University of Mumbai

Syllabus

B. Tech Information Technology
(Last Year Semester VII & VIII)

From
Academic Year 2017-18
(KJSCE 2014 CBGS Pattern)

K. J. Somaiya College of Engineering, Vidyavihar, Mumbai -77
(Autonomous College Affiliated to University of Mumbai)

Vision and Mission of Information Technology Department

Vision
To become a center of excellence for holistic education by preparing world class professionals in the dynamic field of Information Technology.

Mission

Providing quality education to:
- Developed competent IT professionals with ethical values and enable them in lifelong learning.

- Promote a conductive ambience for research and creativity.

Program Educational Objectives (PEOs)
A graduate of Information Technology will able to:

PEO1: Excel in professional career and contribute to social needs through Information Technology.

PEO2: Pursue higher education, conduct research, and demonstrate professionalism and ethics.

PEO3: Exhibit innovation, adaptability, team work, leadership and communication skills.

PROGRAM OUTCOMES (POS) FOR I.T. DEPT.

After successful completion of the program an Information Technology Graduate will be able to:

PO1: Apply knowledge of mathematics, science and engineering in IT domain.

PO2: Analyze problems using engineering principles.

PO3: Design, document and develop IT systems using best practices tailored to the specific needs of any business scenario.

PO4: Investigate problems / design experiments and interpret data to produce IT-based solutions.

PO5: Use current IT techniques and tools in a given context.

PO6: Apply contextual knowledge to health, safety and legal issues.

PO7: Know the benefits of IT solutions to society and environment for sustainable Development.

PO8: Apply knowledge of IT in our profession ethically.

PO9: Function effectively as a member or leader in a diverse team to accomplish a common Goal.

PO10: Communicate effectively with the engineering community and society at large.

PO11: Recognize the need to engage in life-long learning.

PO12: Apply engineering and management skills to implement quality IT projects.

Program Specific Outcomes (PSOs)

After successful completion of the program an Information Technology Graduate will be able to:

PSO1: Work as professionals in Information Technology based companies, create innovative career paths to be an entrepreneur or pursue higher studies.

PSO2: Practice problem solving, decision making skills through the use of appropriate technology (in web, database, security, network and mobile application development).

B. Tech IT VII Semester Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC701	Software Testing and Quality Assurance	03	--	--	03	--	--	03
UITC702	Artificial Intelligence	03	--	--	03	--	--	03
UITC703	Modeling and Simulation	03	--	--	03	--	--	03
UITC704	Big Data Analytics	03	--	--	03	--	--	03
	Elective II							
UITE701	Digital Image Processing	03	--	--	03	--	--	03
UITE702	Advanced Information Security	03	--	--	03	--	--	03
UITE703	Search Engine Optimization	03	--	--	03	--	--	03
UITE704	Software Architecture	03	--	--	03	--	--	03
UITE705	Usability Engineering	03	--	--	03	--	--	03
UITE706	Advanced Computer Networks	03	--	--	03	--	--	03
UITL701	Software Testing and Quality Assurance Laboratory	--	02	--	--	01	--	01
UITL702	Artificial Intelligence Laboratory	--	02	--	--	01	--	01
UITL703	Modeling and Simulation Laboratory	--	02	--	--	01	--	01
UITL704	Big Data Analytics Laboratory	--	02	--	--	01	--	01
UITL7XX	Elective II Laboratory	--	02	--	--	01	--	01
UITP701	Project-A		04			04	--	04
Total		15	14	--	15	09	--	24

B. Tech IT VII Semester Examination Scheme

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work TW	Practical	Oral	Total
		#Continuous Assessment CA			@End Sem. Exam ESE				
		Test 1	Test 2	Internal Assessment IA					
UITC701	Software Testing and Quality Assurance	15	15	10	60	--	--	--	100
UITC702	Artificial Intelligence	15	15	10	60	--	--	--	100
UITC703	Modeling and Simulation	15	15	10	60	--	--	--	100
UITC704	Big Data Analytics	15	15	10	60	--	--	--	100
	Elective II								
UITE701	Digital Image Processing	15	15	10	60	--	--	--	100
UITE702	Advanced Information Security	15	15	10	60	--	--	--	100
UITE703	Search Engine Optimization	15	15	10	60	--	--	--	100
UITE704	Software Architecture	15	15	10	60	--	--	--	100
UITE705	Usability Engineering	15	15	10	60	--	--	--	100
UITE706	Advanced Computer Networks	15	15	10	60	--	--	--	100
UITL701	Software Testing and Quality Assurance Laboratory	--	--	--	--	25	--	25	50
UITL702	Artificial Intelligence Laboratory	--	--	--	--	25	--	25	50
UITL703	Modeling and Simulation Laboratory	--	--	--	--	25	--	25	50
UITL704	Big Data Analytics Laboratory	--	--	--	--	25	--	25	50
UITL7XX	Elective II Laboratory	--	--	--	--	25	--	25	50
UITP701	Project-A	--	--	--	--	25	--	25	50
Total		75	75	50	300	150	--	150	900

List of Electives II

Theory Course Code	Laboratory Course code	Name of the Course
UITE701	UITL705	Digital Image Processing
UITE702	UITL706	Advanced Information Security
UITE703	UITL707	Search Engine Optimization
UITE704	UITL708	Software Architecture
UITE705	UITL709	Usability Engineering
UITE706	UITL710	Advanced Computer Networks

B Tech IT VIII Semester Credit Scheme

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC801	Software Project Management	03	--	--	03	--	--	03
UITC802	Cloud Computing	03	--	--	03	--	--	03
UITC803	Soft Computing	03	--	--	03	--	--	03
	Elective-III							
UITE801	Digital Marketing	03	--	--	03	--	--	03
UITE802	Robotics	03	--	--	03	--	--	03
UITE803	Digital Forensics	03	--	--	03	--	--	03
UITE804	Internet of Things	03	--	--	03	--	--	03
UITE805	Geographical Information System	03	--	--	03	--	--	03
UITL801	Software Project Management Laboratory	--	02	--	--	01	--	01
UITL802	Cloud Computing Laboratory	--	02	--	--	01	--	01
UITL803	Soft Computing Laboratory	--	02	--	--	01	--	01
UITL8XX	Elective-III Laboratory	--	02	--	--	01	--	01
UITP801	Project-B	--	08	--	--	08	--	08
Total		12	16	--	12	12	--	24

B. Tech IT VIII Semester Examination Scheme

Course Code	Course Name	Examination Scheme				Term Work TW	Practical	Oral	Total
		Theory Marks							
		#Continuous Assessment CA			@End Sem. Exam ESE				
		Test 1	Test 2	Internal Assessment IA					
UITC801	Software Project Management	15	15	10	60	--	--	--	100
UITC802	Cloud Computing	15	15	10	60	--	--	--	100
UITC803	Soft Computing	15	15	10	60	--	--	--	100
	Elective-III								
UITE801	Digital Marketing	15	15	10	60	--	--	--	100
UITE802	Robotics	15	15	10	60	--	--	--	100
UITE803	Digital Forensics	15	15	10	60	--	--	--	100
UITE804	Internet of Things	15	15	10	60	--	--	--	100
UITE805	Geographical Information System	15	15	10	60	--	--	--	100
UITL801	Software Project Management Laboratory	--	--	--	--	25	--	25	50
UITL802	Cloud Computing Laboratory	--	--	--	--	25	--	25	50
UITL803	Soft Computing Laboratory	--	--	--	--	25	--	25	50
UITL8XX	Elective-III Laboratory	--	--	--	--	25	--	25	50
UITP801	Project-B	--	--	--	--	100	--	50	150
Total		60	60	40	240	200	--	150	750

List of Elective III

Theory Course Code	Laboratory Course code	Name of the Course
UITE801	UITL804	Digital Marketing
UITE802	UITL805	Robotics
UITE803	UITL806	Digital Forensics
UITE804	UITL807	Internet of Things
UITE805	UITL808	Geographical Information System

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC701	Software Testing and Quality Assurance	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITC701	Software Testing and Quality Assurance	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Pre-requisite: Object Oriented Software Engineering

Course Outcomes:
The student should be able to
1. Understand software testing concepts and strategies.
2. Plan, design and execute test cases using testing techniques.
3. Identify the needs of software test automation and its use in testing tool.
4. Appreciate role of testing practices that support the production of quality software.

