Ethereum Languages, Solidity, TestIRPC, Mist Ethereum Wallet, MetaMask, Web3 JavaScript API, Truffle. **08 Hrs**

Unit-IV

Ethereum Accounts: Ethereum Accounts, Externally Owned Account (EOAs), Keypairs, Working with EOA Accounts, Creating Account, Listing Accounts, Updating Accounts, Checking Balance, Account Transactions, Working with Contract Accounts, Computing and Deploying Contract, Interacting with Contracts, Installing or Watching a Contract. **08 Hrs**

Unit-V

Smart Contracts: Structure of a Contract, Setting up and Interacting with a contract using Get Client, Compiling and Deploying a Contract, Interacting with a contract, Gas, Logs, Events, Setting up and Interacting with a Contract Using Mist Wallet, Compiling and Deploying Contract, Interacting with a Contract, Smart Contract Examples, Event Registration Contract, Voting Contract, Name Registry Contract, IoT Smart Switch Contracts, Smart Contract Patterns, Withdrawal, Access Restriction, Rejecter, Circuit Breaker, Allow Once per Account, Case Study. **07 Hrs**

Reference Books:

1) ArshdeepBahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach" Universities Press, 2019.

2) Blockchain Technology Concepts and Applications by Kumar Saurabh and Ashutosh Saxena.

3) The Block chain Developer A Practical Guide for Designing, Implementing, Publishing, Testing and Securing Distributed Blockchain Based Projects by EladElrom.

18UISE813	Data Compression	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): The course provides an overview of classical and modern techniques and algorithms of various types of data compression. It covers statistical and dictionary methods, lossless and lossy compression algorithms in graphics, video and audio compression

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Analyze** Hoffman coding: Loss less image compression, Text compression, Audio Compression	1	-	-
CO-2	**Design** and Analysis of various coding techniques	3	-	1

CO-3	**Analyze** various Image compression and dictionary based techniques like static Dictionary, Diagram Coding, Adaptive Dictionary	3	-	-
CO-4	**Conceptualize** basis for commonly used lossless compression techniques, and understand how to use and evaluate several readily available implementations of those techniques	3	-	-
CO-5	**Demonstrate** various transformations	4	-	1

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2.0	-	3.0	3.0	-	-	-	-	-	-	-	-	-	-

Prerequisites:

1. Engineering Mathematics

Contents:

Unit-I

Introduction: Compression Techniques, Lossless Compression, Lossy Compression, Measure Of Performance, Model And Coding .Mathematical Performance Of Lossless Compression: Overview,A Brief Introduction To Information Theory, Derivation Of Average Information, Models, Coding, Algorithmic Information Theory, Minimum Description Length Principle **08 Hrs**

Unit-II

Huffman coding: The Huffman Coding Algorithm, Nonbinary Huffman Codes, Adaptive Huffman Coding, Golomb Codes, Rice Codes, Tunstall Codes, Applications Of Huffman Coding Arithmetic Coding.: Introduction Dictionary,Coding A Sequence,Generating A Binary Code, Adaptive Arithmetic Coding, Binary Arithmetic Coding, Comparison Of Huffman And Arithmetic Coding. **08 Hrs**

Unit-III

Dictionary Technique: Introduction, Static Dictionary, Adaptive Dictionary, Grammar-Based Compression, Context-Based Compression: Prediction With Partial Match (Ppm),The Burrows–Wheeler Transform, Associative Coder Of Buyanovsky (Acb), Dynamic Markov Compression **07 Hrs**

Unit-IV

Lossless Image Compression: Introduction, CALIC, JPEG-LS,Prediction Using Conditional Averages, Multiresolution Approaches, Lossless Image Compression Formats, Facsimile Encoding, JBIG2-T.88, MRC-T.44, Mathematical Preliminaries for Lossy Coding: Introduction, Distortion Criteria, Information Theory Revisited, Rate Distortion Theory, Models. **08 Hrs**

Unit-V

Mathematical Preliminaries for Transforms: Sub bands, and Wavelets: Over view, Introduction, Vector Space, Fourier series, Fourier transform, Liner system, sampling, Discrete Fourier transform, Z transform coding: Over view, Introduction, Transform, Transform of Interest, Quantization and coding of Transform co-effients, Application Image compression-JPEG, Application of Audio Compression **09 Hrs**

Reference Books:

1) Khalid sayood, " Introduction to Data Compression",5th Edition, 2018
2) Mark Nelson , "The Data Compression Book "
3) David Salomon., "Data Compression: The Complete Reference "

18UISO821	DevOps	(3-0-0) 3

Contact Hours: **39**

Course learning objectives (CLO): Student will be able to introduce dev ops concepts and architecture of Dev ops, analyze Building the code and deployment

