B. E. Semester –VII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

BE (Electronics & Telecommunication Engineering)							**B. E. (SEM:** VII)		
Course Name: Mobile Communication Systems							**Course Code:** PCC-ETC701		
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**	25	25	**150**
3	-	2	5	4	25	75			
IA: In Semester Assessment- Paper Duration – **1.5 Hours**									
ESE: End Semester Evaluation- 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: Analog Communication, Digital Communication, Probability theory and Random variables									

Course Objective:

To understand the cellular design concepts and different types of radio propagation models used in wireless link design and study the system architecture of 2G, 3G and 4G wireless network.

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	plain various multiple access techniques. Illustrate the cellular fundamentals and estimate the coverage and capacity of cellular systems.	L1, L2, L3, L4, L5
2	ıstrate the fundamentals, system architecture, protocols, radio interface and security of GSM.	L1, L2, L3
3	plain the GSM evolution, IS-95 system architecture and Radio Interface, CDMA fundamentals and radio interface.	L1, L2, L3, L4
4	ply the concepts of 3G technologies of UMTS and CDMA 2000, and elaborate the principles of 3GPP LTE.	L1, L2, L3
5	ıssify different types of propagation models and analyze the link budget.	L1, L2, L3, L4, L5, L6
6	ntify the emerging technologies for upcoming wireless communication generations like Cognitive radio, Relaying and Cooperative communication	L1, L2, L3, L4

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Fundamentals of Mobile Communication** Introduction to wireless communication: basic terms used in wireless communication, call establishment procedure.	10	L1, L2, L3, L4, L5

	Features of all conventional multiple access techniques: Frequency division multiple accesses (FDMA), time division multiple access (TDMA), space spectrum multiple access (SSMA), space division multiple access (SDMA), OFDM-PAPR, and OFDMA. The Cellular Concept System Design Fundamentals: Frequency Reuse, Channel assignment strategies, Interference and System Capacity, Trunking and Grade of Service, and Improving the Coverage and Capacity in Cellular Systems.		
2	2G Technologies GSM: GSM Network architecture, GSM signaling protocol architecture, identifiers used in GSM system, GSM channels, frame structure for GSM, GSM speech coding, authentication and security in GSM, GSM call procedures, GSM hand-off procedures, GSM services and features. Link budget for GSM and its numericals.	**08**	L1, L2, L3
3	GSM evolution and IS-95 GSM evolution: GPRS and EDGE- architecture, radio specifications, channels. IS-95: Architecture of CDMA system, CDMA air interface, power control in CDMA system, power control, handoff, rake receiver, link budget for CDMA and its numericals.	**08**	L1, L2, L3
4	3G Technology UMTS: Objectives, standardisation and releases, network architecture, air interface specifications, channels, security procedure, W-CDMA air interface, attributes of W-CDMA system, and W-CDMA channels. CDMA 2000 cellular technologies: Forward and Reverse Channels, Handoff and Power Control.	**06**	L1, L2, L3
5	3GPP LTE Introduction, system overview: Frequency bands and spectrum flexibility, network structure, and protocol structure. Physical layer: Frames, slots, and symbols, modulation, coding, multiple-antenna techniques, and Logical and Physical Channels. Physical layer procedures: Establishing a connection, retransmissions and reliability, scheduling, power control, handover.	**07**	L1, L2, L3
6	**Mobile Radio Propagation** Large scale fading: Free space propagation model, the three basic propagation mechanisms, reflection, ground reflection (two-ray) model, diffraction, scattering, and practical Link budget design using path loss models. Small scale fading: Small scale multipath propagation, parameters of mobile multipath channels, Doppler shift, types of small-scale fading, power delay profile, average and RMS delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, Rayleigh and Ricean distributed fading channel.	**06**	L1, L2, L3, L4, L5, L6
	Total Hours	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Wireless Communications: Principles and Practice	Theodore S. Rappaport	Pearson Education	Second	2010
2	Wireless Communications	Andrea Goldsmith	Cambridge University Press	First	2009
3	Fundamentals of Wireless Communication	David Tse and Pramod Vishwanath	Cambridge University Press	First	2005
4	Wireless Communications	Andreas F. Molisch	Wiley-IEEE Press	Second	2012
5	Modern Wireless Communications	Michael Moher and Simon S. Haykin	Pearson Education India	First	2011

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/108/106/106106167/	M1, M2, M3, M4
2	NPTEL	http://nptel.ac.in/courses/117104099/	M1, M2, M3, M4, M5, M6
3	NPTEL	https://nptel.ac.in/courses/117/104/117104117/#	Prerequisites and 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**	To study the effect of cluster size and no. of Co-channel interfering cells on signal to Interference ratio.	2	L1, L2, L3
3		simulate the probability density functions of Rayleigh and Rician distribution. dy the relation between cluster size N and capacity C.	2	L1, L2, L3
5	**Design Experiments**	observe the effect of velocity and direction of arrival of a vehicle on Doppler frequency.	2	L1, L2, L3, L4, L5
6		generate PN sequence for the given polynomial	2	L1, L2, L3
7		sign of communication system using Matlab Simulink to study the effect of Rayleigh fading.	2	L1, L2, L3, L4, L5, L6
8		sign of communication system using Matlab Simulink to study the effect of Rician fading.	2	L1, L2, L3, L4, L5, L6
9	**Advanced Experiments**	plot the channel capacity versus SNR for different MIMO systems	2	L1, L2, L3, L4, L5
10		tlab Simulation of energy detection-based spectrum sensing in cognitive radio.	2	
		se Study: 5G	2	
		Total Hours	**20**	

