B.E. Semester –VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Digital Signal & Image Processing							**Course Code :**CSC701		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
4	-	2	6	5	20	80	-	25	**125**
IA: In-Semester Assessment - Paper Duration – 1 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)									
Prerequisite: Engineering Mathematics,Basic Knowledge of Signals and System									

Course Objective: Thecourse intends to deliver the concepts of digital signal processing and Image processing and apply this knowledge on different image processing aspects.

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply the concept of DT Signal and DT Systems.	L1, L2, L3
2	Classify and analyze discrete time signals and systems.	L1, L2, L3, L4
3	Experiment with Digital Signal Transform techniques DFT and FFT.	L1, L2, L3,L4
4	Make use of enhancement techniques for digital Image Processing.	L1, L2
5	Explain advantages and disadvantages of different edge detection techniques.	L1, L2, L3
6	Develop small projects of 1-D and 2-D Digital Signal Processing.	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Discrete-Time Signal and Discrete-Time System** Introduction to Digital Signal Processing, Sampling and Reconstruction, Standard DT Signals, Concept of Digital Frequency, Representation of DT signal using Standard DT Signals, Signal Manipulations(shifting, reversal, scaling, addition, multiplication). Classification of Discrete-Time Signals, Classification of Discrete-Systems Linear Convolution formulation for 1-D and 2-D signal (without mathematical proof), Circular Convolution (without mathematical proof), Linear convolution using Circular Convolution. Auto andCross Correlation formula evaluation, LTI system, Concept ofImpulse Response and Step Response, Output of DT system usingTime Domain Linear Convolution.	12	L1, L2, L3
2	**Discrete Fourier Transform** Introduction to DTFT, DFT, Relation between DFT and DTFT, IDFT Properties of DFT without mathematical proof (Scaling and Linearity, Periodicity, Time Shift and Frequency Shift, Time Reversal, Convolution Property and Parsevals' Energy Theorem). DFT computation using DFT properties. Transfer function of DT System in frequency domain using DFT. Linear and Circular Convolution using DFT, Convolution of long sequences, Introduction to 2-D DFT	6	L1, L2, L3, L4
3	**Fast Fourier Transform** Need of FFT, Radix-2 DIT-FFT algorithm, FFT Flow graph for N=4 and 8, Inverse FFT algorithm. Spectral Analysis using FFT	6	L1, L2, L3, L4
4	**Digital Image Fundamentals** Introduction to Digital Image, Digital Image Processing System, Sampling and Quantization Representation of Digital Image, Connectivity Image File Formats: BMP, TIFF and JPEG.	8	L1, L2
5	**Image Enhancement in Spatial domain** Gray Level Transformations, Zero Memory Point Operations, Histogram Processing, Histogram equalization. NeighborhoodProcessing, Spatial Filtering, Smoothing and Sharpening Filters, Median Filter	12	L1, L2, L3
6	**Image Segmentation** Segmentation based on Discontinuities (point, Line, Edge), Image Edge detection using Robert, Sobel, Previtt masks, Image Edge detection using Laplacian Mask	8	L1, L2, L3
	Total Hours	**52**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Digital Signal Processing: Principles, Algorithms, and Applications	John G. Proakis, Dimitris and G.Manolakis	Pearson Education	Fourth Edition	2007
2	Digital Signal Processing	A. Anand Kumar	PHI Learning Pvt. Ltd.	Second Edition	2013
3	Digital Image Processing	Rafel C. Gonzalez and Richard E. Woods	Pearson Education	ThirdEdition	2009
4	Digital Image Processing	S. Sridhar	Oxford University Press	Second Edition	2012

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.tutorialspoint.com	https://www.tutorialspoint.com/digital_signal_processing/	M1,M2,M3
2	www.gnits.ac.in	https://www.gnits.ac.in/sites/default/files/ONLINERESOURCES/ECE/dsp.pdf https://lecturenotes.in/subject/44/digital-signal-processing-dsp	M1,M2,M3
3	https://lecturenotes.in	https://lecturenotes.in/subject/89/digital-image-processing-dip	M4,M5,M6

List of Practical/ Experiments:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Basic Experiments**	Illustrate a program to sample a continuous time signal and convert it to Discrete Time Signal.	2	L1, L2, L3
2	**Design Experiments**	Develop a function to find auto-correlation operation.	2	L1, L2, L3
3		Develop a function to find cross-correlation operation.	2	L1, L2, L3
4		Experiment with Discrete Fourier transform	2	L1, L2, L3
5		Develop a program to perform Fast Fourier Transform of N point signal.	2	L1, L2, L3
6		Make use of Image negative, Gray level Slicing and Thresholding on to a given image	2	L1, L2, L3

7		Make use of Contrast Stretching, Dynamic range compression & Bit plane Slicing to a given image	2	L1, L2, L3
8		Make use of Histogram Processing	2	L1, L2, L3
9		Make use of Image smoothing/ Image sharpening to a given image	2	L1, L2, L3
10		Implementation of Edge detection using Sobel and Previtt masks	2	L1, L2, L3
11	**Mini/Minor Projects/ Seminar/ Case Studies**	**Case Study:** 1. Speech signal Processing 2. Biomedical Digital Signal Processing 3. Image Security 4. Study on image cryptographic algorithms.	4	L1, L2, L3,L4
13		**Research Paper Presentation** 1. Presentation on latest topics from technical papers in Survey of Signal Processing Algorithm and Image Processing.	2	L1, L2, L3,L4
13		**Mini Project:** 1. Optical character recognition 2. Text Recognition in Images 3. Face recognition 4. Fingerprint recognition 5. Handwriting recognition	4	L1, L2, L3, L4, L5, L6
	Total Hours		**30**	

B.E. Semester –VII

B.E. (Computer Engineering)							B.E. SEM : VII		
Course Name : Mobile Communication & Computing							**Course Code :**CSC702		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**150**
4	-	2	6	5	20	80	25	25	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%).									
Prerequisite: Computer Networks									

Course Objective: Thecourse intends toimpart fundamental concepts related to mobile communication and computing as well as provide a perspective on the converging area of wireless networking, mobility management and introduce recent research topics.