Module No.	Unit No.	Topics	Hrs.
1		**Testing Methodology**	07
	1.1	Introduction, Goals and Model for Software Testing, Effective vs Exhaustive Software Testing , Software Testing Terminology and Methodology , Software Testing Life Cycle (STLC)	
	1.2	Verification: Verification of requirements, high level design and low level design	
	1.3	Validation: Unit Testing, Integration Testing, Function Testing, System Testing, Acceptance Testing	
2		**Testing Techniques**	12
	2.1	Static Testing: Inspection, Review and Walkthrough	

	2.2	Dynamic Testing: White box Testing: Logic coverage criteria, Basis path testing, Loop testing, Data flow testing, Mutation testing Black Box Testing: Boundary value analysis, Equivalence class testing, Decision table based testing, Usability and accessibility Testing	
	2.3	Regression Testing: Objectives, need and types	
3		**Testing Metrics for Monitoring and Controlling the Testing Process**	**04**
	3.1	Measurement objectives, Attributes and corresponding metrics, Estimation models for estimating testing efforts, Architectural design metrics, Information flow metrics, Cyclomatic complexity measures, Function point metrics, Test point analysis, Testing progress metrics	
4		**Test Automation and Testing for Specialized Environment**	**08**
	4.1	Automation: Need and Guidelines for automated testing Testing Tools: Categorization, Selection and Cost incurred	
		# Self Learning: Study of testing tools(LoadRunner, Selenium)	
	4.2	Testing Web based Systems: Challenges, Types of testing: Security, Navigation and Performance Testing	
	4.3	Testing Agile based Software, Mobile Application Testing	
5		**Software Quality Management**	**08**
	5.1	Software Quality , Five Views of Software Quality, McCall's Quality Factors and Criteria, Software Quality metrics	
	5.2	Quality Management: PDCA cycle, Quality Plan, Assurance, Control and Methods, Quality Cost, Benefits of Investment on Quality	
	5.3	Software Quality Tools: Ishikawa Diagram, Check List, Control Chart, Flow Chart, Pareto Chart, Histogram	
	5.4	SQA Models: ISO 9000:2015 Software Quality Standard ,ISO 9000:2015 Fundamentals, ISO 9001:2015 Requirements, Capability Maturity Model, Software Total Quality management, Six Sigma	
		Total	**39**

Recommended Books:
1. Software Testing Principles and Practices Naresh Chauhan, Second edition Oxford Higher Education
2. Effective Methods for Software Testing , Third edition by Willam E. Perry, WileyPublication
3. Software Testing and quality assurance theory and practice by KshirasagarNaik,PriyadarshiTripathy , Wiley Publication
4. Software Testing Principles, techniques and tools by M.G. Limaye , McGraw Hillpublication

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC702	**Artificial Intelligence**	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITC702	**Artificial Intelligence**	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Pre-requisite:
- Data structure, Analysis of Algorithms.

Course Outcomes:

Students will be able to :-

1. Understand structure, types and PEAS parameters of an AI agent.
2. Select an appropriate problem-solving method and knowledge-representation scheme.
3. Analyze and formalize the problem (as a state space, graph, etc.) and select the appropriate search method.
4. Develop/demonstrate/ build simple intelligent systems or classical toy problems using different AI techniques.

Module No.	Unit No.	Topics	Hrs.
1		**Introduction to AI and Intelligent Agents:**	
	1.1	Introduction to AI, AI Problems and AI techniques,	
	1.2	Structure of Intelligent agents, Types of Agents	
	1.3	Agent Environments PEAS representation for an Agent	**06**
	1.4	Solving problems by searching, Problem Formulation.	
2		**Uninformed , Informed and Adversarial Search Techniques:**	
	2.1	Uninformed: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing different techniques.	

	2.2	Informed: Heuristic functions, Best First Search, Greedy BFS, A*, Hill Climbing, Simulated Annealing, Crypto-Arithmetic Problem, CSP and Backtracking for CSP, Performance Evaluation.	12
	2.3	Adversarial: Game Playing, Min-Max Search, Alpha Beta pruning	
3		**Knowledge and Reasoning:**	**06**
	3.1	A Knowledge Based Agent, WUMPUS WORLD Environment,	
	3.2	Propositional Logic, First Order Predicate Logic,	
	3.3	Forward and Backward Chaining, Resolution. , Introduction to PROLOG/LISP	
4		**Uncertain Knowledge and Reasoning:**	**06**
	4.1	Uncertainly, Representing Knowledge in an Uncertain Domain,	
	4.2	Conditional Probability, Joint Probability,	
	4.3	Bay's theorem, Belief Networks, Simple Inference in belief networks.	
5		**Learning:**	09
	5.1	Learning from Observations, General Model of Learning Agents,	
	5.2	Inductive learning, learning Decision Trees,	
	5.3	Introduction to neural networks, Perceptrons, Multilayer feed forward network, Application of ANN,	
	5.4	Reinforcement learning: Passive & Active Reinforcement learning.	
		Self learning Topic: Expert System,	
		Total	**39**

Recommended Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 5th Edition, Pearson Education,2004.
2. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition,2012
3. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 2nd Edition,2003.
4. George Lugar, .AI-Structures and Strategies for Complex Problem Solving., 4/e, Pearson Education, 2002
5. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication, 2002.
6. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education, 1992
7. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication,2014.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC703	Modeling and Simulation	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITC703	Modeling and Simulation	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:

At the end of successful completion of the course a student will be able to :

1. Apply the experimental process of simulation using spreadsheets as well as simulation language/package
2. Generate pseudorandom numbers and perform emperical tests to measure the quality of a pseudorandom number generator.
3. Analyze simulation results to reach an appropriate conclusion.

Module No	Unit No.	Topics	Hrs.
1		**Introduction to Modeling and Simulation**	06
	1.1	Model Characterization, Model Development	01
	1.2	Simulation Studies, Programming Languages	01
	1.4	Organization and Terminology	01
	1.3	Simulation Examples: Single Server Queue, Simple Inventory system	03
2		**Random Number Generation**	07
	2.1	Lehmer Random Number Generators : Introduction, Implementation	02
	2.2	Monte Carlo Simulation: Examples	02
	2.3	Empirical tests of Randomness: KS, Chi Square, Runs, Gap , Autocorrelation	03
	2.4	**Overview –Finite-State Sequences (Self study)**	
3		**Discrete Event Simulation & Statistics**	12
	3.1	Discrete –Event Simulation	02
	3.2	Multi-Stream Lehmer Random Number Generators	01
	3.3	Discrete-Event Simulation examples	02

	3.4	**Statistics:** Sample Statistics Discrete-Data Histogram Continuous-Data Histogram Correlation	03
	3.5	Next-Event Simulation: Introduction, Terminology, Algorithmic approach, examples	02
	3.6	Event List Management: Introduction, schemes, examples	01
	3.7	Overview -A Network of Single-Server Service Nodes	01
4		**Random Variables**	**07**
	4.1	Discrete Random Variables: Introduction, Generation, Algorithmic approach, Applications, Models	02
	4.2	Random Sampling and Shuffling	01
	4.3	Continuous Random Variables: Introduction, Generation, Algorithmic approach, Applications, Models	02
	4.4	Nonstationary Poisson Processes, Acceptance-Rejection technique	01
	4.5	Overview- Birth Death Processes , Finite-State Markov Chains	01
5		**Verification, Validation, Input Modeling and Output Analysis**	**07**
	5.1	Verification, Calibration and Validation of Simulation Models	01
	5.2	Input Modeling: Trace-Driven Modeling of stationary Processes, Parametric Modeling of Stationary Processes ,Modeling Non stationary Processes	03
	5.3	Output Analysis : Interval Estimation ,Monte Carlo Estimation ,Finite-Horizon and Infinite-Horizon Statistics ,Batch Means, Steady -state Single – Server Node Statistics	03
		Total	**39**

Recommended Books:
1. Lawrence M. Leemis , Stephen K. Park , "Discrete-Event Simulation: A First Course", 1st Edition, Pearson
2. Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, "Discrete Event System Simulation", Third Edition, Prentice-Hall
3. Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, "Discrete Event System Simulation", Fifth Edition, Prentice-Hall
4. Averill M Law, "System Modeling & Analysis", 4th Edition TMH.
5. Banks C M , Sokolowski J A ,"Principles of Modeling and Simulation", Wiley
6. Geoffrey Gordon, "System Simulation ", IEEE

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC704	**Big Data Analytics**	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		#Continuous Assessment (CA)			@End Sem. Exam				
		Test 1	Test 2	IA					
UITC704	**Big Data Analytics**	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:
The student should be able to
1. Understand what Big Data Analytics is
2. Comprehend fundamentals of Hadoop, Map Reduce and NO SQL.
3. Apply techniques and algorithms to solve actual Big Data problems (derive value from vast data sets).
4. Realize adequate perspectives of big data analytics in various applications.