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B. E. (Electronics and Telecommunication Engineering)							**B.E. (SEM: VII)**		
Course Name: Professional Elective III (Digital Image Processing)							**Course Code:** PEC-ETC7011		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory**		**Practical/Oral /Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	2@	5	4	25	75	25	25	**150**
IA: In-Semester Assessment - Paper Duration – 1.5 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: Discrete Time Signal Processing									

@-Professional Elective Courses Lab will be conducted in the form Capstone Project

Course Objective: To cover the fundamentals and mathematical models in digital image processing and to develop time and frequency domain techniques for image enhancement & segmentation of Digital images.

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

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Interpret the formation of digital images in a computer and also various image color models.	L1, L2
2	Execute the transformation and the inverse transformation from spatial to Frequency domain for a given image.	L1, L2, L3
3	Execute image enhancement in spatial and frequency domain	L1, L2, L3
4	Choose and apply appropriate morphological tools on images and articulate image restoration models and techniques	L1, L2, L3
5	Summarize, Categorize and apply Image Compression techniques on digital images	L1, L2, L3, L4
6	Articulate and apply image segmentation techniques based on Discontinuities and Similarities	L1, L2, L3

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Digital Image Fundamentals** **Introduction –** Origin – Steps in Digital Image Processing, Components, Elements of Visual Perception – Image Sensing and Acquisition, Image Sampling and Quantization – Relationships between pixels, Transformation: Orthogonal, Euclidean, Affine. **Color Image Processing**: Color Fundamentals Color models.	06	L1, L2
2	**Image Transforms** 1-D DFT, 2-D Discrete Fourier Transform and Its Inverse, Some Properties of 2D DFT, Walsh -Hadamard, Discrete Cosine Transform, Haar Transform	07	L1, L2, L3
3	**Image Enhancement** Image Negative, Log Transform, Power Law transform, Histogram equalization and Histogram Specification **Spatial Domain**: Basics of Spatial Filtering, The Mechanics of Spatial Filtering, Generating Spatial Filter Masks–Smoothing and Sharpening Spatial Filtering **Frequency Domain:** The Basics of Filtering in the Frequency Domain, Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Laplacian, Unsharp Masking and Homomorphic filters	10	L1, L2, L3
4	**Morphology & Image Restoration** **Morphology**: Erosion and Dilation, Opening and Closing, The Hit- or-Miss Transformation. **Restoration**: Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters	06	L1, L2, L3
5	**Image Compression** Need for Data Compression, Run-Length Coding, Entropy Based Coding (Huffman & Arithmetic Coding), Transform Coding (JPEG, JPEG-LS, JPEG 2000), Predictive Coding (DPCM)	08	L1, L2, L3, L4
6	**Image Segmentation** Point edge models, basic and advance edge detection, Edge linking and boundary detection, Canny's edge detection algorithm, Line, and Edge Detection: Detection of Isolated Points, Line detection Thresholding: Foundation, Role of illumination, Basic Global thresholding Region Based segmentation: Region Growing, Region Splitting and merging	08	L1, L2, L3
	Total Hours	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Digital Image Processing	Gonzales and Woods	Pearson Education, India	Third Edition	2008
2	Fundamentals of Image Processing	Anil K. Jain	Prentice Hall of India	First Edition	1989
3	Digital Image Processing	W Pratt	Wiley Publication	Third Edition	2002
4	Digital Image Processing	S Jayaraman	McGraw Hill	Second Edition	2020

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/117/105/117105079/	M1, M2, M3, M4, M6
2	Image Processing Place	http://www.imageprocessingplace.com/	M1-M6

Suggested 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	Spatial and Tonal Resolution	2	L1, L2, L3
2		Image Enhancement in Spatial Domain	2	L1, L2, L3
3	Design Experiments	DFT and IDFT of an Image	2	L1, L2, L3
4		Image Filtering-Spatial domain	2	L1, L2, L3
5		Image Filtering- Frequency Domain.	2	L1, L2, L3
6		Morphological operations on an Image	2	L1, L2, L3

7		Image Restoration.	2	L1, L2, L3
8		Image Segmentation	2	L1, L2, L3
9		Chain Code	2	L1, L2, L3
10	**Mini/Minor Projects/ Seminar/ Case Studies**	Mini Project: 1. Color Image Enhancement by Histogram Processing. 2. Color Image Segmentation. 3. Two-dimensional Discrete Wavelet Transforms. 4. Region Growing. 5. Skeletons	2	L1, L2, L3, L4, L5, L6

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B. E. (Electronics and Telecommunication Engineering)							**B.E. (SEM: VII)**		
Course Name: Professional Elective III (Operating Systems)							**Course Code:** PEC-ETC7012		
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**	**TW**	**150**
3	-	2@	5	4	25	75	25	25	
@-Professional Elective Courses Lab will be conducted in the form Capstone Project **IA: In-Semester Assessment - Paper Duration – 1.5 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: Basic Understanding of Computer System.									