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Understand** the need and significance of Dev ops	2	5	3
CO-2	**Understand** analysis of layers in Dev ops and its effect on software architecture	2	3	1
CO-3	**Design** and development of solutions using Dev ops code	3	2	1
CO-4	**Deployment** of code to practical problems using Dev ops tools	4	5	2

CO-5	**Analysis** of workflow issues and their tracking	5	2	4

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	1.0	2.2	2.0	2.0	2.3	-	-	-	-	-	-	-	-	-

Prerequisites:

1. Linear algebra
2. Statistics and probability

Contents:

Unit-I

Introduction: Introduction to DevOps and Continuous Delivery, Introducing DevOps, Howfast is fast? The Agile wheel of wheels Beware the cargo cult Agile fallacy, DevOps and ITIL. The DevOps process and Continuous Delivery – an over view. The developers, The revision control system, The build server, Theartifact repository, Package managers, Test environments, Staging/ production, Release management, Scrum, Kanban, and the delivery pipeline, Wrapping up –a complete example, Identifying bottlenecks. **07 Hrs**

Unit-II

DevOps Architecture: How DevOps Affects Architecture, Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns. The principle of cohesion, Coupling, Back to the monolithic scenario, Apractical example, Three-tier systems, The presentation tier, The logic tier, Thedata tier, Handling database migrations, Rolling upgrades, Hello world inLiquibase, The changelog file, The pom.xml file, Manual installation, Micro services, Interlude – Conway's Law, How to keep service interfaces forward compatible, Micro services and the data tier, DevOps, architecture, and resilience. **08 Hrs**

Unit-III

Building the code : Why do we build code?, The many faces of build systems, The Jenkins buildserver, Managing build dependencies, The final artifact, Cheating with FPM,Continuous Integration, Continuous Delivery, Jenkins plugins, The host server,Build slaves, Software on the host, Triggers, Job chaining and build pipelines, A look at the Jenkins filesystem layout, Build servers and infrastructure ascode, Building by dependency order, Build phases, Alternative build servers, Collating quality measures, About build status visualization, Taking build errorsseriously, Robustness. **08 Hrs**

Unit-IV

Deploying the Code: Why are there so many deployment systems? Configuring the base OS, Describing clusters, Delivering packages to a system, Virtualization stacks, Executing code on the client ,A note about the exercises, The Puppet master and Puppet agents, Ansible, PalletOps, Deploying with Chef, Deploying with SaltStack, Salt versus Ansible versus Puppet versus PalletOps execution models, Vagrant, Deploying with Docker, Comparison tables, Cloud solutions, AWS,Azure **08 Hrs**

Unit-V

Issue Tracking: What are issue trackers used for? Some examples of workflows and issues, What do we need from an issue tracker?, Problems with issue tracker proliferation, All the trackers, Bugzilla, Trac, Redmine, The GitLab issue tracker, Jira. Introducing the IoT and DevOps, The future of the IoT according to the market, Machine-to-machine communication, IoT deployment affects software architecture, IoT deployment security, Okay, but what about DevOps and theIoT again? A hands-on lab with an IoT device for DevOps. **08 Hrs**

Reference books:

1) The DevOps Hand Book, Gene Kim, Jez Humble, Patric Debois & John Wills.
2) The Practical Guide to Enterprise DevOps and Continuous Delivery, Julian Fish.

18UISO822	Data Science	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): This course will enable students to define data science and its fundamentals demonstrate the process in data science, Explain machine learning algorithms necessary for data sciences, Illustrate the process of feature selection and analysis of data analysis algorithms and Visualize the data and follow of ethics

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Define** data science and its fundamentals	-	-	4
CO-2	**Demonstrate** the process in data science	-	3	-
CO-3	**Explain** machine learning algorithms necessary for data sciences	-	3	-
CO-4	**Illustrate** the process of feature selection and analysis of data analysis algorithms	-	2	-
CO-5	**Visualize** the data and follow of ethics	1	-	-

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3.0	2.0	2.0	1.0	-	-	-	-	-	-	-	-	-	-

Prerequisites:

Database Management Systems

Contents:

Unit-I

Introduction: What is Data Science? Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets. Needed Statistical Inference: Populations and samples, Statistical modeling, probability distributions, fitting a model, - Introduction to R **08 Hrs**

Unit-II

Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate firm). Three Basic Machine Learning Algorithms: Linear Regression, kNearest Neighbors (k-NN), k-means **08 Hrs**

Unit-III

One More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web. **10 Hrs**

Unit-IV

Feature Generation and Feature Selection (Extracting Meaning From Data): Motivating application: user (customer) retention. Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms. Filters; Wrappers; Decision Trees; Random Forests. Recommendation Systems: Building a User-Facing Data Product, Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system. **08 Hrs**

Unit-V

Mining Social-Network Graphs: Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs, Partitioning of graphs, Neighborhood properties in graphs, Data Visualization: Basic principles, ideas and tools for data visualization. Data Science and Ethical Issues, Discussions on privacy, security, ethics, Next-generation data scientists **07 Hrs**

Reference Books:

1) Doing Data Science Cathy O'Neil and Rachel Schutt Straight Talk From The Front line. O'Reilly 2014.