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Module No.	Unit No.	Detailed content	Hrs
1		**Introduction to Big Data and its Handler**	05
	1.1	Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions	
	1.2	What is NoSQL? NoSQL business drivers; NoSQL case studies	
	1.3	NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns	
	1.4	Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture	
	1.5	Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems	
2		**Insight to Hadoop and MapReduce**	08

	2.1	What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Physical Architecture; Hadoop limitations	
	2.2	MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures	
	2.3	Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step	
3		**Finding Similar Items**	03
	3.1	Applications of Near-Neighbor Search, Jaccard Similarity of Sets, Similarity of Documents, Collaborative Filtering as a Similar-Sets Problem	
	3.2	Distance Measures: Definition of a Distance Measure , Euclidean Distances, Jaccard Distance, Cosine Distance, Edit Distance, Hamming Distance	
4		**Mining Data Streams and Frequent Item Sets**	11
	4.1	The Stream Data Model: A Data-Stream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing	
	4.2	Sampling Data in a Stream : Obtaining a Representative Sample , The General Sampling Problem, Varying the Sample Size	
	4.3	Filtering Streams: The Bloom Filter, Analysis. Counting Distinct Elements in a Stream The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements	
	4.4	Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-Indyk- Motwani Algorithm, Query Answering in the DGIM Algorithm, Decaying Windows	
	4.5	**Handling Larger Datasets in Main Memory :** Algorithm of Park, Chen, and Yu, The Multistage Algorithm, The Multihash Algorithm	
	4.6	The SON Algorithm and MapReduce	
	4.7	**Counting Frequent Items in a Stream :** Sampling Methods for Streams, Frequent Itemsets in Decaying Windows	
5		**Link Analysis and Clustering**	12
	5.1	PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient	
	5.2	Topic sensitive Page Rank, link Spam, Hubs and Authorities	
	5.3	CURE Algorithm, Stream-Computing , A Stream-Clustering	

		Algorithm, Initializing & Merging Buckets, Answering Queries, Clustering in Parallel Environment	
	5.4	**Case Study :** o Social Networks as Graphs, o Clustering of Social-Network Graphs, o Direct Discovery of Communities, o SimRank, Counting triangles using Map-Reduce	
		Total	**39**

Recommended books:

1. Zikopoulos, Paul, and Chris Eaton. Understanding big data: Analytics for enterprise class hadoop and streaming data. McGraw-Hill Osborne Media, 2011.
2. Hurwitz, Judith, et al. Big data for dummies. John Wiley & Sons, 2013.
3. McCreary and Ann Kelly "Making Sense of NoSQL" – A guide for managers and the rest of us, Manning Press,2013
4. Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press, 2012
5. Chuck Lam, "Hadoop in Action", Dreamtech Press,2014
6. AnandRajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press, 2010
7. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley India, 2013.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE701	**Digital Image Processing**	03	--	-	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		#Continuous Assessment (CA)			@End Sem. Exam				
		Test 1	Test 2	IA					
UITE701	**Digital Image Processing**	15	15	10	60	--	-	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Pre-requisite: Fundamentals of Digital Signal Processing

Course Outcomes:
The student should be able to
1. Illustrate the fundamental concepts of a digital image processing.
2. Apply various Image Processing techniques like enhancement, object extraction, object representation & description on images.
3. Demonstrate the concepts and techniques of image compression for efficient storage and transmission
4. Understand the basics of feature extraction and object recognition techniques.

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Module No.	Detailed content	Hrs
0*	**Introductions to Signal Processing**	04
	Analog, discrete and digital signals, Conversion from analog to digital, Classification of signals.	
	Discrete time signals: Representation , classification & operations.	
	Discrete time systems, LTI systems and their properties	
	Convolution and Correlation- need, methods and examples	
	1-D Discrete Fourier Transform, properties.	
1	**Introduction to digital image processing**	03
	Introduction: Definition of digital image	
	Generation of digital image, steps in digital image processing	
	2-D sampling, spatial and tonal resolution	
	Pixel connectivity, elements of digital image processing systems	
2	**Image enhancement**	10

	Spatial Domain		05
	Point operations		
	Histogram processing		
	Spatial filtering: smoothing, sharpening, median ,high boost		
	Frequency Domain		05
	Introduction to image in frequency domain, Concept of basis images		
	Two dimensional D.F.T. and its properties		
	Two dimensional F.F.T		
	F.F.T. Filtering in the frequency domain: smoothening, sharpening and homomorphic filtering.		
3	**Image segmentation, representation and description**		14
	Segmentation		10
	Detection of discontinuities		
	Edge linking and boundary detection: Local Processing, Global Processing: Hough Transform, Graph Theoretic Technique		
	Segmentation based on Thresholding		
	Region based segmentation		
	Representation and description		04
	Boundary descriptors: Run length code, Shape number, Fourier descriptor		
	Area Descriptors: Statistical moments		
	Morphological Operators		
	Fundamental Operations in Morphology: Dilation Erosion,		
	Opening & Closing, Hit or Miss Transform, other basic Morphological Algorithms		
4	**Image data compression**		05
	Image data redundancies: coding, inter-pixel psycho-visual		
	Fundamentals of lossless compression: Arithmetic coding, Huffman coding, LZW coding, RLE, Bit plane coding		
	Lossy compression : JPEG, Vector quantization		
	Image compression standard, Fidelity criteria		
5	**Feature Extraction and Object Recognition**		03
	Overview of different types of features and Classification /recognition methods(Supervised and Unsupervised)		
	Case study: Feature Extraction and classification techniques in Hand-written Character Recognition		
		Total	39

***Module 0 is to bridge the GAP in the syllabus as there is no course on Digital Signal Processing. It will have no weightage in End-semester examination.**

Recommended books:

1. Gonzalez & Woods, Digital Image Processing, Pearson Education, Third Edition.

2. W. Pratt, Digital Image Processing, Wiley Publication, Fourth Edition, 2013.

3. J. G. Proakis and D. G. Manolakis, Digital Signal processingPrincipals,Algorithms and Applications,PHI publications, Third edition,

2. Milan Sonka , Digital Image Processing and Computer Vision, Thomson publication, Second Edition.2007.

3. A.K. Jain, Fundamentals of Image processing, Prentice Hall of India Publication, 1995

4. Gonzalez & Woods, Digital Image Processing using MATLAB, Pearson Education

5. S.Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Processing ,McGraw Hill Education (India) Private Limited, New Delhi, 2009.