Course Objective: To provide an introduction to the internal operation of modern operating systems. In particular, the course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file 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	Understand the role of an operating system, its function and issues.	L1, L2
2	Understand process management and memory management concepts including scheduling, synchronization, deadlocks and various algorithms.	L1, L2, L3
3	Compare between different algorithms used for File management and disk management.	L1, L2, L3
4	Be familiar with Unix and its management and scheduling.	L1, L2, L3
5	Be familiar with Linux OS.	L1, L2, L3
6	Learn various OS used by hackers.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	**Topics**	**Hrs.**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	**Introduction to Operating System** Definition, objectives, functions, evolution, services, types, and different views of OS, Operating System as a resource manager, system calls, and shell, Monolithic systems, layered systems, client server model, monolithic kernel and microkernel	6	L1, L2
2	**Process Management and Memory Management** Process, process creation, process control block, process states, process state transition diagram, Scheduling queues and schedulers, preemptive and non-preemptive scheduling algorithms, types of threads, multithreading models,	10	L1, L2, L3

	Race condition, critical section, mutual exclusion, semaphores, monitors, Multiprogramming with fixed and variable partitions, memory allocation strategies, Logical and physical address space, paging and segmentation, performance of demand paging, page replacement algorithms, Deadlock Problem, deadlock characterization, deadlock prevention and deadlock avoidance, deadlock detection and recovery		
3	**File Management and Input Output Management** File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Memory Mapped Files, Implementing Files, contiguous allocation, linked list allocation, indexed allocations, I-node, Single level directory system, Two level directory system, Hierarchical Directory System, Principles of Input/output H/W: I/O Devices, Device Controllers, Direct Memory Access, Principles of Input/output S/W: Goals Of I/O S/W, Interrupt Handler, Device Driver, Device Independent I/O Software Disks: RAID levels, Disks Arm Scheduling Algorithms, Management of free blocks.	10	L1, L2, L3
4	**Unix Operating System** History of UNIX, UNIX Goals, Unix Shell, interfaces to Unix, UNIX utility programs, Traditional UNIX Kernel, Modern UNIX Systems, Unix process management: Concept, Scheduling in Unix, Unix Memory management: Paging, Page replacement strategies, Unix file management: I-node, File allocation, I/O management, Unix Security measures	6	L1, L2, L3
5	**Linux Operating System** History, Linux Processes and Thread management, Scheduling in Linux, Linux System calls, Memory management: Virtual memory, Buddy Algorithm, Page replacement policy, Linux File System, I/O management: Disk Scheduling, Advantages of Linux and Unix over Windows	9	L1, L2, L3
6	**Case Study - Operating Systems for Hackers** Kali Linux, Backtrack, Pentoo, Nodezero, Parrot-sec forensic os, Network Security Toolkit (NST), Arch Linux, GnackTrack, Bugtraq, DEFT Linux, Knoppix STD, BlackArch Linux, Samurai Web Testing Framework, Caine, Fedora Security Spin, Live Hacking OS, ArchStrike Linux, BackBox, BlackBuntu, Dracos Linux	4	L1, L2, L3, L4
	Total Hours	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Operating System-Internal & Design Principles	William Stallings	Pearson	6th Edition	2005
2	Operating Systems Concepts	Silberschatz A., Galvin P., and Gagne G	Wiley	9th Edition	2012
3	Modern Operating Systems	Tanenbaum	PHI	3rd Edition	2009
4	The Design of Unix Operating System	Maurice J. Bach	Prentice Hall	1st Edition	1986
5	Operating Systems	Achyut S. Godbole	Tata McGraw Hill	2nd edition	2008
6	Linux Command Line & Shell Scripting	Richard Blum and Christine Bresnahan	Wiley	2nd edition	2011

Online Reference:

Sr. No.	Website Name	URL	Modules Covered
1	Udacity	https://www.udacity.com/course/introduction-to-operating-systems--ud923	M2, M3
2	NPTEL	https://nptel.ac.in/courses/106/108/106108101/	M1, M2, M3
3	Tutorial Point	https://www.tutorialspoint.com/operating_system/os_overview.htm	M1, M2, M3
4	Coursera	https://www.coursera.org/learn/cybersecurity-roles-processes-operating-system-security#syllabus	M1-M3, M5

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B. E. (Electronics and Telecommunication Engineering)							**B.E. (SEM: VII)**		
Course Name: Professional Elective III (Microwave Engineering)							**Course Code:** PEC-ETC7013		
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**	**TW**	**150**
3	-	2@	5	4	25	75	25	25	
@-Professional Elective Courses Lab will be conducted in the form Capstone Project **IA: In-Semester Assessment - Paper Duration – 1.5 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: Electromagnetic Engineering, Antenna and Radio Wave Propagation, Communication Engineering									

Course Objective: The course intends to give an understanding of Active and Passive devices. The course also aims to make the students understand and apply design technique to impedance matching network using lumped components and transmission lines. Lastly, the course will also deliver the fundamental understanding of Microwave Measurements parameters.