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Illustrate basic concepts and principles in mobile communication & computing, cellular architecture.	L1, L2
2	Demonstrate the components and functioning of mobile networking.	L1, L2, L3, L4
3	Classify variety of security techniques in mobile network.	L1, L2, L3, L4
4	Apply the concepts of WLAN for local as well as remote applications.	L1, L2, L3
5	Applytheconcepts of mobility management	L1, L2, L3
6	Demonstrate Long Term Evolution (LTE) architecture and its interfaces.	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Mobile Computing** Introduction to Mobile Computing, Telecommunication Generations, Cellular systems,Electromagnetic Spectrum, Antenna, Signal Propagation, Signal Characteristics, Multiplexing, Spread Spectrum:DSSS& FHSS	06	L1, L2
2	**GSM Mobile services** GSM Mobile services, System Architecture, Radio interface, Protocols , Localization and Calling, Handover, security**(A3,A5 & A8),** GPRS system and protocol architecture UTRAN , UMTS core network ; Improvements on Core Network	08	L1, L2, L3, L4
3	**Mobile Networking** **Mobile Networking:** Medium Access Protocol, InternetProtocol and Transport layer, **Medium Access Control:**Motivation for specialized MAC, Introduction to multipleAccess techniques (MACA) **Mobile IP**: IP Packet Delivery, Agent Advertisement and Discovery, Registration, TunnellingandEncapsulation, Reverse Tunnelling, Routing (DSDV,DSR) **Mobile TCP :** Traditional TCP, Classical TCP Improvements like IndirectTCP, Snooping TCP & Mobile TCP, Fast Retransmit/ FastRecovery, Transmission/Timeout Freezing, SelectiveRetransmission	10	L1, L2, L3, L4
4	**Wireless Local Area Networks** **Wireless Local Area Networks :** Introduction, Infrastructureand Ad-Hocnetwork **IEEE 802.11:**System architecture, Protocol architecture,Physical layer, Medium access control layer, MAC management, 802.11a, 802.11b **Wi-Fi security :** WEP ,WPA, Wireless LAN Threats,Securing Wireless Networks, HiperLAN 1 &HiperLAN 2 **Bluetooth:** Introduction, User Scenario, Architecture, protocolstack	10	L1, L2, L3
5	**Mobility Management** **Mobility Management :** Introduction, IP Mobility,Optimization, IPv6 **Macro Mobility** : MIPv6, FMIPv6, **Micro Mobility:**CellularIP, HAWAII, HMIPv6	7	L1, L2, L3
6	**Long-Term Evolution (LTE) of 3GPP** **Long-Term Evolution (LTE) of 3GPP :** LTE SystemOverview, Evolution from UMTS to LTE LTE/SAE Requirements, SAE Architecture EPS: Evolved Packet System, E-UTRAN, Voice over LTE(VoLTE), Introduction to LTE-Advanced System Aspects, LTE Higher Protocol Layers, LTE MAClayer, LTE PHY Layer, Self-Organizing Network (SON-LTE),SON for HeterogeneousNetworks (HetNet), Introduction to 5G	11	L1, L2
	Total Hours	**52**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Mobile Communication	JochenSchillller	Pearson Education	Second Edition	2017
2	Wireless Communications & Networks	William Stallings	Pearson education	Second Edition	2009
3	Mobile Computing	Raj Kamal	Oxford University Press-New Delhi	Third Edition	2018
4	LTE Self-Organizing Networks (SON): Network Management Automation for Operational Efficiency	SeppoHamalainen, Henning Sanneck, CinziaSartori,	Wiley publications	First Edition	2011
5	An Introduction to LTE: LTE, LTE-Advanced, SAE and 4G Mobile Communications	Christopher Cox	Wiley publications	Second Edition	2014
6	Mobility Protocols and Handover Optimization: Design, Evaluation and Application	Ashutosh Dutta, Henning Schulzrinne	IEEE Press, Wiley Publication	First Edition	2015
7	Build your own security lab	Michael Gregg	Wiley India edition	First Edition	2012
8	Emerging Wireless Technologies and the Future Mobile Internet	DipankarRaychaudhuri, Mario Gerla	Cambridge	First Edition	2011
9	Wireless Communications	Andreas F.Molisch	Wiley Publication	Second Edition	2010

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.coursera.org/	https://www.coursera.org/learn/wireless-communications	M4
2	nptel.ac.in	https://nptel.ac.in/courses/106106147/	M1-M6
3	vlab.amrita.edu	http://vlab.amrita.edu/index.php?sub=78&brch=256	M1, M3, M5

List of Practical/ Experiments:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Basic Experiments**	Outline cellular architecture with emphasis on the process of clustering and frequency reuse.	2	L1, L2, L3

2		Compare the GSM security algorithms i.e. A3, A5, A8	2	L1, L2, L3
3	**Design Experiments**	Apply a Bluetooth network to transfer a file from one device to another.	2	L1, L2, L3
4		Apply basic function of Code Division Multiple Access (CDMA) to test the orthogonalityof a code to be used for CDMA operation.	2	L1, L2, L3
5		Apply basic function of Code Division Multiple Access (CDMA) to test the autocorrelation of a code to be used for CDMA operation.	2	L1, L2, L3
6		Apply setup & configuration of Wireless Access Point (AP) using NS3.	2	L1, L2, L3
7		Develop an application that writes data to the SD card.	2	L1, L2, L3
8		Develop an application that uses GUI components.	2	L1, L2, L3
9		Develop an application that draws basic graphical primitives on the screen.	2	L1, L2, L3
10		Develop an application that makes use of database.	2	L1, L2, L3
11		Develop an application that creates an alert upon receiving a message.	2	L1, L2, L3
12		Develop mobile node discovery	2	L1, L2, L3
13	**Mini/Minor Projects/ Seminar/ Case Studies**	**Case Study** 1. Describe Long Term Evolution (LTE) architecture and its interfaces. 2. Describe and compare HiperLAN 1 &HiperLAN 2 3. Describe and compare Macro Mobility and Micro Mobility **Mini Project:** Compare number of packet retransmissions required in both RTS/CTS wireless networks	6	L1, L2, L3, L4, L5
	Total Hours		**30**	

B.E. Semester –VII

B.E. (Computer Engineering)							B.E. SEM : VII		
Course Name : Artificial Intelligence & Soft Computing							CSC703		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**150**
4	-	2	6	5	20	80	25	25	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)									
Prerequisite: Discrete Mathematics, Analysis of Algorithms, Data Structure									

Course Objective: Thecourse intends to deliver the basic knowledge and techniques of AI and SC and apply various AI and SC algorithms to create AI based real world applications/systems.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Evaluate the various characteristics of Artificial Intelligence and Soft Computing techniques.	L1, L2, L3, L4, L5
2	Evaluate problem solving methods for an agent to find a sequence of actions to reach the goal state.	L1, L2, L3, L4, L5
3	Review the strength and weakness of AI approaches to knowledge representation, reasoning and planning.	L1, L2, L3
4	Design fuzzy controller system for real world application.	L1, L2, L3, L4, L5, L6
5	Apply supervised and unsupervised ANN for real world applications.	L1, L2, L3
6	Apply Hybrid approach for expert system design.	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per blooms Taxonomy
1	**Introduction to Artificial Intelligence(AI) and Soft Computing**	4	L1, L2, L3, L4, L5
	Introduction and Definition of Artificial Intelligence. Intelligent Agents: Agents and Environments, Rationality, Nature of Environment, Structure of Agent, types of Agent. Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques.		
2	**Problem Solving**	10	L1, L2, L3, L4, L5
	Problem Solving Agent, Formulating Problems, Example Problems Uninformed Search Methods: Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Method: A* Search Optimization Problems: Hill climbing Search, Simulated annealing, Genetic algorithm		
3	**Knowledge, Reasoning and Planning**	10	L1, L2, L3
	Knowledge based agents First order logic: syntax and Semantic, Knowledge Engineering in FOL, Inference in FOL : Unification, Forward Chaining, Backward Chaining and Resolution Planning Agent, Types of Planning: Partial Order, Hierarchical Order, Conditional Order		
4	**Fuzzy Logic**	12	L1, L2, L3, L4, L5, L6
	Introduction to Fuzzy Set: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, membership functions Fuzzy Logic: Fuzzy Logic basics, Fuzzy Rules and Fuzzy Reasoning Fuzzy inference systems: Fuzzification of input variables, defuzzification and fuzzy controllers		
5	**Artificial Neural Network**	12	L1, L2, L3
	Introduction – Fundamental concept– Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron Neural Network Architecture: Perceptron, Single layer Feed Forward ANN, Multilayer Feed Forward ANN, Activation functions, Supervised Learning: Delta learning rule, Back Propagation algorithm. Un-Supervised Learning algorithm: Self Organizing Maps		
6	**Expert System**	4	L1, L2, L3
	Hybrid Approach - Fuzzy Neural Systems Expert system : Introduction, Characteristics, Architecture, Stages in the development of expert system		
	Total Hours	**52**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Artificial Intelligence a Modern Approach	Stuart J. Russell and Peter Norvig	McGraw Hill	Third Edition	2009
2	Introduction to soft computing	Samir Roy and Chakraborty	Pearson Edition	First Edition	2013
3	Principles of Soft Computing	S.N.Sivanandam, S.N.Deepa	Wiley Publication	Second Edition	2011
4	Neural Networks, Fuzzy Logic and Genetic Algorithms	S.Rajasekaran and G.A.VijayalakshmiPai	PHI Learning	Second Edition	2017
5	Artificial Intelligence and Intelligent Systems	N. P. Padhy	Oxford	First Edition	2005
6	Artificial Intelligence	Elaine Rich and Kevin Knight	Tata McGraw-Hill Education Pvt. Ltd.	Third Edition	2008
7	Neural Networks A Classroom Approach	Satish Kumar	Tata McGraw-Hill Education Pvt. Ltd.	Second Edition	2012
8	Fuzzy Set Theory and its Applications	Zimmermann H.S	Kluwer Academic Publishers	Fourth Edition	2001
9	Neural Network Design	Hagan, Demuth, Beale	CENGAGE Learning, India Edition	Second Edition	2014
10	Neuro-Fuzzy and Soft Computing	J.-S.R.Jang	PHI	Third Edition	2003
11	Introduction to Artificial Neural Sytems	Jacek M. Zurada	Jaico Publishing House	First Edition	1994