6. S.Sridhar, Digital Image Processing ,Oxford University Press, New Delhi, 2011.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE702	Advanced Information Security	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		#Continuous Assessment (CA)			@End Sem. Exam				
		Test 1	Test 2	IA					
UITE702	Advanced Information Security	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:

The student should be able to

1 To develop information security and Computer Forensics Awareness

2 Ability to design security protocols and use security Tools

3 Ability to use Cyber security Applications

Module No.	Unit No.	Detailed content	Hrs
1	**Digital Certificates**		**06**
	1.1	Introduction to Digital Certificates ,Digital Signatures, Application of Authentication Protocols: Kerberos, X.509 Authentication Service	02
	1.2	Private Key Management, PKI Trust Models, Public Key Cryptography Standards,	02
	1.3	Revocation, Directories and PKI, PKIX and Security.	02
2	**Anonymous Browsing**		**04**
	2.1	Browsing anonymously HTTP Proxies, Verifying proxy anonymity ,HTTP_VIA /HTTP_X_FORWARDED_FOR ,	02
	2.2	Tor Network Tunneling for anonymity , SSH Tunneling Cleaning traces ,Cleaning the event log	02
3	**Penetration and vulnerability Analysis**		**07**
	3.1	Understanding and Exploiting Heap Overflows ,Finding and fixing Buffer Overflows: Beyond the Stack , Exploiting Integer Overflow Vulnerabilities	01
	3.2	Creating Temporary Files, Finding and fixing vulnerability	01

		associated with temporary files, Storing Password in plain text – Finding and fixing associated, Leaving data in memory, Finding and fixing vulnerability associated with data stored in	
	3.3	Network Basics for Digital Investigators	01
	3.4	Applying Forensic Science to Networks	01
	3.5	Digital Evidence on the Internet	01
	3.6	Digital Evidence on Physical and Data-Link Layers	01
	3.7	Digital Evidence at the Network and Transport Layers, Security and Fraud detection in Mobile and wireless networks.	01
4	**OWASP Attacks**		**17**
	4.1	Introduction to OWASP top10	02
	4.2	AVISPA tool	02
	4.3	Case Study	02
	4.4	Introduction, The Cellular Network, Handset Specifications,	02
	4.5	Mobile Operating Systems- Android OS, Windows Phone	02
	4.6	Standard Operating Procedures for Handling Handset Evidence	02
	4.7	Handset Forensics, Manual Cell phone Examinations, Global Satellite Service Providers	02
	4.8	Legal Considerations, Other Mobile Devices	02
	4.9	Case Study	01
5	**Security Policies and Design Guidelines**		**05**
	5.1	Policies: Policy creation, Regularity considerations, Privacy regulations.	02
	5.2	Security: Infrastructure and components.	01
	5.3	Design Guidelines. Authentication: Authorization and accounting.	01
	5.4	Physical and logical access control. User authentication: Biometric devices.	01
		Total	**39**

Recommended books:
1. Robert Bragge, Mark Rhodes, "Network Security- The complete reference", TMH
2. Stephen Northcatt,"Inside Network: Perimeter security", Pearson Education
3. King, Patton,"Security Architecture, design, deployment and operation", RSA press
4. William Stallings, "Cryptography and Network Security", 3rd Edition, Prentice Hall, 2003
5. Bruce Schneier," Applied Cryptography: Protocols, Algorithms and Source Code in C", Wiley
6. Heather Mahalik, Rohit Tamma , Satish Bommisetty," Practical Mobile Forensics", Second Edition Kindle Edition, Packt publishing 2016
7. Darren R. Hayes," A Practical Guide to Computer Forensics Investigations", Pearson IT Certification 2014

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE703	Search Engine Optimization	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE703	Search Engine Optimization	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:
At the end of successful completion of the course a student will be able to
1. Apply search engine optimization essentials covering aspects of on-page and off-page optimization to web page
2. Comprehend factors influencing search engine optimization
3. Understand how to measure performance of web site from search engine perspective and avoid SEO traps

Module No	Unit No.	Details of Topic	Hrs.
1		**Introduction to SEO**	**06**
	1.1	Search Engines That Matter Today, Types of Search Engines and Web Directories, Web Directories, Search Engine Anatomy	02
	1.2	SEO Process, SEO Benefits, SEO Marketing, SEO Challenges	01
	1.3	Analyzing SERP, Determining searcher Intent and Delivering Relevant, Fresh Content, Analyzing Ranking factors, Using advanced search techniques	03
2		**On-Page and Off Page Optimization**	**10**
	2.1	On –Page Optimization - Keyword Planning, On- Site Ranking factors	02
	2.2	Meta Tags- Description, Keywords, Author, Country, Robots, Redirection Tags, Headings Tags, Anchor Text, Link Title, Robots.txt file use and creation	02
	2.3	Optimal Information Architecture (IA), Root Domain, Subdomains, Microsites, Optimization of Domain Names/URLs, Content Optimization	02
	2.4	External Ranking Factors- External Links, Broken Outbound Links, User Behavior Patterns, Website Performance and Website Age	02

	2.5	Off –Page Optimization – Determining Top Competitors, Assessing Historical Progress, Website Backlinks	02
3		**Factors influencing SEO**	**12**
	3.1	Introduction to Web metrics, Sitemaps – Understanding Sitemaps, Utilizing other sitemaps style	02
	3.2	Keyword Research - Keyword Strategy, Traditional approaches, The Importance of Word Stemming, Keyword Modifiers, Keyword Research Process, Keyword research tools	03
	3.3	Link Building – Precursors to Link Building , Types, Choosing Link-Building strategy, Elements of Link Building, Approaches to Content- based link acquisition , Link marketing , Fighting Link Spam	03
	3.4	Content Considerations- Predictive SEO, Short-Term Content, Long-Term Content, Content Balance, Content Creation Motives, Content Duplication Issues, Vertical Search, Controlling contents with Cookies and Session IDs	02
	3.5	Introduction to SEO Algorithms – Page Rank, Google Panda, Google Penguin, Google Hummingbird	02
4		**Monitoring and Tracking Progress**	**06**
	4.1	Measuring Search Traffic, Popular Web Stats Tools, Competitive and Diagnostics Search Metrics	03
	4.2	Introduction to Google webmaster tools and Google Analytics	03
5		**Search Engine Traps**	**05**
	5.1	JavaScript Traps, Dynamic Widget Traps, HTML Traps, Website Performance Traps	02
	5.2	Maintaining Search Engine Visibility during and after a Site redesign and domain name changes	01
	5.4	Changing Server, Hidden Content, Spam Filtering and Penalties, Content Theft	02
		Total	**39**

Recommended Books:
1. Eric Enge, Stephan Spencer, Jessie Stricchiola, Rand Fishkin, "The Art of SEO, 2nd Edition Mastering Search Engine Optimization", O'Reilly Media; 2 edition, 2012
2. John I Jerkovic, "SEO Warriors", O'Reilly Media; 1 edition, 2009
3. RafiqElmansy, "Teach Yourself VISUALLY Search Engine Optimization (SEO)" John Wiley & Sons, 2013

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE704	Software Architecture	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE704	Software Architecture	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:

At the end of successful completion of the course a student will be able to

1. Comprehend the related concepts of architecture of software systems including connector, architectural styles and patterns, etc.
2. Apply modeling, visualization techniques to obtain software architecture design decisions.
3. Apply analysis, Implementation, Deployment concepts of software architecture for software design

Module No	Unit No.	Details of Topic	Hrs.
1		**Introduction to Software Architecture**	08
	1.1	Concept of Software Architecture, Model, Process, Stakeholders	
	1.2	Architecture Design Process, Architectural conception	
	1.3	Architectural Styles	
	1.4	Architectural Pattern	
2		**Software Connectors**	06
	2.1	Introduction to connector with example, Connector foundations, Framework of software connector	
	2.2	Software Connector Roles, Types	
	2.3	Examples of distributed connector types	
3		**Architectural Modelling and Visualization**	13
	3.1	Modelling concepts – Stakeholder driven modeling, Basic architectural concepts, Elements of Architectural Style, Static and Dynamic Aspects	

	3.2	Ambiguity, Accuracy, Precision, Views and Viewpoints, Criteria for evaluating modeling techniques	
	3.3	Modeling Techniques- Generic, Informal Graphical, UML	
	3.4	Introduction to Architectural description languages	
	3.5	Visualization – Concepts, Evaluation of Visualization, Common Issues in Visualization, Evaluating Visualization techniques, Visualization Techniques – Textual, Informal Graphical, UML, xADL	
4		**Architectural Analysis, Implementation, Deployment**	10
	4.1	Analysis- Goals, Scope, Architectural concern being analyzed, level of formality of architectural models, Type of analysis, level of automation, System stakeholders, Analysis techniques- Inspection and review based, Model based analysis	
	4.2	Implementation – concepts, Existing Frameworks	
	4.3	Deployment – concepts, Deployment activities	
5		**Applied Architectures and Styles**	02
		Distributed and Networked architectures, Architectures for Network-Based Application, REST, SOA	
		Total	39

Recommended Books:
1. Richard Taylor, " Software Architecture – Foundations, Theory and Practice", Wiley-India
2. Len Bass, "Software Architecture in Practice", Pearson

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE705	Usability Engineering	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE705	Usability Engineering	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:
At the end of successful completion of the course a student will be able to
1. Comprehend role of usability engineering in software development along with its life cycle
2. Apply usability heuristics, testing and assessment methods
3. Develop web application with usability understanding