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	Characterize S parameter and transmission line	L1, L2, L3, L4
2	Design and analyze impedance matching network using lumped and distributed parameters.	L1, L2, L3, L4, L5, L6
3	Characterize microwave passive devices	L1, L2
4	Characterize microwave tubes	L1, L2
5.	Characterize microwave semiconductor devices at higher frequencies.	L1, L2
6.	Demonstrate skills of microwave measurements	L1, L2, L3

Detailed Syllabus:

Module No.	**Topics**	**Hrs.**	**Cognitive levels of attainment as per Bloom's Taxonomy**

1	**Introduction to Microwaves** 1.1 Microwave Frequency Bands in Radio Spectrum, Characteristics, Advantages and Applications of Microwaves. 1.2 Scattering parameters: Characteristics and Properties. 1.3 Strip lines, Microstrip lines and coupled lines: Analysis and design.	06	L1, L2, L3, L4
2	**Impedance Matching &Waveguides** 2.1 Design of Impedance matching network using lumped parameters. 2.2 Design of Impedance matching network using distributed parameters: Single stub design. 2.3 Rectangular and circular waveguides: Construction, Working and Mode analysis.	09	L1, L2, L3, L4, L5, L6
3	**Passive Devices** 3.1 Resonators, Re-entrant cavities, Tees, Hybrid ring, Directional couplers, Phase shifters, Terminations, Attenuators and Ferrite devices such as Isolators, Gyrators, and Circulators.	05	L1, L2
4	**Microwave Tubes** 4.1 Two Cavity Klystron, Multi-Cavity Klystron and Reflex Klystron. 4.2 Helix Travelling Wave Tube and Cross Field Amplifier. 4.3 Cylindrical Magnetron and Gyrotron.	10	L1, L2
5	**Microwave Semiconductor Devices& Microwave Integrated Circuits (MIC)** 5.1 Diodes: Varactor, PIN, Tunnel, Point Contact, Schottky Barrier, Gunn, IMPATT and TRAPATT 5.2 Transistors: BJT, Hetro junction BJT, MESFET, and HEMT 5.3 MIC Materials. 5.4 Types of MIC: Hybrid and Monolithic MIC.	10	L1, L2
6	**Microwave Measurements** 6.1 VSWR, Frequency, Power, Noise, Q-Factor, Impedance, Attenuation, Dielectric Constant, Antenna Gain.	05	L1, L2, L3
	Total	**45**	

Books & References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Microwave Devices and Circuits	Samuel Liao	Prentice Hall	Third Edition	1998
2	Microwave Engineering	David Pozar	McGraw Hill Education	Fourth Edition	2014

3	Radio Frequency and Microwave Electronics	Matthew M. Radmanesh	Pearson Education.	Third Edition	2000
4	Microwave Engineering	Annapurna Das and S. K Das	McGraw Hill Education	Second Edition	2017
5	Foundations of Microwave Engineering	R. Collin	Wiley Interscience	Second Edition	2003
6	Radio Frequency and Microwave Communication Circuits- Analysis and Design	Devendra Misra	John Wiley & Sons	Second Edition	2001

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Swayam	https://swayam.gov.in/nd1_noc19_ee68/preview	M1-M6

B.E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

<table>
<tr><td colspan="7">BE (Electronics & Telecommunication Engineering)</td><td colspan="4">B. E. (SEM: VII)</td></tr>
<tr><td colspan="7">Course Name: Professional Elective III (Biomedical Electronics)</td><td colspan="4">Course Code: PEC-ETC7014</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td rowspan="2">25</td><td rowspan="2">25</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2@</td><td>5</td><td>4</td><td>25</td><td>75</td></tr>
<tr><td colspan="10">@-Professional Elective Courses Lab will be conducted in the form Capstone Project
IA: In Semester Assessment- Paper Duration – 1.5 Hours
ESE: End Semester Evaluation- 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%)</td></tr>
<tr><td colspan="10">Prerequisite: Electronic Devices and Circuits, Analog and Digital communication</td></tr>
</table>

Course Objective: The course intends to deliver a background of natural behaviour of the human body as a source of numerous signals, highly significant for diagnosis and therapy. The aim of the course is also to give students an idea of Electrodes, transducers as basic building block in the development of biomedical instrumentation along with current practices in the field of biomedical electronics.

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 basic bioelectric signals of human body coming from muscle cell	L1, L2
2	Understand various transducers and electrodes for pressure, temperature and bioelectric signals	L1, L2, L3
3	Understand the principle and working of various cardiovascular parameters and their measurement techniques with applications.	L1, L2, L3
4	Distinguish between the various medical imaging techniques based on the principles and concepts involved in them.	L1, L2, L3
5	Understand application of analog and digital communication in the field of biotelemetry for remote patient monitoring	L1, L2, L3
6	Describe the significance of electrical safety in biomedical measurement.	L1, L2, L3