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://nptel.ac.in	https://nptel.ac.in/courses/106105077/	M1-3
2	https://nptel.ac.in	https://nptel.ac.in/courses/106105173/	M4-6

List of Practical/ Experiments:

Sr. No.	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels as per blooms Taxonomy
1	**Basic Experiment**	(a)Specifyproblem formulation for an AI problem. (b) Specify PEAS description for an AI agent.	2	L1, L2, L3, L4, L5
2		Solve a given problem using uninformed search technique.	2	L1, L2, L3, L4, L5
3	**Design Experiments**	Solve a given problem using informed search technique.	2	L1, L2, L3, L4, L5
4		Develop solution to optimization problem using Genetic Algorithm.	2	L1, L2, L3, L4, L5
5		Build knowledge base for Wumpus world problem.	2	L1, L2, L3
6		Solve a reasoning problem using unification.	2	L1, L2, L3
7		Apply concepts of Fuzzy to develop a Fuzzy Controller system.	2	L1, L2, L3
8		Apply Mc-Culloch Pitts Model to solve a classification problem.	2	L1, L2, L3
9	**Advanced Experiments**	Solve given problem using Supervised Neural Network.	2	L1, L2, L3
10		Solve given problem using unsupervised Neural Network.	2	L1, L2, L3
11	**Case Studies**	Investigate a Case study on Hybrid Systems	2	L1, L2, L3, L4
12		Investigate a Case study of a real life /Industry based Application	2	L1, L2, L3, L4
13	**Mini Projects**	1. Game Development 2. Chatbot 3. Pattern Recognition 4. Prediction 5. Smart Apps 6. Fuzzy System	6	L1, L2, L3, L4, L5, L6
	Total Hours		**30**	

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Department Level Optional Course – III(Advanced System Security and Digital Forensics)							**Course Code :**CSDLO7031		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	
4	-	2	6	5	20	80	25	25	**150**
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%).									
Prerequisite: System Security									

Course Objective: Thecourse intends to deliver advanced concepts about System Security to develop security management and policies for reducing Cyber-Attacks. It will also help in understanding and explore techniques used in Digital Forensics and analyze various software vulnerabilities, attacks and protection in Web Applications& Wi-Fi Networks

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply access control policies and control mechanisms to cyber-attacks	L1, L2, L3
2	Identify malicious code and targeted malicious code	L1, L2, L3
3	Analyze threats to web applications	L1, L2, L3, L4
4	Understand the vulnerabilities of Wi-Fi networks and explore different measures to secure wireless protocols, WLAN and VPN network	L1, L2, L3, L4
5	Asses ethical and legal issues associated with cyber-crimes and be able to mitigate impact of crimes with suitable policies	L1, L2, L3, L4, L5
6	Make use of different forensic tools to acquire and duplicate data from compromised systems and analyze the same	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per blooms Taxonomy
1	**Introduction & Access Control**	7	L1, L2, L3
	Cyber-attacks, Vulnerabilities, Defense Strategies and Techniques, Authentication Methods and Protocols, Defense in Depth Strategies Access Control Policies: DAC, MAC, Multi-level Security Models: Biba Model, Bell La Padula Model, Single Sign on, Federated Identity Management		
2	**Program & OS Security**	7	L1, L2, L3
	Malicious and Non-Malicious programming errors, Targeted Malicious codes: Salami Attack, Linearization Attack, Covert Channel, Control against Program threats, Operating System Security: Memory and Address protection, File Protection Mechanism, User Authentication Linux and Windows: Vulnerabilities, File System Security		
3	**Web Application Security**	10	L1, L2, L3, L4
	OWASP, Web Security Considerations, User Authentication and Session Management, Cookies, SSL, HTTPS, SSH, Privacy on Web, Web Browser Attacks, Account Harvesting, Web Bugs, Clickjacking, Cross-Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, Web Service Security, OAuth 2.0		
4	**Wireless Security**	9	L1, L2, L3, L4
	Wi-Fi Security, WEP, WPA, WPA-2, Mobile Device Security- Security Threats, Device Security, GSM and UMTS Security, IEEE 802.11/802.11i Wireless LAN Security, VPN Security		
5	**Legal and Ethical issues**	7	L1, L2, L3, L4, L5
	Cybercrime and its types, Intellectual property, Privacy, Ethical issues Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, case studies of ethics		
6	**Digital Forensics**	12	L1, L2, L3, L4
	Introduction to Digital Forensics, Acquiring Volatile Data from Windows and Unix systems, Forensic Duplication Techniques, Analysis of forensic images using open source tools like Autopsy and SIFT, Investigating logs from Unix and windows systems, Investigating Windows Registry		
	Total Hours	**52**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Computer Security Principles and Practice	William Stallings	Pearson Education	Sixth Edition	2011
2.	Security in Computing	Charles P. fleeger	Pearson Education	Fifth Edition	2015
3.	Network Security and Cryptography	Bernard Menezes	Cengage Learning	Second Edition	2014
4.	Network Security Bible	Eric Cole	Wiley	Second Edition	2009

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	https://www.owasp.org/index.php/Main_Page	https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project	M1-M2
2.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/operating_system/os_security	M2-M3
3.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/wireless_security/	M4
4.	https://pressbooks.com/	https://bus206.pressbooks.com/chapter/chapter-12-the-ethical-and-legal-implications-of-information-systems/	M5
5.	https://www.open.edu/openlearn/	https://www.open.edu/openlearn/science-maths-technology/digital-forensics/content-section-4.3	M6

List of Practical/ Experiments:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels as per blooms Taxonomy
1	Basic Experiments	Explain vulnerability scanning using Nessus, Nikto (Kali Linux)	2	L1, L2
2		Illustrate web-application vulnerabilities using open source tools like Wapiti, browser exploitation framework (BeEf), etc.	2	L1, L2
3		Idebtify SQL injection vulnerabilities in a website database using SQLMap	2	L1, L2, L3
4	Design Experiments	Apply Installation step and use a security app on an Android mobile (e.g. Droidcrypt)	2	L1, L2, L3
5		Make use of forensics tools in Kali Linux for acquiring, analyzing and duplicating data: dd, dcfldd, foremost, scalpel, debugfs, wireshark, tcptrace, tcpflow	2	L1, L2, L3
6		Analyze forensic images using open source tools like Autopsy, SIFT, FKT Imager	2	L1, L2, L3, L4
7		Make use of steganographic tools like OpenStego, to detect data hiding or unauthorized file copying	2	L1, L2, L3
8		Make use Password cracking using tools like John the Ripper/Cain and Abel/ Ophcrack to detect weak passwords.	2	L1, L2, L3
9		Analyze static code using open source tools like RATS, Flawfinder etc.	2	L1, L2, L3, L4
10		Apply a penetration testing using Metasploit (Kali Linux)	2	L1, L2, L3
11	Case Studies	1. Exploring Authentication and access control using RADIUS, TACACS and TACACS+ 2. Case Study on Stegonographic Tools 3. Case Study on latest Digital Forensic Tools	4	L1, L2, L3, L4

12	**Mini/Minor Projects/**	1. Application Security 2. Stenography 3. Authentication Mechanisms 4. Android Security Application 5. Vulnerability Scanner	6	L1, L2, L3, L4,L5, L6
	Total Hours		**30**	

B.E. Semester –VII

B.E. (Computer Engineering)							B.E. SEM : VII		
Course Name : Department Level Optional Course -III (Big Data Analytics)							Course Code :CSDLO7032		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**150**
4	-	2	6	5	20	80	25	25	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)									
Prerequisite: Database Management System**,** Data Warehouse and Mining, Machine Learning									

Course Objective: Thecourse intends to provide an overview of an exciting growing field of big data analytics and equip the students with programming skills to solve complex real world problems using big data technologies.