2) Mining of Massive Datasets. v2.1 Jure Leskovek, Anand Rajaraman and Jeffrey Ullman Cambridge University Press 2014.

3) Machine Learning: A Probabilistic Perspective Kevin P. Murphy 2013.

4) Data Mining: Concepts and Techniques Jiawei Han, Micheline Kamber and Jian Pei Third Edition 2012.

18UISO823	Computer Vision	(3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs): The course will have a comprehensive coverage of theory and computation related to imaging geometry, and scene understanding. It will also provide exposure to clustering, classification and deep learning techniques applied in this area

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Analyze** the formation of image and transformation of image in different dimensions	1	2	-
CO-2	**Analyze** the geometry of camera models and calibration of camera	1	2	-
CO-3	**Design** and apply the algorithms for feature extraction	3	-	13,14
CO-4	**Design** and **apply** algorithm for segmentation, and classification of images	4	-	13,14
CO-5	**Apply** deep neural network algorithms in image analysis	4	-	11

POs/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Mapping Level	3.0	2.0	3.0	3.0	-	-	-	-	-	-	1.0	-	1.0	1.0

Prerequisites:

Linear Algebra, Vector Calculus, Data Structures and Programming

Contents:

Unit-I

Introduction: Definition and brief history of computer vision.

Image formation: Geometric primitives and transformations: Geometric primitives, 2D Transformation, 3D Transformation, 3D Rotations, 3D to 2D Projections Photometric **image formation**: Lighting, Reflectance and shading, Optics.

The digital camera: sampling and aliasing, Color, Compressing, **07 Hrs**

Unit-II

Camera geometry: Geometric Camera Models, Pinhole Perspective Weak Perspective Cameras with Lenses the Human Eye Intrinsicand Extrinsic Parameters Rigid Transformations and Homogeneous Coordinates Intrinsic Parameters, Extrinsic Parameters Perspective Projection Matrices, Weak-Perspective Projection Matrices Geometric Camera Calibration A Linear Approach to Camera Calibration A Nonlinear Approach to Camera Calibration **08 Hrs**

Unit-III

Feature detection and description:

Points and patches: Feature detectors Feature descriptors, Feature matching, Feature tracking Application: Performance-driven animation,

Edges: Edge detection Edge linking Application: Edge editing and enhancement

Lines: Successive approximation Hough transforms, Vanishing points **08Hrs**

Unit-IV

Segmentation: Active contours : Snakes, Dynamic snakes and CONDENSATION , Scissors ,Level Sets, Application: Contour tracking and proto scoping,

Split and merge: Watershed Region splitting (divisive clustering) Region merging (agglomerative clustering) ,Graph-based segmentation, Probabilistic aggregation, **Mean shift and mode finding**

K-means and mixtures of Gaussians ,Mean shift ,

Normalized cuts

Graph cuts and energy-based methods, Application: Medical image segmentation. **08 Hrs**

Unit-V

Deep Neural Architecture and application: Image Classification, Image Classification with Localization, Object Detection, Object Segmentation, Image Style Transfer, Image Colorization, Image Reconstruction, Image Super-Resolution, Image Synthesis. **08 Hrs**

Reference Books:

1) Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.

2) Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003

3) Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.

4) K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990

5) R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992.

18UISL801 TECHNICAL SEMINAR (0-0-2) 1

Contact Hours: **26**

Technical Seminar: The students are expected to learn how to carry out literature survey to locate the state of the art technology in engineering domain of their interest. They are required to carry out selection of an emerging topic beyond the syllabus relevant to the branch of study, understand the concept, analyze and present effectively for 15-20 minutes followed by 5 minutes of questions and answers before their classmates and faculty. They can also present the technical innovative/novel work carried out in the laboratory. They are also required to learn the effective communication and modalities of technical interactions. Further, they have to submit the seminar material in the form of a paper in IEEE format. All the students are required to attend all the session throughout the semester.