Module No	Unit No.	Details of Topic	Hrs.
1		**Introduction to Usability Engineering**	08
	1.1	Usability and Other Considerations, Definition of Usability, Usability Slogans	
	1.2	Example: Measuring the Usability of Icons, Usability Trade-Offs, Categories of Users and Individual User Differences	
	1.3	Generations of User Interfaces	
	1.4	Responsive UI	
2		**The Usability Engineering Lifecycle**	08
	2.1	Know the User, Competitive Analysis, Goal Setting, Parallel Design, Participatory Design, Coordinating the Total Interface	
	2.2	Guidelines and Heuristic Evaluation, Prototyping, Interface Evaluation	
	2.3	Iterative Design, Follow-Up Studies of Installed Systems, Meta-Methods, Prioritizing Usability Activities	
3		**Usability Heuristics**	06
	3.1	Simple and Natural Dialogue, Speak the Users' Language, Minimize User	

		Memory Load		
	3.2	Consistency, Feedback, Clearly Marked Exits, Shortcuts, Good Error Messages		
	3.3	Prevent Errors, Help and Documentation, Heuristic Evaluation		
4		**Usability Testing and Assessment Methods**	**09**	
	4.1	Test Goals and Test Plans , Getting Test Users , Choosing Experimenters		
	4.2	Ethical Aspects of Tests with Human Subjects, Test Tasks, Stages of a Test		
	4.3	Performance Measurement, Thinking Aloud, Usability Laboratories		
		Usability assessment Methods beyond Testing – Observation, Questionnaires and Interviews, Focus Groups, Logging Actual Use, User Feedback, Choosing Usability Methods		
5		**Prioritizing Web Usability**	**08**	
	5.1	Revisiting Web usability Findings		
	5.2	Prioritizing Usability Problem		
	5.3	Navigation and Information Architecture		
		Total	**39**	

Recommended Books:
1. Jakob Nielsen, " Usability Engineering", Academic Press, 1993
2. HoaLoranger and JakobNielsen , "Prioritizing Web Usability", New Riders Press, Berkeley CA,   2006
3. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale "Human Computer Interaction", Prentice Hall

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE706	Advanced Computer Networks	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE706	Advanced Computer Networks	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Pre-requisite: Computer Networks, Principles of Communication Engineering.

Course Outcomes:
After completing this course, students will be able to:
1. Understand the protocols at network , Transport and Application Layers
2. Describe the concept of routing, flow control, Congestion Control and Quality of Sevice.
3. Interpret the Multimedia basics and performance modelling.

Module No.	Unit No.	Topics	Hrs.
1		**Network Layer**	**10**
	1.1	**Multicast Routing :**Introduction, Multicasting Basics, Design requirements of routing protocol, Classification of routing protocols, Core routing concepts, Routing protocols in the internet: RIP, OSPF, BGP.	
	1.2	**Next generation IP:**IPv6 Protocol, IPv6 addressing, Transition from IPv4 to IPv6.	
	1.3	Host Configuration: BOOTP**,** DHCP	
	1.4	Private Networks, Virtual private networks and Network Address Translation	
2		**Flow control and Congestion control**	**13**
	2.1	TCP: Flow Control, Congestion Control, Transmission Policy, Timer management, Remote Procedure call, SCTP :Services and features and	

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		Packet format, SCTP Association.		
	2.2	Frame Relay: Packet switching networks, Frame relay Networks, Congestion Control in Frame Relay.		
	2.3	ATM : Protocol Architecture, Logical connections, Cells, Service categories, AAL , CongestionControl in ATM, Traffic management in ATM		
	2.4	Quality of Service: Data Traffic, Quality of service, Techniques to improve QOS, Integrated Services, Differentiated Services, QoS in switched networks: Frame relay and ATM		
3		**Application Layer**		08
	3.1	Domain Name System: Name space, Domain name space, Distribution of Name space, DNS in the Internet, Resolution, DNS Messages, Types of Records		
	3.2	Remote Logging, TELNET, Electronic mail, User agent, SMTP, POP, IMAP, Web based mail,File transfer.		
4		**Performance Modelling**		05
	4.1	Overview, Queueing Analysis: Queing Models, Single server Queuing, Multiserver Queuing, Queues with priorities, Other queuing models, Estimating Model parameters		
5		**Multimedia**		03
	5.1	Multimedia: Digitizing Audio/Video, Compression, Multimedia data, Streaming live Audio/Video, Multimedia in the internet, Real Time Interactive Audio Video: Characteristics, Protocols: RTP, RTCP, Voice over IP:SIP, H.323.		
		Total		39

Recommended Books:

1. Behrouz A Forouzan, "Data communication and Networking" , 4th Edition Tata McGraw Hill, Third Edition, 2003
2. William Stallings,"High Performance Networks and Internet, Performance and Quality of Service", 5th edition, Pearson Education
3. Andrew Tanenbaum, " Computer Networks",5th Edition, Pearson education
4. James F. Kurose,Keith W. Ross," Computer Networking-A Top Down Approach",5th Edition, Pearson education
5. SumitKasera, NishantNarang, SumitaNarang, "Communiation Networks, Principles and practices",TataMcGraw Hill
6. Behrouz A Forouzan, "TCP/IP Protocol Suite", 3rd/4th Edition, Tata McGraw Hill

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL701	Software Testing and Quality Assurance Laboratory		02	--		01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL701	Software Testing and Quality Assurance Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL702	Artificial Intelligence Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL702	Artificial Intelligence Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL703	Modeling and Simulation Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL703	Modeling and Simulation Laboratory	--	--	--	--	25	--	25	50

Term Work:
Term work shall consist of total 8 to 10 experiments covering entire syllabus.
Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:
The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL704	Big Data Analytics Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL704	Big Data Analytics Laboratory	--	--	--	--	25		25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:

The oral will be based on the entire syllabus

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL705	Digital Image Processing	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL705	Digital Image Processing	--	--	--	--	25	--	25	50

Term Work:
Term work shall consist of total 8 to 10 experiments covering entire syllabus.
Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.
Oral Exam:
The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL706	Advanced Information Security	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL706	Advanced Information Security	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL707	Search Engine Optimization Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL707	Search Engine Optimization Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL708	Software Architecture Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL708	Software Architecture Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

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Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL709	Usability Engineering Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL709	Usability Engineering Laboratory	--	--	--	--	25	--	25	50

Term Work:
Term work shall consist of total 8 to 10 experiments covering entire syllabus.
Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.
Oral Exam:
The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL710	Advanced Computer Networks	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL710	Advanced Computer Networks	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time. Final term work marks will be the average of all experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

SEM VIII

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC801	Software Project Management	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITC801	Software Project Management	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Pre-requisite: Object Oriented Software Engineering

Course Outcomes:
The student should be able to
1. Apply knowledge of functional areas of Project Management.
2. Use the tool for developing the project schedule.
3. Understand best practices, standards and their applications.

Module No.	Unit No.	Topics	Hrs.
1		**An overview of IT Project Management and Project Integration Management**	08
	1.1	The State of IT Project Management, Context of Project Management, Need, Project Goals, PMBOK, Project Life Cycle and IT Development, Agile Project Management	
	1.2	Information Technology Project Methodology(ITPM),Project Feasibility, Business Case, Project Selection and Approval, Project Management Processes	
	1.3	Introduction to Project Integration Management, Project Charter, Project Planning Framework, Planning Process, Administrative Closure, Project Evaluation, Project Audit	
	1.4	Case Studies	
2		**Project Scope Management, Project Time Management and Project Cost Management**	14
	2.1	Introduction to Scope Management, Scope Planning, Project Scope Definition, Project Scope Verification, Scope Change Control, Linear	