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Outline the key issues in big data management and its associated applications for business decisions and strategy.	L1, L2
2	Develop problem solving and critical thinking skills in fundamental enabling techniques like Hadoop, Map-reduce and NoSQL in big data analytics.	L1, L2, L3
3	Collect, manage, store, query and analyze various forms of Big Data.	L1, L2, L3, L4
4	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.	L1, L2, L3, L4, L5
5	Appraise adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc...	L1, L2, L3, L4, L5
6	Solve Complex real world problems in various applications like recommender systems, social media applications, health and medical systems, etc.	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Big Data and Hadoop** Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions. Concept of Hadoop, Core Hadoop Components; Hadoop Ecosystem	6	L1, L2
2	**Hadoop HDFS and MapReduce** **Distributed File Systems:** Physical Organization of Compute Nodes, Large-Scale File-System Organization**.** **MapReduce:** The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures. **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 **Hadoop Limitations**.	10	L1, L2, L3
3	**NoSQL** Introduction to NoSQL, NoSQL Business Drivers, **NoSQL Data Architecture Patterns**: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns, NoSQL Case Study NoSQL solution for big data, Understanding the types of big data problems;Analyzing big data with ashared-nothingarchitecture; Choosing distribution models: master-slave versus peer-to- to-peer; Four ways that NoSQL systems handle big data problems	6	L1, L2, L3, L4
4	**Mining Data Streams** **The Stream Data Model**: A Data-Stream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing, Sampling Data techniques in a Stream, Filtering Streams: Bloom Filter with Analysis, Counting Distinct Elements in a Stream, Count-Distinct Problem, Flajolet-Martin Algorithm, Combining Estimates, Space Requirements, **Counting Frequent Items in a Stream,** Sampling Methods for Streams, frequent Itemsets in Decaying Windows, Counting Ones in a Window: The Cost of Exact Counts, TheDatar-Gionis-Indyk-Motwani Algorithm, Query Answering in the DGIM Algorithm, Decaying Windows.	12	L1, L2, L3, L4, L5
5	**Finding Similar Items and Clustering** **Distance Measures:** Definition of a Distance Measure, Euclidean Distances, Jaccard Distance, Cosine Distance, Edit Distance, Hamming Distance.CURE Algorithm, Stream-Computing , A Stream-Clustering Algorithm,Initializing& Merging Buckets, Answering Queries	8	L1, L2, L3, L4, L5
6	**Real-Time Big Data Models** **PageRank Overview,** Efficient computation of PageRank: PageRank Iteration Using MapReduce, Use of Combiners to Consolidate the Result Vector **A Model for Recommendation Systems,** Content-Based Recommendations, Collaborative Filtering	10	L1, L2, L3

	Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities in a social graph**.**		
	Total Hours	**52**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Mining of Massive Datasets	AnandRajaraman and Jeff Ullman	Cambridge University Press	First Edition	2012
2	Hadoop in Practice	Alex Holmes	Manning Press, Dreamtech Press	Second Edition	2015
3	Making Sense of NoSQL- A guide for managers and the rest of us	Dan Mcary and Ann Kelly	Manning Press	First Edition	2010
4	Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics	Bill Franks	John Wiley & Sons	First Edition	2012

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.mmds.org	http://www.mmds.org	M1-M6
2	www.guru99.com	https://www.guru99.com/bigdata-tutorials.html	M1,M2
3	www.edureka.co	https://www.edureka.co/blog/hadoop-tutorial/	M1, M2
4	www.tutorailride.com	https://www.tutorialride.com/big-data-analytics	M1-M6

List of Practical/ Experiments:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels as per blooms Taxonomy
1	**Basic Experiments**	Explain Hadoop Ecosystem	2	L1, L2
2		Experiment with basic programs of Hadoop	2	L1, L2, L3
3		Make use of Sqoop tool to transfer data between Hadoop and relational database servers.	2	L1, L2, L3
4	**Design Experiments**	Apply Installation and configuration steps ofMongoDB/Cassandra/HBase to execute NoSQL commands	2	L1, L2, L3
5		Apply Map Reduce to Word count problem	2	L1, L2, L3
6		Experiment withHadoop Map-Reduce/PySpark	2	L1, L2, L3

7		Develop clustering algorithm K-means/CURE using MapReduce	2	L1, L2, L3
8		ApplyMap- Reduce to implement Matrix multiplication, Aggregates, joins, sorting, searching	2	L1, L2, L3
9		Develop DGIM algorithm/ Bloom Filter using any programming language	2	L1, L2, L3
10		DevelopPageRank algorithm	2	L1, L2, L3
11	**Advanced Experiments**	DevelopHIVE Database and Descriptive analytics-basic statistics, visualization using HIVE/PIG/R	2	L1, L2, L3
12		Apply R/Scilab/rapid miner to implement predictive analytics techniques (regression/time series)	2	L1, L2, L3
13	**Mini/Minor Projects/ Seminar/ Case Studies**	1. Twitter data analysis 2. fraud detection 3. Text Mining 4. Opinion mining 5. Fraud detection analysis 6. Similar topic detection analysis	4	L1, L2, L3, L4,L5, L6
14	**Paper writing on Different Big data analysis techniques in real life**	Identify research topics in Big data analytics and write a research paper	2	L1, L2, L3, L4
	Total Hours		**30**	

B.E. (Computer Engineering)							B.E. SEM : VII		
Course Name :Department Level Optional Course - III(Robotics)							Course Code :CSDLO7033		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
4	-	2	6	5	20	80	25	25	150
IA: In-Semester Assessment - Paper Duration – 1 Hour ESE: End Semester Examination - Paper Duration - 3 Hours **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)									
Prerequisite: Engineering Mathematics									

Course Objective: Thecourse intends to introduce the principles of robotics, and apply mathematical Kinematic modeling for manipulation of Robot in 3-D Space, It will also use various actuator and sensor to provide vision for proper task planning of the Robot.

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Outline typical robot and its characteristics.	L1, L2
2	Analyze kinematics parameters of robotic manipulator.	L1, L2, L3, L4
3	Identify actuators, sensors and control of a robot for different applications.	L1, L2, L3
4	Analyze motion of the robot for task planning	L1, L2, L3, L4
5	Apply Robotics to solve day to day problems using vision algorithms.	L1, L2, L3
6	Develop an Expert system of Robotics using Fuzzy logic controller	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction and Fundamentals of Robotics** Types of automation, Introduction, definition of a Robot, Classification of Robots, Robotics, History of Robotics, Advantages and Disadvantages of Robots, Robot Applications Tasks involved in Robotics, Robot Components, Robot characteristics and classification, Degrees of Freedom, Robot joints, Robot Coordinates, Robot Reference frames, Programming Modes, Robot Workspace, Work Envelop.	6	L1, L2
2	**Direct and Inverse Kinematics** **Direct (Forward) Kinematics**: Homogeneous coordinates, Link coordinates, Coordinate frame, coordinate transform, Arm equations, An example – Four Axis SCARA. **Inverse Kinematics:** Inverse kinematics problem, Tool Configuration, An example – Four Axis SCARA.	12	L1, L2, L3, L4
3	**Sensors, Actuators and Drive Systems** **Sensors:** Characteristics, Utilization, Types - Position, Velocity, Acceleration, Force and Pressure, Torque, Visible Light and Infrared, Touch and Tactile, Proximity, Range Finders sensors. **Actuators and Drive System:** Characteristics, Hydraulic Actuators, Pneumatic Devices, Electric Motors	4	L1, L2, L3
4	**Robot Task and Motion Planning** **Reactive Paradigms:** Overview, Attributes of reactive paradigm Task level programming, Uncertainty, Configuration Space, Gross motion planning, Fine-motion planning, Simulation of Planner motion, Source and goal scene, Task planner Simulation. **Robot Motion Planning:** Concept of motion planning, BUG 1, BUG 2 and Tangent Bug Algorithms	11	L1, L2, L3, L4
5	**Robot Vision** Image Representation, Template Matching, Polyhedral Objects Shape Analysis, Iterative Processing Perspective Transformations, Structured Illumination , Camera Calibration	11	L1, L2, L3
6	**Expert Systems, Robot Language and Fuzzy Logic** Introduction to Expert Systems, Expert system Characteristics, Robot as Expert System, Robot Languages: Classification of Robot Languages, Computer Control and Robot Software, VAL System, and Language Introduction, Fuzzy set, Fuzzification, Fuzzy Inference Rule Base, Defuzzification, Applications of Fuzzy Logic in Robotics.	8	L1, L2, L3
	Total Hours	**52**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Introduction Robotics - Analysis, Control, Applications	Saeed B. Niku	Wiley India	Second Edition	2010
2	Fundamentals of Robotics	Robert J. Schilling	Pearson	First Edition	2007
3	Introduction to AI robotics	Robin Murphy	PHI	Second Edition	2000
4	Robotics Technology and Flexible Automation	S. R. Deb	TMH	Second Edition	2002