Course Outcomes:

ID	Description of the Course Outcome	Mapping to Program Outcome		
		Substantial Level (3)	Moderate Level (2)	Slight Level(1)
CO-1	Demonstrate an ability to present the work carried out both in written and	10		

	oral form.			
CO-2	Demonstrate an ability to incorporate rapid changes in technology by undergoing life-long learning	12	2	

PO →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14
Mapping Level		2								3		3		

Procedure to conduct technical Seminar:

- All the students are informed to select a topic from the field of their interest from their branch or relevant to their branch and register the topic with the faculty (ies) In charge of Seminar.
- Two faculty members assigned to carry out this activity. The faculty members prepare the schedule of the seminar spread over the entire semester and display the same in the notice board.
- Change of seminar topic is not allowed once registered, however in the case of genuine reasons only once change of topic may be permitted.
- Based on the number of hours mentioned in the scheme, 4-6 students shall present the seminar in one slot of 2/3 hours.
- The faculty members shall conduct the seminar session every week as per the schedule in the slot mentioned on the time table and carry out the evaluation.
- Attendance is compulsory for all the students for all the seminars.
- The students are required to submit two hard copies of report not exceeding 6 pages and one soft copy of seminar report one week prior to their date of presentation.
- Report shall be in IEEE format viz A4 size paper, Title: Bold, Times new Roman Font 14, Sub heading & Body of the text: Times new Roman font 12. Margin for left should be 1 ½.
- Student name, USN, seminar date should be mentioned on the report.
- Presentation is for about 15-20 minutes, followed by 5 minutes for questions and answers.
- Typical evaluation methodology: The seminar shall be evaluated for maximum 50 marks. The breakup of marks shall be: Presentation: a) 40 marks b) Report: 10 marks.

For presentation, the following points not limited to may be considered.

- Concept, understanding, depth of the knowledge, originality of the topic, Quality of PPT, communication skills etc.
- For report evaluation, the following points not limited to may be considered
- Adherence to IEEE format, relevance of topic, subject depth and originality in writing etc.
- The seminar is aimed at as an educative program for the students. This is because, the students shall listen to 60- 70 seminars on different topics from emerging areas is as good as undergoing a course on latest happenings in the related branch of Engineering.

The departments going for Independent study in place of technical seminar shall plan, prepare the modalities and take the approval from Dean (AP

18UISL802	Major Project Phase-2	0 - 0 -12

Contact Hours: **72**

Course Learning Objectives (CLOs): Understand the domain, analyze through Modeling and Implementation through state of the art technology available .Know Software Engineering Principles: Modeling, Estimation, Design standards and architectural issues through use of Standards etc. To write modular programs and handle exceptions to provide reliable solutions. To test and verify the programs for different scenarios.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)/PSOs(13-14)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Identify, formulate** the problem statement and prepare software requirement specification (SRS)	2, 8, 13	1, 5, 11, 12	7
CO-2	**Design** specification using standard diagrams and tools.	3, 8, 13, 16	1, 5, 11, 12	7
CO-3	**Implement** the system based on design specification using appropriate programming standards, tools, and practices.	8, 14, 16	1, 4, 5, 12	-
CO-4	**Verify and Validate** the given system using standard practices and tools.	8, 15	1, 4, 5, 12	-

CO-5	**Communicate** effectively with and learn from, the experts from different domains.	8, 9, 10	5, 12	-

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	2.0	3.0	3.0	2.0	2.0	-	1.0	3.0	3.0	3.0	2.0	2.0	3.0	3.0

Major project phase-2 is the continuation from **Major project phase – I** in which the students are expected to go for material collection, survey, visits, data collection, preliminary design, analysis, model development, code writing, field work etc. The same project team formed for phase –I will continue the work under the guidance of the same faculty member. For all the projects, problems may be domain specific or interdisciplinary also in nature. A committee consisting of minimum 3 faculty members of which guide is a member shall evaluate at the end for CIE. There is a viva voce examination which shall be examined by two examiners one internal and one external to the college appointed by COE based on the suggestions by the respective HoD.

The reference materials for the project work are as listed below but not limited to:
Reference materials/books:

1. Engineering books.
2. Journals.
3. Manuals and data sheets.
4. Software packages.
5. Previous project reports.
6. Product information brochures.
7. Interaction with academia and industrial experts.
8. Internet etc.

General Instructions to Students:

- Students are expected to Design the problem modules in consultation with project guide/supervisor. Students are expected to submit Design Phase (Design Aspects in Phase-2) approved by project guide, to the project coordinator as per the schedule notified. A copy is to be maintained with students and the guide. Designs will be the base line for the implementation module.
- Notification/schedules and evaluation procedures will be sent to all students in the Google groups created in the department.
- Evaluation of Design Phase, implementation of each module Exploring different test cases with respect to each module is done in 8th semester.
- Final Project Report will be prepared includes the content of Phase-1 and Phase-2.