		Responsibility Chart	
	2.2	Introduction to Project Time Management, Developing the Project Schedule, Logic Diagrams and Networks (AOA), Critical Path, PERT, CPM ,PDM Network, Management Schedule Reserve	
	2.3	Allocating Resources to the Project: Resource Loading, Resource Leveling, Constrained Resources and Goldratt's Critical Chain	
	2.4	Introduction to Project Cost Management, Cost Estimating, Cost Escalation, Cost Estimating and System Development Cycle, Cost Estimating Process, Elements of Budgets and Estimates	
	2.5	Case Studies	
3		**Project Human Resource Management and Stakeholder Management**	07
	3.1	Introduction, Organization and Project Planning ,Formal Organization, Project Team, Multidisciplinary Teams, Project Environment	
	3.2	Project Leadership and Ethics: Introduction, Project Leadership, Leadership Styles ,Ethics in Projects, Multicultural Projects, Role of Project Manager, IT Governance and Project Office	
	3.3	Managing Change, Resistance and Conflicts: Introduction, the Nature of Change, Change Process, Change Management Plan, Dealing with Resistance and Conflicts	
	3.4	Introduction to Project Stakeholder Management, Stakeholder Analysis	
	3.5	Case Studies	
4		**Project Procurement Management**	05
	4.1	Introduction, Project Procurement Processes, Outsourcing	
	4.2	Request for Proposal (RFP), Project Proposal ,Project Contracting	
	4.3	Case Study	
5		**Project Communication Management**	05
	5.1	Introduction, Monitoring and Controlling the Project, Project Communication Plan, Plan-Monitor-Control Cycle	
	5.2	Project Metrics, Reporting Performance and Progress, Information Distribution	
	5.3	Case Study	
		Total	39

Recommended Books:

1. Jack T. Marchewka, Information Technology Project Management, 4th edition, Wiley India,2009.
2. John M. Nicholas, Project Management for Business and Technology, 3rd edition, Pearson
   Education.
3. E-Book - Project Management Body of Knowledge (PMBOK).
4. Claudia M. Baca, Patti M. Jansen, PMP: Project Management Professional Workbook, SybexPublication.
5. Hughes and Cornell, Software Project Management, 3rd edition, Tata McGraw Hill
6. Joseph Phillips,IT Project Management,endedition, Tata McGraw Hill

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC802	Cloud Computing	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		#Continuous Assessment (CA)			@End Sem. Exam				
		Test 1	Test 2	IA					
UITC802	Cloud Computing	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:

The student should be able to

1. Describe the common terms and definitions of virtualization and different types of Virtualization technologies
2. Comprehend the cloud platform architecture
3. Implement basic cloud applications
4. Identify security issues in cloud computing.

Module No.	Unit No.	Detailed content	Hrs
1	**Introduction to Cloud Computing and Cloud Computing Services**		08
		Cloud architecture, The economics and benefits of cloud computing, horizontal/vertical scaling, Purpose of architecture,XaaS, IaaS, PaaS-Leveraging PaaS for Productivity-Languages for PaaS –SaaS –Software as a service, Comparison of various cloud computing providers, pattern design, visualization, mobile apps for CC, Storage and retrieval on cloud	
2	**Virtualization**		08
		What is Virtualization, Types of Virtualization, CPU Virtualization, Memory Virtualization, Storage Virtualization, Network Virtualization, OS virtualization, Advantages and disadvantages of Virtualization ESX internals , Microsoft –Window, Virtualization Technologies : Hyper-V,Xen and KVM Hypervisor. QEMU , SUN's VirtualBox	

3	Cloud Platform Architectures		10
		Amazon AWS, Microsoft Azure, Google App Engine, Google MapReduce / Yahoo Hadoop , Eucalyptus, Nimbus, OpenStack	
4	Cloud Security		06
		Security for Virtualization Platform –Issues in security of cloud computing, Host security for SaaS, PaaS and IaaS – Data Security –Data Security Concerns –Data Confidentiality and Encryption –Data Availability –Data Integrity –Cloud Storage Gateways –Cloud Firewall	
5	Cloud Programming		07
		Programming Support for Google Apps engine: GFS, Big tables,Xen technologies,	
		Total	39

Recommended books:

1. Rajkumar Buyya ,Cloud Computing Principles and Paradigms, Wiley
2. Kai Hwang, Distributed and Cloud Computing, Mk Publication
3. Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah, KLSI Cloud computing Black Book Dreamtech Publication
4. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper ,Cloud Computing for Dummies Wiley India Edition
5. Gautam Shroff, Enterprise Cloud Computing, Cambridge
6. Ronald Krutz and Russell Dean Vines, Google Apps by Scott Granneman,Pearson
7. Tim Malhar, S.Kumaraswammy, S.Latif ,Cloud Security & Privacy, SPD,O'REILLY
8. Antohy T Velte, Cloud Computing : A Practical Approach, et.al McGraw Hill,
9. Barrie Sosinsky,Cloud Computing Bible, Wiley India
10. Stefano Ferrettiet.al.QoS–aware Clouds", 2010 IEEE 3rd International Conference on Cloud Computing
11. Bernald Golden,Virtualization for Dummies, Wiley India.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITC803	Soft Computing	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		#Continuous Assessment (CA)			@End Sem. Exam				
		Test 1	Test 2	IA					
UITC803	Soft Computing	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 mark

Course Outcomes:
The student should be able to
1. Understand the components of Soft Computing and their advantages, dis-advantages and applications.
2. Apply various Neural Learning Algorithms to design, analyze and perform experiments on real life problems.
3. Conceptualize fuzzy logic and its implementation for various real world applications.
4. Understand the fundamentals of components of Evolutionary computation and their applications.

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Module No.	Unit No.	Detailed content	Hrs
01		**Introduction to Soft Computing and its components**	02
	1.1	Machine Learning: Neural Networks, Support Vector Machines	
	1.2	Fuzzy Logic	
	1.3	Evolutionary Computation: Genetic Algorithms, Metaheuristic and Swarm Intelligence	
02		**Machine Learning: Artificial Neural Networks**	15
	2.1	Biological Neurons and their artificial models, Basic models of Artificial Neural Networks, Neural Processing, Learning and adaptation, Neural Network Learning Rules and comparison.	
	2.2	**Single layer Perceptron classifiers:** Single Discrete Perceptron Learning Algorithm, Single layer Continuous Perceptron Networks for linearly separable classifiers, Multicategory Single- Layer Perceptron Networks	
	2.3	**Multilayer Feedforward Networks:** Linearly Nonseparable Pattern Classification, Delta learning rule for Multiperceptron layer, Generalized Delta Learning Rule, Feedforward Recall and Error back-propagation	

		algorithm, learning factors	
	2.4	**Recurrent Neural Networks:** Bidirectional Associative Memories, Discrete Hopfield Networks	
03		**Machine Learning: Support vector Machines**	02
		Introduction, Need for Support Vector Machines, Support vector Machine Classifier, Applications	
04		**Fuzzy Logic**	12
		Introduction, Classical set (crisp set) Fuzzy sets and their properties, Fuzzy models, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Defuzzification. Application of Fuzzy logic to real world problem.	
05		**Evolutionary Computation**	08
	5.1	Genetic Algorithms: Introduction, basic operators and Terminologies in GA, Genetic operators – Selection, cross-over, reproduction and mutation – fitness function, traditional vs. Genetic algorithm, simple genetic algorithm, general genetic algorithm, the schema theorem, classification of GA, Genetic programming	
	5.2	Introduction to Ant Systems (Ant Colony Systems), Swarm Intelligence (Particle Swarm Optimization)	
		Total	**39**

Recommended books:

1. Jacek M. Zurada, "Introduction to Artificial Neural Systems," Jaico Publishing House
2. S. Rajasekaran, G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and applications," PHI Learning Pvt. Ltd
3. Timoth J. Ross, "Fuzzy Logic with Engineering Applications," 3rd ed. Wiley India
4. S. N. Sivananandam and S. N. Deepa, "Principles of Soft Computing," 2nd ed. Wiley India.
5. H. J. Zimmerman, "Fuzzy Set Theory and its Applications," Allied Publishers Ltd.
6. Zbigniew Michalewicz, Martin Schmidt, Matthew Michalewicz, constantinChiriac, "Adaptive Business Intelligence," Springer

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE801	**Digital Marketing**	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE801	**Digital Marketing**	15	15	10	60	--	--	--	100

\# There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 mark

Course Outcomes:

At the end of successful completion of the course a student will be able to

1. Comprehend change in marketing paradigm from Digital Marketing perspective
2. Realize different digital marketing channels
3. Apply web marketing principles
4. Apply social media platforms for digital marketing