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://onlinelibrary.wiley.com	https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8659.1140189	M1-M2
2	https://link.springer.com	https://link.springer.com/chapter/10.1007/978-1-4615-2353-6_6	M6
3	http://www.aishack.in	http://www.aishack.in/tutorials/obstacle-avoidance-bug-algorithm/	M4

List of Practical/ Experiments:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels as per blooms Taxonomy
1	**Basic Experiments**	Illustrate Representation of Various Robots and there all Specification (Study Experiment)	2	L1, L2
2		Demonstrate 5 DOF Articulated Robot through code	2	L1, L2
3		Make use of Y,P,R to develop basic Composite Rotation matrix	2	L1, L2, L3
4	**Design Experiments**	Make use of Y,P,R to develop homogenous Rotation Matrix on basis of CRM	2	L1, L2, L3
5		To identify position and orientation of Direct Kinematics of 2/3/4 Axis Robot	2	L1, L2, L3
6		To identify configuration space of Inverse kinematics of 2/3/4 Axis Robot	2	L1, L2, L3
7		Develop BUG 1 and BUG 2 Algorithm to detect obstacles	2	L1, L2, L3
8		Develop Tangent BUG Algorithm to detect obstacles	2	L1, L2, L3
9		Apply Run Length Encoding for image compression	2	L1, L2, L3

10		Apply Edge Detection Algorithm on to an image	2	L1, L2, L3
11		Apply Shrink and Swell operator on to an image	2	L1, L2, L3
12		Apply Rule based Fuzzification Model for Washing Machine Problem	2	L1, L2, L3
13	**Mini/Minor Projects/ Seminar/ Case Studies**	1. Design Robot Arm of SCARA Robot 2. Surveillance Robot 3. Designing a Robot Manipulator for Pre defined Task 4. Detect Edge and Obstacle for Robot Motion 5. Design a Simulation from Source to Destination using Bounded Deviation Algorithm 6. Create a Project to Simulate Task Planning	6	L1, L2, L3, L4, L5, L6
	Total Hours		**30**	

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name: Institute Level Optional Course-I(Product Life Cycle Management)							**Course Code: ILO 7011**		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
MSE: Mid Semester Examination - Paper Duration – **1.5 Hours** **SEE :** Semester End Examination - Paper Duration - **3 Hours**									
Prerequisite: Product Design and Development, Quality and Reliability Engineering									

Course Objective: The Course should be able to provide an exposure to new product development program and guidelines for designing and developing a product and apply the knowledge of Product Data Management & PLM strategies.

Course Outcomes:Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Illustrate knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation	L1, L2
2	Illustrate various approaches and techniques for designing and developing products.	L1,L2
3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc	L1, L2, L3
4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant	L1, L2, L3
5	Apply Integration of Environmental Aspects in Product Design	L1, L2, L3
6.	Illustrate knowledge aboutLife Cycle Assessment and Life Cycle Cost Analysis	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Product Lifecycle Management (PLM) and PLM Strategies** Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy , Change management for PLM	10	L1, L2
2	**Product Design** Product Design: Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process	9	L1, L2
3	**Product Data Management (PDM)** Product Data Management (PDM):Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation	7	L1, L2, L3
4	**Virtual Product Development Tools** Virtual Product Development Tools: For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies	7	L1, L2, L3
5	**Integration of Environmental Aspects in Product Design** Integration of Environmental Aspects in Product Design: Sustainable Development, Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle Environmental Strategies and Considerations for Product Design	6	L1, L2, L3
6	**Life Cycle Assessment and Life Cycle Cost Analysis** Life Cycle Assessment and Life Cycle Cost Analysis: Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis. Introduction to Industry 4.0, Design principles and Challenges , Applications of Industry 4.0	8	L1, L2
	Total Hours	**39**	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Product Lifecycle Management: Paradigm for 21st Century Product Realisation	John Stark	Springer-Verlag	-	2004
2	Product Design for the environment-A life cycle approach	Fabio Giudice, Guido La Rosa, AntoninoRisitano	Taylor & Francis	-	2006
3	Product Life Cycle Management	SaaksvuoriAntti, ImmonenAnselmie	Springer, Dreamtech	-	-
4	Product Lifecycle Management: Driving the next generation of lean thinking	Michael Grieve	Tata McGraw-Hill,	-	2006

Online References:

S. No.	Website Name	URL	Modules Covered
1	www.nptel.ac.in	https://nptel.ac.in/courses/110104070/9	M1-M6
2	www.amieindia.in	https://www.amieindia.in/study-materials/product-life-cycle.pdf	M1, M5, M6

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name: Institute Level Optional Course-I(Reliability Engineering)							**Course Code: ILO 7012**		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
MSE: Mid Semester Examination - Paper Duration – **1.5 Hours** **SEE :** Semester End Examination - Paper Duration - **3 Hours**									
Prerequisite: Product Design and Development, Quality and Reliability Engineering									

Course Objective: To impart various aspects of probability theory, system reliability, maintainability, availability and FMEA procedure.

Course Outcomes: **Upon completion of the course students will be able to:**

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	Understand and apply the concept of Probability to engineering problems	L1,L2,L3
2	Apply various reliability concepts to calculate different reliability parameters	L1,L2,L3,L4
3	3Estimate the system reliability of simple and complex systems	L1,L2,L3
4	Carry out a Failure Mode Effect and Criticality Analysis	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Bloom's Taxonomy
1	Probability theory Probability: Standard definitions and concepts; ConditionalProbability, Baye's Theorem. Probability Distributions: Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. Measures of Dispersion: Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.	8	L1,L2,L3
2	Reliability Concepts	08	L1,L2,L3

	Reliability Concepts: Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve. Failure Data Analysis: Hazard rate, failure density, Failure Rate, Mean Time ToFailure (MTTF), MTBF, Reliability Functions. Reliability Hazard Models: Constant Failure Rate, Linearly increasing, TimeDependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.		
3	System Reliability: System Reliability: System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems	06	L1,L2,L3,L4
4	Reliability Improvement: Reliability Improvement: Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis. System Reliability Analysis – Enumeration method, Cut-set method, Success, Path method, Decomposition method.		L1,L2
5	Maintainability and Availability Maintainability and Availability: System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Partsstandardization and Interchangeability, Modularization and Accessibility, Repair VsReplacement. Availability – qualitative aspects.	5	L1,L2,L3
6	**Failure Mode, Effects and Criticality Analysis:** Failure mode effects analysis:severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols,development of functional reliability block diagram, Fau1t tree analysis and Event tree Analysis	5	L1,L2
	Total Hours	**39**	

Books and References:

S. No	Title	Authors	Publisher	Edition	Year
1	Reliability Engineering",	L.S. Srinath,	"Affiliated East-Wast Press (P) Ltd	3rdEdition	1985
2	"Reliability and Maintainability Engineering	Charles E. Ebeling	Tata McGraw Hill.	4th Edition	2015
3	Engineering Reliability	B. S. Dhillion C. Singh,	John Wiley & Sons	5th edition	1980
4	Practical Reliability Engg.",	P.D.T. Conor	John Wiley & Sons	3rd Edition	1985.
5.	Reliability in Engineering Design	K.C. Kapur, L.R. Lamberson	John Wiley & Sons.	3rdEdition	1989
6.	Probability and Statistics	Murray R. Spiegel	Tata McGraw-Hill Publishing Co. Ltd.	5th edition	1980

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Institute Level Optional Course-I(Management Information System)							**Course Code :**ILO 7013		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite: Database Design and Management									

Course Objective: Thecourse intends to deliver the role of Management in Information Systems & to understand the impact of these systems within an Organization to improve business performance and decision making. It analyzes typical functional information systems, principal tools and technologies for accessing information from databases & interpreting Ethical issues & Privacy for the same.