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Electrophysiology And Cell Structure:** Bioelectric signals: EEG, ECG, EMG, EOG, Muscle cell and nerve cell actions, resting potentials	08	L1, L2
2	**Physiological Transducers, Recording Electrodes and Bio Signal Amplifier:** Classification of transducers, performance characteristics of transducers, pressure and temperature transducers, electrodes for ECG, EEG, EMG, electrode jelly and creams, Basic requirements of op-Amp circuits and instrumentation amplifiers in biomedical applications,	08	L1, L2, L3
3	**Central Nervous and Cardio-Vascular System:** Receptors, Motor systems, Neural and neuromuscular measurements, Evoked response of EEG, Structure of Heart, Rhythmicity, Pacemaker cells, ECG theory, Electrocardiograph, Measurement of blood pressure and blood flow, Life saving devices: Pacemaker, Defibrillators	08	L1, L2, L3
4	**Imaging Techniques:** X-Ray machine and its application. CT Scan- CT Number, Block Diagram, scanning system and application. Ultrasound Imaging- Modes of scanning and their application. MRI- Concepts and image generation, block diagram and its application	08	L1, L2, L3
5	**Biomedical Telemetry and Telemedicine:** Wireless Telemetry, single channel telemetry system, multi-channel wireless telemetry system, Multi-patient telemetry, Implantable telemetry system, Transmission of analog physiological signals over telephone, Telemedicine	08	L1, L2, L3
6	**Electrical Safety of Medical Equipment:** Regulation of medical devices, Physiological Effects of Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention	05	L1, L2, L3
	Total Hours	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Biomedical Instrumentation and Measurement	Leslie Cromwell, Fred Weibell and Erich A Pfeiffer	PHI	2nd	1980
2	Handbook of Biomedical Instrumentation	R. S. Khandpur	Tata McGraw Hill	2nd	2004
3	Principles of Applied Biomedical Instrumentation‖	L. E. Baker L. A. Geddes	John Wiley and Sons	3rd	1991
4	Introduction to Biomedical Equipment Design	Carr and Brown	John Wiley	4th	2001

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Engineering Notes Handwritten PYQ | LectureNotes	Notes Biomedical Instrumentation BI by Verified Writer | LectureNotes	M1, M2, M3,M4,M5

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B. E. (Electronics and Telecommunication Engineering)							**B.E. (SEM: VII)**		
Course Name: Professional Elective III (Error Correcting Codes)							**Course Code:** PEC-ETC7015		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory**		**Practical/Oral /Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR**	**TW**	
3	-	2@	5	4	25	75	25	25	**150**
@-Professional Elective Courses Lab will be conducted in the form of Capstone Project **IA: In-Semester Assessment - Paper Duration – 1.5 Hours** **ESE: End Semester Examination Paper Duration - 3Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Digital communication, Linear algebra, probability theory, some exposure to transform theory									

Course Objective: The course intends to deliver the fundamental knowledge of mathematical tools from groups and finite fields to develop codes and sequences to develop an ability to encode and decode different error correcting codes in digital communication.

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 knowledge of mathematical tools from groups and finite fields to design various error control codes.	L1, L2, L3
2	Encode, detect, and correct the errors using the linear block coding technique.	L1, L2, L3, L4
3	Compute the cyclic and Golay codes for correcting double errors.	L1, L2, L3, L4
4	Demonstrate the competence in encoding and decoding BCH and Reed Solomon Codes	L1, L2, L3, L4
5	Illustrate the use of tree and trellis diagrams and the Viterbi algorithm to encode and decode convolutional codes.	L1, L2, L3, L4
6	Explain different error control codes based on spectral techniques.	L1, L2, L3, L4

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Algebra** Importance of error correction methods in data communication. Groups, Fields and Vector Spaces, Elementary Properties of Galois fields, order of a Galois Field Element, The Euler Function, Primitive Elements in a Galois Field Primitive Polynomials and Galois Fields of Order pm, Irreducible Polynomials, Primitive Polynomials, Subfields of Galois Fields, minimal Polynomials and Conjugate Elements, Minimal Polynomials, Conjugates of Field Elements	07	L1, L2, L3
2	**Linear Block Codes** Linear block codes, Codeword and Error Pattern Weight, Structure matrix description, Standard Array Decoding, Syndrome decoding, Hamming Codes, Perfect Codes, Reed – Muller Codes,	08	L1, L2, L3, L4
3	**Cyclic Codes** Polynomial description, matrix description, Hamming Codes as Cyclic Codes for correcting double error, Cyclic Codes for correcting burst errors, the binary Golay code, Shortened cyclic Codes.	08	L1, L2, L3, L4
4	**BCH and Reed Solomon Codes** Linear Algebra, Galois Field, Definition and Construction of Binary BCH Codes, Error Syndromes In Finite Fields, Decoding SEC and DEC, Reed- Solomon Codes.	08	L1, L2, L3, L4
5	**Convolutional Codes** Convolutional encoders, Tree and Trellis diagram, Convolutional Codes Correcting burst errors, The Viterbi Decoding algorithm, Sequential decoding algorithm, The Fano algorithm, The stack algorithm. Applications of error control coding.	08	L1, L2, L3, L4
6	**Codes based on Spectral Techniques** Spectral description of cyclic Codes, Extended Reed – Solomon Codes, Extended BCH codes, Goppa Codes.	06	L1, L2, L3, L4, L5
	Total Hours	**45**	

Books and References:

Sr No	Title	Authors	Publisher	Edition	Year
1	Error Control Coding-Fundamentals and Applications	Shu Lin, Daniel J. Costello, Jr	Prentice-Hall	2nd	2004
2	Error Correcting Coding Theory	Man Young Rhee	McGraw – Hill Publishing	1st	1989
3	Introduction to Error Control Codes	Salvatore Gravano	Oxford	3rd	2001
4	An Introduction to Error Correcting Codes with Applications	S. A. Vanstone and P. C. van Oorschot	Kluwer Academic Press	1st	1989

5	Error-Control Systems for Digital Communication and Storage,	S. Wicker	Prentice-Hall	1st	1995

B.E. Semester – VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H2019)
Proposed Syllabus under Autonomy Scheme

BE (Electronics & Telecommunication Engineering)											**Sem:** VII
Course Name: Big Data Analytics											**Course Code: PEC-ETC7016**
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**	**Credit**	**MSE**	**SEE**	**MSE**	**SEE**	**MSE**	**SEE**	**150**
3	-	2	5	4	25	75		25		25	

MSE: Mid Semester Exam- Paper Duration **– 1.5 Hours**

SEE: Semester End Exam **– 3 Hours**

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

Prerequisite: Data Base Management System

Course Objectives: Course should be able to deliver the fundamental knowledge of the various aspects of Big Data Analytics and apply the knowledge in various platforms like Hadoop, NoSQL and Mapreduce spread over various level.

Course Outcomes:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Able to understand the key issues in big data management	L1, L2
2	Able to acquire fundamental enabling techniques using tools in big data analytics.	L1, L2, L3
3	Able to understand and apply BDA analysis in Hadoop	L1, L2, L3
4	Able to understand and apply BDA analysis in NoSQL	L1, L2, L3, L4
5	Able to understand and apply BDA analysis using Map reduce	L1, L2, L3, L4

6	Able to achieve adequate perspectives of big data analytics in various applications like sensor, recommender systems, social media applications etc	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's Taxonomy
1	**Introduction to Big Data Analytics**	**06**	L1, L2
	1.1 Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach. 1.2 Technologies Available for Big Data, Infrastructure for Big Data, Big Data Challenges, Case Study of Big Data Solutions.		
2	**Hadoop**	**06**	L1, L2, L3
	2.1 Introduction to Hadoop. Core Hadoop Components, Hadoop Ecosystem, Physical Architecture, Hadoop limitations, Hadoop Features, Latency & Throughput, Hadoop file creation, Replication Factor, Rack awareness, Fault tolerance, High availability, Hadoop & DBMS comparison		
3	**NoSQL**	**08**	L1, L2, L3
	3.1 Introduction to NoSQ, NoSQL business drivers, NoSQL case studies 3.2 NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns 3.3 Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; Analyzing bigdata with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems		
4	**MapReduce**	**08**	L1, L2, L3, L4
	4.1 MapReduce and The New Software Stack: Distributed File Systems, Physical Organization of Compute Nodes, Large Scale File-System Organization 4.2 MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures 4.3 Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations by MapReduce, Matrix Operations, Matrix Multiplication by MapReduce.		
5	**Techniques in Big Data Analytics**	**10**	L1, L2, L3, L4

	5.1 Finding Similar Item: Nearest Neighbor Search, Similarity of Documents 5.2 Mining Data Streams: Data Stream Management Systems, Data Stream Model, Examples of Data Stream Applications: Sensor Networks, Network Traffic Analysis 5.3 Link Analysis: PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: Page Rank Implementation Using MapReduce 5.4 Frequent Itemset Mining : Market-Basket Model, Apriori Algorithm, Algorithm of Park-Chen-Yu		
6	**Big Data Analytics Applications**	**07**	L1, L2, L3, L4
	6.1 Recommendation Systems: Introduction, A Model for Recommendation Systems, Collaborative-Filtering System: NearestNeighbor Technique, Example. 6.2 Mining Social-Network Graphs: Social Networks as Graphs, Types of Social-Network. Clustering of Social Graphs: Applying Standard Clustering Techniques, Counting triangles using MapReduce.		
	Total	**45**	

Books & References:

SN	Title	Authors	Publisher	Edition	Year
1	Big Data Analytics	Radha Shankarmani and M Vijayalakshmi	Wiley	Second	2015
2	Hadoop in Practice‖	Alex Holmes	Manning Press	Second	2017
3	Making Sense of NoSQL– A guide for managers and the rest of us	Dan McCreary and Ann Kelly	Manning Press	Third	2013
4	Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics	Bill Franks	Wiley	Third	2015

Online References:

S. No.	Website Name	URL	Modules Covered
1	https://nptel.ac.in/	https://nptel.ac.in/courses/106104189/	M1, M2, M3
2	https://www.coursera.org	https://www.coursera.org/courses?query=introduction%20to%20big%20data%20analytics	M6