Module No	Unit No.	Details of Topic	Hrs.
1		**Digital Marketing – A paradigm shift in marketing**	**09**
	1.1	New world of Marketing, Modern Digital consumer and his journey	
	1.2	Marketing Strategies for Digital world, Measurement and ROI for Digital Strategies	
	1.3	Capturing Customers with Online Marketing Techniques - Web 2.0 Interactive Techniques, Video and Vlogs, Webcasts, Web Conferences, and Webinars, Podcasts, Mobile Devices	
	1.4	Understanding Law in Digital Marketing	
2		**Introduction to Digital Marketing Channels**	**08**
	2.1	PPC Platforms, PPC Fundamentals, Marketing with PPC, Google AdWords, Google AdSense	
	2.2	Video Marketing And Video Cast	
	2.3	Email Marketing	
	2.4	Mobile Marketing	
3		**Web Marketing**	**08**
	3.1	Setting Goals for Web Site, Creating a Concept and developing content	
	3.2	Introduction to SEO - Optimizing with google and other search engine,	

		Ensuring Easy navigation, site structure, link structure	
	3.3	Improving result with web analytics - Tracking Web Site Activity, Identifying What Parameters to Measure, Interpreting Sales Statistics, Getting Going with Google Analytics, Diagnosing Conversion Rate Troubles	
	3.4	Crating marketing effective online store - Examining the Key Components of an Online Store, Selling B2B with an Online Store, Merchandising Online Store, Making It Easy for Customers to Buy, Understanding Do's and Don't of Online store	
4		**Social Media Marketing**	08
	4.1	Defining Social Media Marketing, Understanding Pros and cons of Social Media marketing, Developing a Strategic Social Media Marketing Plan, Segmenting B2C Market, Researching B2B Markets, Conducting Other Types of Market Research Online	
	4.2	Managing Cybersocial Campaign - Managing Social Media Schedule, Creating a Social Media Marketing Policy, Staying on the Right Side of the Law, Protecting Band	
	4.3	Discovering Helpful Tech Tools- Keeping Track of the Social Media Scene, Saving Time with Content Distribution Tools, Notifying Search Engines about Updates, Snipping Ugly URLs, Using E-Commerce Tools for Social Sites	
	4.4	Optimizing Social Media for Search Engines, Gaining Visibility in Real-Time Search	
5		**Case study –Facebook**	06
	5.1	Creating a Page for Your Business, Developing a Facebook Marketing Plan, Promoting Your Page	
	5.2	Using Facebook As a Marketing Tool, Facing Facebook Groups, Hosting Facebook Events, Reaching out Further with Facebook Connect, Using Facebook Tools and Applications	
		Analyzing Facebook Metrics - Checking Referrals from Web Sites, Monitoring Post Comments, Measuring Link Effectiveness, Making the Grade on Facebook Grader	
		Total	39

Recommended Books:
1. Eric Greenberg, Alexander Kates, "Strategic Digital Marketing: Top Digital Experts Share the Formula for Tangible Returns on Your Marketing Investments", McGraw Hill Education
2. Jan Zimmerman, "Web Marketing For Dummies", Willy Publishing, 2nd Edition
3. Jan Zimmerman, Deborah Ng, "Social Media Marketing All-in-One For Dummies, 2nd Edition", Willy Publishing
4. Amy Porterfield, Phyllis Khare, Andrea Vahl, "Facebook Marketing All-in-One For Dummies", Willy Publishing

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE802	Robotics	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE802	Robotics	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:
The student should be able to
1. Understand key components of robotics technologies namely classification, kinematics, sensors and actuators, systematization, and typical applications
2. Solve basic robot forward and inverse kinematics problems
3. Understand basics of robotic dynamics, path planning and Task planning
4. Apply image processing techniques in robotics to improve the ability of robots
5. Understand the current trend of automation and data exchange in manufacturing technologies

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Module No.	Unit No.	Detailed content	Hrs
01		**Introduction**	05
	1.1	Automation and Robots	
	1.2	Robot Classification	
	1.3	Robot Applications	
	1.4	Robot Specifications	
	1.5	Advantages and Dis-advantages of Robots	
02		**Robot Arm Kinematics**	15
	2.1	**Direct Arm Kinematics:** Homogeneous Co-ordinates, Homogeneous Co-ordinate Transformations, Composite Homogeneous Co-ordinate Transformations, Kinematic parameters, D-H Algorithm, Arm Equation, Direct Kinematic analysis of 2 and 3 axes planar robot, 4-axes Adept One SCARA Robot	
03		**Workspace Analysis, trajectory Planning and task planning**	02
	3.1	**Workspace Analysis:** Workspace Analysis of 4-axis SCARA robot, workspace fixtures	

	3.2	**Trajectory Planning:** The pick-and-place operation, Continuous Path Motion of a 4-axis Adept One SCARA Robot	
	3.3	**Task Planning:** Task-level programming, Uncertainity, Gross-Motion Planning (Generalized Voronoi Diagrams), Grasp Planning, Fine Motion Planning	
04		**Robot Vision**	12
		Image Representation, Template Matching, Edge detection, Corner Point detection, Thresholding, Region Labelling, Run-length encoding, Shape Analysis, Iterative Processing, Perspective Transformations	
05		**Industry 4.0**	05
	5.1	Definition and Key Components of Industry 4.0	
	5.2	Requirements of CPA	
	5.3	IIoT Architecture and Information-Based Interaction	
	5.4	Cloud Robotics o A brief History o BIG DATA o Cloud Computing o Collective robot Learning o Human Computation: Crowd Sourcing and call Centers o Open-Source and Open-Access	
	5.5	Two Stages of Achieving Zero defects	
	5.6	Robot and AI-Bot: Drawing parallels	
		Total	**39**

Recommended books and Papers:

1. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
2. Fu, Gonzales and Lee, Robotics, McGraw Hill
3. J.J, Craig, Introduction to Robotics, Pearson Education
4. Ben Kehoe, Sachin Patil, Pieter Abbeel, and Ken Goldberg, "A Survey of Research on Cloud Robotics and Automation," IEEE Trans. On Automation Science and Engineering, Vol. 12, No. 2, April 2015
5. Fan-Tien Cheng, HaoTieng, Haw-Ching Yang, Min-Hsiung Hung, Yu-Chuan Lin, Chun-Fan Wei,andZih-Yan Shieh, "Industry 4.1 for Wheel Machining Automation," IEEE Robotics and Automation Letters, Vol. 1, No. 1, January 2016
6. Jiafu Wan, Shenglong Tang, ZhaogangShu, Di Li, ShiyongWang,Muhammad Imran, and Athanasios V. Vasilakos, "Software-Defined Industrial Internet of Things in the Context of Industry 4.0," IEEE Sensors Journal., VOL. 16, NO. 20, OCTOBER 15, 2016.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE803	Digital Forensics	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		#Continuous Assessment (CA)			@End Sem. Exam				
		Test 1	Test 2	IA					
UITE803	Digital Forensics	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:
The student should be able to
1. Understand the fundamentals of Digital forensics and its role in crime investigation process.
2. Describe the importance of evidence management in forensic examination.
3. Identify and apply some of the current techniques and tools for network, e-mail and mobile forensics.

Module No.	Unit No.	Detailed content	Hrs
1	**Digital Forensics Foundations**		06
	1.1	Introduction, six A's of Digital Forensics, Digital Investigations and Evidence, Digital Crime Scene Investigation Process,	
	1.2	Computer evidence- Introduction, Types, Chain of custody, rules of evidence,The location of Electronic evidence- Files created by computer users, Files protected by computer users, Files created by the computer, Authentication, Standards	
	1.3	Incident Response and computer forensics	
		Incident response – types of incidents, Incident response methodologies, Order of volatility, Initial triage – live response, memory forensics	
	1.4	IT Law , Case Study	
2	**Image capturing and Information Extraction from Data-**		06
	2.3	The Imaging Process, Types of Images, Partial Volume Images, Working with Virtual Machines, Imaging/Capture Tools	
	2.4	Extracting Information from Data, Hidden Evidence, Trace Evidence, Registry Analysis, File Carving, Internet artifacts analysis	
	2.5	Passwords- Finding Passwords, Deducing Passwords, Cracking Passwords, Encryption and bit-locker	
	2.6	Case Study	