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Explain how information systems Transform Business	L1, L2
2	Understand about Data and Knowledge Management	L1, L2, L3
3	Analyze the Ethical issues and Privacy in Information Systems	L1, L2, L3, L4
4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making	L1, L2, L3
5	Analyze the types of systems used for enterprise-wide knowledge management and how they provide value for businesses	L1, L2, L3, L4
6	Analyze the impact of information systems have on an organization	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction To Information Systems (IS)** Computer Based Information Systems, Impact of IT on organizations, Importance of IS to Society. Organizational Strategy, Competitive Advantages and IS	4	L1, L2
2	**Data and Knowledge Management** Database Approach, Big Data, Data warehouse and Data Marts, Knowledge Management Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Presenting Results	7	L1, L2, L3
3	**Ethical issues and Privacy** Information Security. Threat to IS, and Security Controls	7	L1, L2, L3, L4
4	**Social Computing (SC)** Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C. Mobile commerce.	7	L1, L2, L3
5	**Wired and Wireless Technology** Computer Networks Wired and Wireless Technology,Pervasive computing, Cloud computing model.	6	L1, L2, L3, L4
6	**Information System within Organization** Transaction Processing Systems, Functional Area Information System, ERP and ERP support of Business Process. Acquiring Information Systems and Applications: Various System development life cycle models	8	L1, L2, L3, L4
	Total Hours	**39**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Management Information Systems	Kelly Rainer, Brad Prince	Wiley	Sixth Edition	2011
2.	Management Information Systems	K.C. Laudon and J.P. Laudon	Prentice Hall	Tenth Edition	2007
3.	Managing Information Systems: Strategy and Organization	D. Boddy, A. Boonstra	Prentice Hall	Tenth Edition	2008

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/	M1
2.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/information_need_objective.htm	M2
3.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/mis_security_and_ethical_issues.htm	M3
4.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/system_development_life_cycle.htm	M4
5.	https://pressbooks.com/	https://bus206.pressbooks.com/chapter/chapter-13-future-trends-in-information-systems/	M5
6.	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/business_continuity_planning.htm	M6

List of Practical/ Experiments:NA

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Institute Level Optional Course-I(Design of Experiments)							**Course Code :**ILO 7014		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite:									

Course Objective: The course intends to study issues and principles of Design of Experiments (DOE) and list the guidelines for designing experiments to become familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization

Course Outcomes: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Plan data collection, to turn data into information and to make decisions that lead to appropriate action	L1, L2, L3, L4
2	Apply the methods taught to real life situations	L1, L2, L3
3	Plan, analyze, and interpret the results of experiments	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction** Strategy of Experimentation, Typical Applications of Experimental Design, Guidelines for Designing Experiments, Response Surface Methodology	6	L1, L2
2	**Fitting Regression Models**		

	Linear Regression Models, Estimation of the Parameters in Linear Regression Models, Hypothesis Testing in Multiple Regression, Confidence Intervals in Multiple Regression, Prediction of new response observation, Regression model diagnostics, Testing for lack of fit.	8	L1, L2, L3, L4
3	**Two-Level Factorial Designs** The 2^2 Design, The 2^3 Design , The General 2k Design, A Single Replicate of the 2k Design, The Addition of Center Points to the 2k Design, Blocking in the 2k Factorial Design Split-Plot Designs	7	L1, L2, L3, L4
4	**Two-Level Fractional Factorial Designs** The One-Half Fraction of the 2k Design, The One-Quarter Fraction of the 2k Design, The General 2k-p Fractional Factorial Design, Resolution III Designs, Resolution IV and V Designs, Fractional Factorial Split-Plot Designs	7	L1, L2, L3, L4
5	**Response Surface Methods and Designs** Introduction to Response Surface Methodology, The Method of Steepest Ascent, Analysis of a Second-Order Response Surface, Experimental Designs for Fitting Response Surfaces	7	L1, L2, L3, L4
6	**Taguchi Approach** Crossed Array Designs and Signal-to-Noise Ratios, Analysis Methods, Robust design examples	4	L1, L2, L3
	Total Hours	**39**	

Books and References:

	Title	Authors	Publisher	Edition	Year
1	Response Surface Methodology: Process and Product Optimization using Designed Experiment	Raymond H. Mayers, Douglas C. Montgomery, Christine M. Anderson-Cook	Wiley & Sons	3rd Edition	2001
2	Design and Analysis of Experiment	D.C. Montgomery	John Wiley & Sons	5th edition	2001
3	Statics for Experimenters: Design, Innovation and Discovery,.	George E P Box, J Stuart Hunter, William G Hunter	Wiley	2nd Ed	2005

Online Resources:

S. No.	Website Name	URL	Modules Covered
1	https://www2.isye.gatech.edu	https://www2.isye.gatech.edu/~yxie77/isye2028/lecture12.pdf	M1, M2
2	http://reliawiki.org	http://reliawiki.org/index.php/Multiple_Linear_Regression_Analysis	M2
3	https://www.stat.washington.edu	https://www.stat.washington.edu/pds/stat502/LectureNotes/2k.factorial.intro.pdf www.math.montana.edu/jobo/st578/sec6.pdf	M3,M5
4	https://www2.isye.gatech.edu	https://www2.isye.gatech.edu/~jeffwu/isye6413/unit_08_12spring.pdf	M6

List of Practical/ Experiments: NA

Approved by Ad-Hoc Board of Studies and Academic Council under TCET Autonomy

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Institute Level Optional Course-I(Operation Research)							**Course Code :**ILO 7015		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite: Engineering Mathematics									

Course Objective: Course should deliver the optimization techniques so that student should be able to optimize any engineering product or process.

Course Outcomes: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.	L1, L2, L3
2	Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change	L1, L2, L3
3	Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems	L1, L2, L3, L4
4	Understand the applications of integer programming and a queuing model and compute important performance measures	L1, L2, L3
5	Apply conflict between two players	L1, L2, L3, L4
6	Apply EOQ model in inventory	L1, L2, L3, L4, L5

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Operations Research** Introduction, , Structure of the Mathematical Model, Limitations of Operations Research **Linear Programming**: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, Revised simplex method, **Duality**, Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis 1.1 **Transportation Problem**: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method 1.2 **Assignment Problem** Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem **Integer Programming Problem** Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms.	14	L1, L2, L3
2	**Queuing models**: queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population	05	L1, L2, L3
3	**Simulation:** Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation	05	L1, L2, L3, L4
4	**Dynamic programming.** Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.	6	L1, L2, L3, L4
	Game Theory.		

5	Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	10	L1, L2, L3
6	**Inventory Models** Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,	08	L1, L2, L3, L4, L5

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Operations Research - An Introduction	Taha, H.A.	Prentice Hall,	7th Edition,	2002-
2	Operations Research: Principles and Practice",	Ravindran, A, Phillips	John Willey and Sons	2nd Edition -	2009
3	Introduction to Operations Research	Hiller, F. S. and Liebermann	McGraw Hill	-	-
4	Operations Research	S. D. Sharma	KedarNath Ram Nath-Meerut	-	-

B.E. (Computer Engineering)							B.E. SEM : VII		
Course Name : Institute Level Optional Course-I(Cyber Security and Laws)							**Course Code :**ILO 7016		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite: Cryptography and network security									

Course Objective: The Course intends to deliver the fundamentals of cyber law, intellectual property, cybercrimes, trademarks, domain theft, tools used in cyber security and analyze security policies, protocols applied in Indian IT Act 2008, security standards compliances.