Suggested List of Practical / Experiment:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	RBT Levels
1	**Basic Experiments**	Study of Hadoop ecosystem	2	L1, L2, L3
2		gramming exercises on Hadoop	2	L1, L2, L3
3	**Design Experiments**	gramming exercises in No SQL	2	L1, L2, L3
4		Implementing simple algorithms in Map-Reduce - Matrix multiplication, Aggregates	2	L1, L2, L3
5		Design and implementation of any case study/ applications based on standard Datasets available on the web 2Twitter data analysis `	2	L1, L2, L3
6		T2o understand the overall programming architecture using Map Reduce API	2	L1, L2
7		Sto2re the basic information about students such as roll no, name, date of birth , and address of student using various collection types such as List, Set and Map	4	L1, L2, L3,L4
8		Basic CRUD operations in MongoDB	4	L1, L2, L3,L4, L5
9		Retrieve various types of documents from students collection	4	L1, L2, L3,L4, L5
10		To find documents from Students collection		L1, L2, L3,L4, L5
11, 12,13,14,15	**Mini/Minor Projects/ Seminar/ Case Studies**	1. Develop Map Reduce Work Application 2. Mid Semester Examination 3. Creating the HDFS tables and loading them in Hive and learn joining of tables in Hive 4. Design and implementation of any case study/ applications based on standard Datasets available on the web Fraud Detection 5. Design and implementation of any case study/ applications based on standard Datasets available on the web Text Mining etc. using modern tools	8	L1, L2, L3,L4, L5
		Total Hours	**32**	

B.E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

BE (Electronics & Telecommunication Engineering)							**B. E. (SEM: VII)**		
Course Name: Professional Elective IV (Machine Learning)							**Course Code:** PEC-ETC7021		
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**
3	-	2@	5	4	25	75	25	25	
@-Professional Elective Courses Lab will be conducted in the form Capstone Project **IA:** In Semester Assessment- Paper Duration **– 1.5 Hours** **ESE:** End Semester Evaluation- 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: Basic Probability and Statistics, Algebra and Calculus, Linear Algebra									

Course Objective: This course will introduce the field of Machine Learning, in particular focusing on the core concepts of supervised and unsupervised learning. In supervised learning we will discuss algorithms which are trained on input data labelled with a desired output, for instance an image of a face and the name of the person whose face it is and learn a function mapping from the input to the output. Unsupervised learning aims to discover latent structure in an input signal where no output labels are available, an example of which is grouping web-pages based on the topics they discuss. The course will also introduce the applications of machine learning to a range of real-world problems.

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	Understand and explain the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.	L1, L2
2	Understand and explain the strengths and weaknesses of many popular machine learning approaches.	L1, L2
3	Identify machine learning techniques suitable for a given problem	L1, L2, L3, L5
4	Apply Dimensionality Reduction Techniques	L1, L2, L3
5	Solve the problems using various machine learning techniques	L1, L2, L3, L4, L5
6	Describe and appreciate the application of Machine Learning to different real-world problems	L1, L2, L3, L4, L5

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction** What is Machine Learning, what is Artificial Intelligence, Machine Learning vs AI, Machine Learning vs Deep Learning, Types of Machine Learning, General Steps or Process of Machine Learning, Data cleaning, data transform/fitting, Over fitting, Under fitting, Variance, Bias, Parametric Vs Non Parametric models-Linear models.	06	L1, L2
2	**Supervised Learning: Classification** Random Forest, Decision Trees, Logistic Regression, Support Vector Machines, KNN, Naïve Bayes, Usage, Bagging, Boosting	10	L1, L2, L3, L4
3	**Supervised Learning: Regression** Linear Regression, Polynomial Regression, Principle Component Analysis, Usage	06	L1, L2, L3, L4
4	**Unsupervised Learning** Clustering: K-Means, K Nearest Neighbors, Agglomerative Clustering, Divisive Clustering.	06	L1, L2, L3, L4
5	**Artificial Neural Networks** Representation, Back Propagation Algorithm, CNN, RNN, Transfer Learning, Ensemble Learning	10	L1, L2, L3, L4
6	**Machine Learning Applications across Industries** Healthcare, Retail, Financial Services, Manufacturing, Hospitality	07	L1, L2, L3, L4, L5
	Total Hours	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Machine Learning	Tom M. Mitchell	McGraw Hill	First Edition	1997
2	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer-Verlag New York	First Edition	2006
3	Introduction to Machine Learning	Ethem ALPAYDIN	MIT Press	Second Edition	2010

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/106/106/106106139/	M1-M3, M5
2	Coursera	https://www.coursera.org/learn/machine-learning	M1-M5

B. E. Semester –VII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B.E. (Electronics & Telecommunication Engineering)							**B.E. SEM:** VII		
Course Name: Professional Elective IV (Robotics)							**Course Code:** ETC7022		
Teaching Scheme (Program Specific)					**Examination scheme**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week- Theory (100)							**Practical/Ora l (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**	**150**
3	-	2@	5	4	25	75	25	25	
@-Professional Elective Courses Lab will be conducted in the form Capstone Project **IA:** Internal Assessment - Paper Duration – 1Hour **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 (20%)									
Prerequisite: Instrumentation & Control									

Course Objective: The course intends to deliver the systematic study of basic knowledge of robotics, kinematics & dynamics of robots, path and trajectory planning and robot vision.