3	**Network Forensics**		09
	3.8	Standalone vs Networked Devices, Computer Networks	
	3.9	Network components, Network related evidence	
	3.10	Network Forensics analysis Tools	
	3.11	Special issues when conducting investigations in a Networked Environment, Preliminary analysis,	
	3.12	Documentation and collection, Analysis and preservation	
	3.13	**Self Learning -Database Forensics**	
	3.14	IT Law , Case Study	
4	**E-mail Forensics**		08
	4.4	The importance of Email Investigations, Email: The Basics	
	4.5	How to conduct an Email Investigation	
	4.6	Problems Encountered by Computer Forensics Investigators	
	4.7	IT Law ,Case Study	
5	**Mobile Forensics**		10
	5.1	Introduction, The Cellular Network, Handset Specifications,	
	5.2	Mobile Operating Systems- Android OS, Windows Phone	
	5.3	Standard Operating Procedures for Handling Handset Evidence	
	5.4	Handset Forensics, Manual Cell phone Examinations, Global Satellite Service Providers	
	5.5	Legal Considerations, Other Mobile Devices	
	5.6	IT Law, Case Study	
		Total	**39**

Recommended books:
1. Marie-Helen Maras, "Computer Forensics: Cybercriminals, Laws and Evidence", Jones & Bartlett Learning
2. Dr. Darren R. Hayes, "A Practical Guide to Computer Forensics Investigations", Pearson Publications
3. Cory Altheide, Harlan Carvey,"Digital Forensics with Open Source Tools", Elsevier Publications
4. Michael G. Solomon, K Rudolph, Ed Tittel, Neil Broom, Diane Barrett, "Computer Forensics Jumpstart", Second Edition, Wiley Publishing Inc.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE804	**Internet of Things**	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE804	**Internet of Things**	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.

@ ESE will be of 100 marks and scaled to 60 marks

Course Outcomes:

At the end of successful completion of the course a student will be able to

1. Appreciate the IoT and its perceived applications for today and tomorrow
2. Comprehend IoT architecture, enabling technologies and protocols
3. Realize design process of IoT applications and IoT challenges

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Module No	Unit No.	Details of Topic	Hrs.
1		**Introduction to the Internet of Things (IoT)**	07
	1.1	From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics	
	1.2	M2M and IoT Technology fundamentals	
	1.3	Domain Specific IoT applications- Home Automation, Industry Automation , Energy, Cities, Environment, Retail, Agriculture	
2		**IoT Architectures**	07
	2.1	IoT Architecture – State of the Art	
	2.2	IoT Reference model	
	2.3	IoT Reference Architecture - Functional view, Information view, Deployment and operational view, Other relevant architectural views	
3		**Enabling Technologies and Protocols**	12
	3.1	RFID – Introduction, Role in IoT Environment	
	3.2	Wireless Sensor Network - Introduction, Role in IoT Environment	

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Department of Information Technology

	3.3	Cloud Computing - Introduction, Role in IoT Environment	
	3.4	Embedded Systems - Introduction, Role in IoT Environment	
	3.5	IoT Protocols at Link, Network, Transport and Application Layer	
4		**Design of IoT application**	07
	4.1	Logical Design of IoT- IoT Functional Blocks, IoT Communication Models, IoT Communication API	
	4.2	IoT levels and Deployment Templates	
	4.3	IoT Design Methodologies	
	4.4	Case study on IoT system	
5		**IoT Challenges**	06
	5.1	Problem of Interoperability	
	5.2	Problem of Standardization - Importance	
	5.3	Security, Privacy, Trust	
		Total	39

Recommended Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.

2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014.

3. Dr. Ovidiu Vermesan, Dr. Peter Friess, "Internet of Things - From Research and Innovation to Market Deployment", River Publisher, 2014

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITE805	Geographical Information Systems	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITE805	Geographical Information Systems	15	15	10	60	--	--	--	100

There is no separate head of passing for individual components of CA.
@ ESE will be of 100 marks and scaled to 60 marks

Course Pre-requisite: Computer Graphics, Image Processing, Database Systems.

Course Outcomes:
After completing this course, students will be able to:

1. Understand main concepts that define Geographic Information Systems.
2. Perform map projections, spatial data processing, spatial analysis, spatial interpolation for spatial data.
3. Describe Remote Sensing concepts, Remote Sensing Systems and programs, its potential to spatial analysis.
4. Apply some basic tools and techniques to Create GIS and cartographic outputs for presentation.

Module No.	Unit No.	Topics	Hrs.
1		**Fundamentals of GIS**	**06**
	1.1	Introduction, Definition of GIS, Evolution of GIS , components of GIS,	
	1.2	Geospatial Data, Geographic Coordinate System, Map Projections, Commonly Used Map Projections, UTM grid system, Map Scale	
	1.3	Cartographic Symbolization, Types of Maps, Typography, Map Design, Map Production	
2		**Data Management, Models and Quality Issues**	**08**
	2.1	Vector Model : Topology, Non topological Vector models, Attribute Data	

		in GIS, Attribute Data Entry, Vector Data Query, Manipulation of Fields and Attribute Data	
	2.2	Raster Data Model : Elements of Raster Data Model, Types of Raster Data, Raster Data Structure, Raster Data Query, Data Compression, Data Conversion, Integration of Raster and Vector data	
	2.3	Data input and editing, Data quality Issues: Accuracy, Consistency, Precision and Resolution, Completeness; sources of error in GIS	
3		**GIS Data Exploration Analysis and Visualization**	**10**
	3.1	Data exploration: Descriptive statistics, Graphs, Dynamic Graphics	
	3.2	Vector Data Analysis: Buffering, Overlay, Distance Measurement, Pattern Analysis, Map Manipulation	
	3.3	Raster Data Analysis: Local Operations, Neighborhood Operations, Zonal Operations, Data Extraction, Data Generalization, Comparison of Vector and Raster Based Data	
	3.4	Spatial Interpolation: Elements of Spatial Interpolation, Global methods, Local Methods, Comparison of Spatial Interpolation Methods, Slope and Aspect in Terrain Mapping	
4		**Remote Sensing Fundamentals**	**09**
	4.1	Remote Sensing: Basic Principles, Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials, Energy Interactions with Atmosphere, Spectral Reflectance Curves.	
	4.2	Remote Sensing Platform and Sensors, Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites. Data Formats, Standard Products. Image Interpretation, Elements of Image Interpretation.	
5		**Project Management , Modern trends and Applications of GIS**	**06**
	5.1	Planning of project, Implementation of project, management of Project, case study. Multimedia GIS, Internet GIS, Mobile GIS, Applications of GIS in Urban and municipal area.	
		Total	**39**

Recommended Books:

1. Kang-tsung Chang, "Introduction to Geographical Information Systems", Tata McGraw Hill, Third Edition, 2003
2. M. AnjiReddi, "Remote Sensing and Geographical Information Systems", B. S. Publications, Second Edition, 2001
3. BasudebBhatta ,Remote Sensing and GIS ,Oxford University Press,2nd Edition
4. Ian Heywood, Sarah Cornelius &etal., "An Introduction to Geographical Information Systems", 2nd Edition, Pearson Education
5. Remote Sensing S Chandra , Narosa Publications

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL801	Software Project Management Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL801	Software Project Management Laboratory	--	--	--	--	25	--	25	50

Term Work:
Term work shall consist of total 8 to 10 experiments covering entire syllabus.
Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.
Oral Exam:
The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL802	Cloud Computing Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL802	Cloud Computing Laboratory	--	--	--	--	25	--	25	50

Term Work:
Term work shall consist of total 8 to 10 experiments covering entire syllabus.
Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:
The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL803	Soft Computing Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL803	Soft Computing Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL804	Digital Marketing Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL804	Digital Marketing Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL805	Robotics Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL805	Robotics Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL806	Digital Forensics Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL806	Digital Forensics Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL807	Internet of Things Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL807	Internet of Things Laboratory	--	--	--	--	25	--	25	50

Term Work:

Term work shall consist of total 8 to 10 experiments covering entire syllabus.

Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.

Oral Exam:

The oral will be based on the entire syllabus.

Course Code	Course Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UITL808	Geographical Information System Laboratory	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UITL808	Geographical Information System Laboratory	--	--	--	--	25	--	25	50

Term Work:
Term work shall consist of total 8 to 10 experiments covering entire syllabus.
Term work assessment will be based on the overall performance of the student with every experiment graded from time to time out of 25. Final term work marks will be the average of 8 to 10 experiments marks.
Oral Exam:
The oral will be based on the entire syllabus.

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