Course Outcomes: **Upon completion of the course students will be able to:**

SN	Course Objectives	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the concept of cybercrime and its effect on outside world	L1,L2
2	Interpret and apply IT law in various legal issues , Analyze security challenges and issues	L1,L2,L3
3	Understand and analyze various attack using tools like wire shark , key logger etc	L1,L2
4	Distinguish different aspects of cyber law	L1,L2,L3,L4
5	Study India IT Act and analyze different case studies	L1,L2,L3,L4
6	Apply Information Security Standards compliance during software design and development	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Cybercrime:** Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes.	**4**	L1,L2
2	**Cyber offenses & Cybercrime:** Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cyber café and Cybercrimes, Bot nets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops	**9**	L1,L2
3	**Tools and Methods Used in Cyber line** Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)	**6**	L1,L2
4	**The Concept of Cyberspace** E-Commerce , The Contract Aspects in Cyber Law ,The Security Aspect of Cyber Law ,The Intellectual Property Aspect in Cyber Law , The Evidence Aspect in Cyber Law , The Criminal Aspect in Cyber Law,Global Trends in Cyber Law , Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking , The Need for an Indian Cyber Law	**8**	L1,L2,L3,L4
5	**Indian IT Act.** Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments	**6**	L1,L2,L3,L4
6	**Information Security Standard compliances** SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI.	6	L1,L2,L3,L4
	Total Hours	**39**	

Books and References

Sr. No	Title	Authors	Publisher	Edition	Year
1	Cyber Security	Nina Godbole, SunitBelapure	Wiley India ,New Delhi	2nd	2011

2	The Indian Cyber Law	Suresh T. Vishwanathan	Bharat Law House,New Delhi	2nd	2015
3	Cyber Law & Cyber Crimes	Advocate Prashant Mali	Snow White Publications, Mumbai	2nd	2015
4	Information Systems Security	Nina Godbole	Wiley India, New Delhi	2nd	2014
5	Cyber Security &Global Information Assurance	Kennetch J. Knapp	Information Science Publishing.	1st	2009

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Institute Level Optional Course-I(Disaster Management and Mitigation Measures)							**Course Code :**ILO 7017		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite: Analog Communication, Digital Communication, Computer Communication and Networks									

Course Objective: Main objective of the subject is to understand causes of different types of disasters, mitigation /rehabilitation measures and existing government policies and agencies.

Course Outcomes: **Upon completion of the course students will be able to:**

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.	L1, L2
2	Plan of national importance structures based upon the previous history.	L1, L2
3	Get acquainted with government policies, acts and various organizational structure associated	L1, L2, L3
4	Get to know the simple do's and don'ts in such extreme events and act accordingly.	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction**	**03**	
	Definition of Disaster, hazard, global and Indian scenario, generalperspective, importance of study in human life, Direct and indirecteffects of disasters, long term effects of disasters. Introduction to global warming and climate change		L1, L2

2	**Natural Disaster and Manmade disasters**	**09**	
	Natural Disaster: Meaning and nature of natural disaster, Flood,Flash flood, drought, cloud burst, Earthquake, Landslides,Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, StormSurge, climate change, global warming, sea level rise, ozonedepletion, Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards.Role of growing population and subsequent industrialization,urbanization and changing lifestyle of human beings in frequentoccurrences of manmade disasters		L1, L2
3	**Disaster Management, Policy and Administration**	**06**	
	Disaster management: meaning, concept, importance, objective ofdisaster management policy, disaster risks in India, Paradigm shift indisaster management **Policy and administration:** Importance and principles of disaster management policies, commandand co-ordination of in disaster management, rescue operations-howto start with and how to proceed in due course of time, study offlowchart showing the entire process.		L1, L2
4	**Institutional Framework for Disaster Management in India**	**06**	
	Importance of public awareness, Preparation and execution ofemergency management program. Scope and responsibilities ofNational Institute of Disaster Management (NIDM) and Nationaldisaster management authority (NDMA) in India. Methods andmeasures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communicationamongst different agencies in such situations.Use of Internet and softwares for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.		L1, L2
5	**Financing Relief Measures**	**09**	
	Ways to raise finance for relief expenditure, role of governmentagencies and NGO‘s in this process, Legal aspects related to financeraising as well as overall management of disasters. Various NGO‘sand the works they have carried out in the past on the occurrence ofvarious disasters, Ways to approach these teams.International relief aid agencies and their role in extreme events		L1, L2
6	**Preventive and Mitigation Measures**	**06**	
	Pre-disaster, during disaster and post-disaster measures in someevents in general.Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication.Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingencyplans.Do‘s and don‘ts in case of disasters and effective implementation of relief aids.		L1, L2
	Total	**39**	

Books & References:

SN	Title	Authors	Publisher	Year
1	Disaster Management	Harsh K.Gupta	Universities Press Publications	2003
2	Disaster Management: An Appraisal of Institutional Mechanisms in India	O.S.Dagur	Centre for land warfare studies	2011
3	Introduction to International Disaster Management	Damon Copolla	Butterworth Heinemann Elsevier Publications	2006
4	Disaster Management Handbook	Jack Pinkowski	CRC Press Taylor and Francis group	2008
5	Disaster management & rehabilitation	RajdeepDasgupta	Mittal Publications	2007
6	Natural Hazards and Disaster Management, Vulnerability and Mitigation	R B Singh	Rawat Publications	2006
7	Concepts and Techniques of GIS	C.P.Lo Albert, K.W. Yonng	Prentice Hall (India) Publications.	2006

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Institute Level Optional Course-I(Energy Audit and Management)							**Course Code :**ILO 7018		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite:									

Course Objective: The course intends to provide understanding of unwanted source of energy and remedial measures for Energy Conservation through Energy Audit. In addition, subject analyses and highlights the detailed audit procedures of various energy generation plants & establishments, Govt initiatives and bodies associated with Electrical Energy Management.

Course Outcomes:Upon completion of the course students will be able to:

SN	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	To identify and describe present state of energy conservation, security and its importance.	L1, L2
2	To identify and describe the basic principles and methodologies adopted in energy audit of energy generation establishment/plants.	L1, L2, L3, L4
3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities	L1, L2, L3, L4, L5
4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities	L1, L2, L3, L4, L5
5	To analyze the data collected during performance evaluation and recommend energy saving measures	L1, L2, L3, L4, L5, L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Energy Scenario**	**05**	L1
	Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, EnergyConservationAct-2001 and its Features. Basics of Energy and itsvarious forms, Material and Energy balance		
2	**Energy Audit Principles**	**08**	L1, L2, L3
	Definition, Energy audit- need, Types of energy audit, Energymanagement (audit) approach-understanding energy costs, Benchmarking, Energy performance, Matching energy use to requirement,Maximizing system efficiencies, Optimizing the input energyrequirements, Fuel and energy substitution. Elements of monitoring&targeting; Energy audit Instruments; Data and information-analysis. Financial analysis techniques: Simple payback period, NPV, Returnon investment (ROI), Internal rate of return (IRR)		
3	**Energy Management and Energy Conservation in ElectricalSystem**	**05**	L1, L2, L3, L4
	Electricity billing, Electrical load management and maximumdemand Control; Power factor improvement, Energy efficientequipments and appliances, star ratings. **Energy efficiency measures in lighting system, Lighting control:** Occupancy sensors, daylight integration, and use of intelligentcontrollers. **Energy conservation opportunities in**: water pumps, industrialdrives, induction motors, motor retrofitting, soft starters, variablespeed drives.		
4	**Energy Management and Energy Conservation in ThermalSystems**	**08**	L1, L2, L3, L4
	Review of different thermal loads; Energy conservation opportunitiesin: Steam distribution system, Assessment of steam distributionlosses, Steam leakages, Steam trapping, Condensate and flash steamrecoverysystem.General fuel economy measures in Boilers and furnaces, Waste heatrecovery, use of insulation- types and application. HVAC system: Coefficient of performance, Capacity, factors affecting Refrigerationand Air Conditioning system performance and savings opportunities.		

5	**Energy Performance Assessment**	**07**	L1, L2, L3, L4, L5
	On site Performance evaluation techniques, Case studies based on: Motors and variable speed drive, pumps, HVAC system calculations; Lighting System: Installed Load Efficacy Ratio (ILER) method, Financial Analysis.		
6	**Energy conservation in Buildings**	**06**	L1, L2, L3, L4, L5
	Energy Conservation Building Codes (ECBC): Green Building,LEED rating, Application of Non-Conventional and RenewableEnergy Sources		
	Total	**39**	

Books & References:

SNo.	Title	Authors	Publisher	Edition
1	Handbook of Electrical Installation Practice	Geofry Stokes,	Blackwell Science	2003
2	Designing with light: Lighting Handbook	Anil Valia	Lighting System	2010
3	Energy Management Handbook	W.C. Turner	John Wiley and Sons	2007
4	Handbook on Energy Audits and Management	Edited by A. K. Tyagi	Tata Energy Research Institute (TERI).	2017
5	Energy Management Principles	C.B.Smith	Pergamon Press	2015
6	Energy Conservation Guidebook	Dale R. Patrick, S. Fardo, Ray E. Richardson	Fairmont Press	2015
7	Handbook of Energy Audits	Albert Thumann, W. J. Younger, T. Niehus,	CRC Press	2017

Online References:

S. No.	Website Name	URL	Modules Covered
1	energymanagertraining	www.energymanagertraining.com	M3
2	bee-india.nic	www.bee-india.nic.in	M2

B.E. Semester–VII

B.E. (Computer Engineering)							**B.E. SEM : VII**		
Course Name : Institute Level Optional Course-I(Development Engineering)							**Course Code :**ILO 7019		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	20	80	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hour **ESE: End Semester Examination - Paper Duration - 3 Hours**									
Prerequisite: Civics, Ethics									

Course Objectives: Course intend deliver introduction to characteristics of rural Society and the Scope, Nature and Constraints of rural Development&exploration of human values ‘good’ professional, a ‘good’ society and a ‘good life’ in the context of work life and the personal life of modern Indian professionals.

Course Outcomes:Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom’s Taxonomy
1	Apply knowledge for Rural Development.	L1, L2
2	Apply knowledge for Management Issues..	L1,L2
3	Apply knowledge for Initiatives and Strategies	L1, L2, L3
4	Develop acumen for higher education and research.	L1, L2, L3
5	Master the art of working in group of different nature.	L1, L2, L3
6	Develop confidence to take up rural project activities independently	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to Rural Development Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development Roots of Rural Development in India Rural reconstruction and Sarvodayaprogramme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services.	10	L1, L2
2	Rural Development Initiatives Post-Independence rural Development BalwantRai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development	9	L1, L2
3	Rural Development Initiatives . Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development.	7	L1, L2, L3
4	**Amendments** Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments.	7	L1, L2, L3
5	Values and Science and Technology Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education. Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom.	6	L1, L2, L3
	Ethics		

6	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education	8	L1, L2
	Total Hours	**39**	

Books and References:

Sr.No.	Title	Authors	Publisher	Edition	Year
1	Village Planning and Rural Development	ITPI	ITPI	-	-
2	Human Settlements	Thooyavan, K.R.	MA Publication, Chennai	--	2005
3	Manual of Integrated District Planning	Planning Commission	Planning Commission	--	2006
4	Normative Ethics in Planning	How, E.	Journal of Planning Literature	Vol.5, No.2, pp. 123-150	2017

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.india.gov.in	https://www.india.gov.in/my-government/constitution-india/amendments/constitution-india-seventy-third-amendment-act-1992	M1-M4

B.E. (Computer Engineering)							B.E. SEM : VII		
Course Name :Major Project-I							Course Code : CSP701		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
-	-	6	6	3	-	-	25	50	75

IA: In-Semester Assessment - Paper Duration – 1 Hour

ESE: End Semester Examination - Paper Duration - 3 Hours

The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of project (40%) and Attendance/Learning Attitude (20%)

Prerequisite: -

Course Objective: The Project work enables students to develop further skills and knowledge gained during the programme by applying them to the analysis of a specific problem or issue, via a substantial piece of work carried out over an extended period. For students to demonstrate proficiency in the design of a research project, application of appropriate research methods, collection and analysis of data and presentation of results.

Guidelines:

1. **Project Topic:**

- To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing IT programme. Research and development projects on problems of practical and theoretical interest should be encouraged.
- Project work must be carried out by the group of at least two students and maximum three and must be original.
- Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
- The project work can be undertaken in a research institute or organization/company/any business establishment.
- Student must consult internal guide along with external guide (if any) in selection of topic.
- Head of department and senior staff in the department will take decision regarding selection of projects.
- Student has to submit weekly progress report to the internal guide and whereas internal guide has to keep track on the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks.
- In case of industry projects, visit by internal guide will be preferred.

2. **Project Report Format:**

At the end of semester a project report should preferably contain at least following details:-

- Abstract
- Introduction
- Literature Survey
  - Survey Existing system
  - Limitation Existing system or research gap
  - Problem Statement and Objective
  - Scope
- Proposed System

- Analysis/Framework/ Algorithm
- Details of Hardware & Software
- Design details
- Methodology (your approach to solve the problem)

- Implementation Plan for next semester
- Conclusion
- References

3. Term Work:

Distribution of marks for term work shall be as follows:

a. Weekly Attendance on Project Day
b. Project work contribute
c. Project Report (Spiral Bound)
d. Term End Presentation (Internal)

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

4. Oral & Practical :

Oral &Practical examination of Project-I should be conducted by Internal and External examiners approved by University of Mumbai. Students have to give presentation and demonstration on the Project I.

BE (ALL BRANCHES)							SEM: VII		
Course Name: Research Based Learning 3							**Course Code:HSD-CSRBL701**		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Assessment/Evaluation Scheme**				
Hours Per Week					**Presentation**		**Report**		**Term Work**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**IA**	**ESE**	**TW**
Audit course evaluated by Teacher Guardian									
Mid Semester Assessment for Term work will be on continuous basis									
Prerequisite: Subject knowledge, Domain knowledge									

Course Objectives:

This course is focused to give basic aspects of Research and development, including research methodologies, innovation, IPR, and entrepreneurship.

Course Outcomes:**Upon completion of the course students will be able to:**

S.N.	Course Outcome	Cognitive level attainment as per revised Bloom Taxonomy
1	Students will be to publish research paper.	L1, L2, L3,L4
2	Student will be able to create new idea for problem solving related to industry or societal issues.	L1, L2, L3,L4
3	Students will be to developentrepreneurial thinking with an idea to convert project into product.	L1, L2, L3,L4,l5,L6
4	Students will be aware ofethics and plagiarism aspects in technical writing.	L1, L2, L3,L4,l5,L6

Detailed Syllabus:

Module No.	Topics	Cognitive level attainment as per revised Bloom Taxonomy
1	**Research Publication** Forming interest groups with mentors, Topic Identification, Literature Survey, and Sketching of Idea/Design of Survey, Implementation, and Analysis of Results, Identifying journal /conference for publication conference paper, Publishing of research Paper/Survey paper. **Evaluation by faculty as per format**.	L1, L2, L3,L4
2	**Management of Innovation and Technical Change** What is innovation, kinds of Innovation, Innovation as a core business process, Developing an innovation strategy, Sources of innovation, Creating new products and services **Idea competition and evaluation.**	L1, L2, L3,L4
3	**Research Ethics, IPR And Scholarly Publishing** Ethical issues; IPR-intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing-IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability. **Evaluation of product feasibility for IPR.**	L1, L2, L3,L4,l5,L6
4	**Entrepreneurship** Concepts and practices of technology entrepreneurial thinking and entrepreneurship. Using lectures, case studies, business plans, and student presentations, the course teaches	L1, L2, L3,L4,l5,L6

	life skills in entrepreneurial thought and action that students can utilize in starting technology companies or executing R&D projects in large companies. **Pitch presentationcompetition and evaluation**	

References:

Sr. No.	Title	Authors	Publisher	Edition	Year
3.	Research Methodology Methods and Techniques	C.R. Kothari	New Age International Limited,	2nd Edition	2004
4.	Entrepreneurship Development and Small Business Enterprise	Poornima M. Charantimath	Pearson Education India	5thEdition	2005
3.	Law Relating to Patents, Trade Marks, Copyright, Designs and Geographical Indications	B. L. Wadehra	Universal Law Publishing Co Ltd	Kindle	2004

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	https://www.statpac.com	https://www.statpac.com/online-software-manual/Basic-Research-Concepts.htm	M1
2.	https://www.slideshare.net	https://www.slideshare.net/25Mksp/management-technology-innovation-change	M2
3.	https://www.eng.ufl.edu	https://www.eng.ufl.edu/leadership/wp-content/uploads/sites/7/2015/02/Engineering-Entrepreneurship-Course-Overview.pdf	M4
4.	https://www.vesalius.edu	https://www.vesalius.edu/wp-content/uploads/2016/11/BUS213G-S15.pdf	M3