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

Sr.No.	Course Outcomes	Cognitive Level s as per Blooms Taxonomy
1	Understand the basics of robotics and Describe Forward & Inverse Kinematics of Robots	L1, L2
2	Describe trajectory planning and path planning for robots	L2, L3
3	Understand robot vision and task planning	L2, L3
4	Work in interdisciplinary projects	L4, L5, L6

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Level as per Blooms Taxonomy

1	**Fundamentals of Robotics** Robot Classification, Robot Components, Degrees of freedom, Joints, Coordinates, Coordinate frames, workspace, applications	04	L1, L2
2	**Forward & Inverse Kinematics of Robots** Homogeneous transformation matrices, Inverse transformation matrices, Forward and inverse kinematic equations – position and orientation. Denavit- Hatenberg representation of forward kinematics, Forward and inverse kinematic solutions of three and four axis robot	10	L2, L3
3	**Velocity Kinematics & Dynamics** **Differential motions and velocities :** Differential relationship, Jacobian, Differential motion of a frame and robot, Inverse Jacobian, Singularities	04	L2, L3
4	**Trajectory planning** Dynamic Analysis of Forces: Lagrangian mechanics, Newton Euler formulation, Dynamic equations of two axis robot. Basics of Trajectory planning, Joint-space trajectory planning, Cartesian- space trajectories	10	L2, L3
5	**Robot Vision** Image representation, Template matching, Polyhedral objects, Shape analysis, Segmentation, Iterative processing, Perspective transform, Camera Calibration	09	L2, L3
6	**Task Planning** programming, Uncertainty, Configuration Space, Gross motion Planning; Grasp ine-motion Planning, Simulation of Planer motion, Source and goal scenes, Task ulation	08	L4, L5, L6
		Total Hours	**45**

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Introduction to Robotics – Analysis, Control, Applications	Saeed Benjamin Niku,	Wiley India Pvt. Ltd	2nd edition	2011
2	Introduction to Robotics – Mechanics & Control	John J. Craig	Pearson Education, India	3rd edition	2009
3	Learning ROS for Robotics Programming	Aaron Martinez & Enrique Fernandez	Shroff Publishers	1st edition	2013
4	Fundamentals of Robotics - Analysis and control	Robert Shilling	Prentice Hall of India	2nd edition	2010

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B.E. (Electronics & Telecommunication Engineering)							**B.E. (SEM: VII)**		
Course Name: Professional Elective IV (RF MEMS)							**Course Code:** ETC7023		
Teaching Scheme (Program Specific)					**Examination scheme**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week- Theory (100)							**Practical/Ora l (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**	**150**
3	-	2@	5	4	25	75	25	25	
@-Professional Elective Courses Lab will be conducted in the form Capstone Project **IA:** Internal Assessment - Paper Duration – 1Hour **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 (20%)									
Prerequisite: Electromagnetic Engineering									

Course Objective: The course intends to give an understanding of MEMS Switches. The course also aims to make the students understand and apply design technique to Inductors, Capacitors, RF Filters and Phase Shifters using MEMS technology. Lastly, the course will also deliver the understanding of micromachine technique to microstrip antennas performance enhancement.

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	Characterize RF MEMS Switches	L1, L2
2	Design and analyze MEMS Inductors.	L1, L2, L3, L4, L5, L6
3	Design and analyze MEMS Capacitors	L1, L2, L3, L4, L5
4	Characterize and design Micromachined RF Filters	L1, L2, L3, L4
5.	Characterize and design MEMS Phase Shifters	L1, L2, L3, L4
6.	Demonstrate skills of Micromachining to improve antenna performance	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**RF MEMS Switches** Introduction to MEMS, Switch parameters, Mechanical switches and Electronic switches, Switches for RF and microwave applications, Actuation mechanisms for MEMS devices.	08	L1, L2
2	**MEMS Inductors** Self-inductance and mutual inductance, Micromachined inductor, Meander inductors, Spiral inductors, Solenoid inductors, Effect of inductor layout, Modeling and design issues of planar inductor.	09	L1, L2, L3, L4, L5, L6
3	**MEMS Capacitors** MEMS gap-tuning capacitors:Electrostatic tuning, Electro-thermal tuning, Piezoelectric-actuator tuning. MEMS area tuning capacitors, Dielectric tunable capacitors.	06	L1, L2, L3, L4, L5
4	**Micromachined RF Filters** Parameters for characterizing bandpass filters. Modeling of Micromechanical filters: Electrostatic comb drive, Micromechanical filters using comb drives, Micromechanical filters using electrostatic coupled beam structures Bulk acoustic wave filters, Micromachined filters for millimeter wave frequencies	08	L1, L2, L3, L4
5	**MEMS Phase Shifters** Types of phase shifters and their limitations: Ferrite phase shifters, Semiconductor phase shifters, Ferroelectric thin-film phase shifters, Limitations of phase shifters. MEMS phase shifters: Switched delay line phase shifters, Distributed MEMS phase shifters, Polymer-based phase shifters.	08	L1, L2, L3, L4
6	**Micromachined Antennas** Microstrip antennas, Basic characteristics of microstrip antenna Design parameters of microstrip antennae, Micromachining to improve antenna performance, Reconfigurable antennas.	06	L1, L2, L3
	Total	**45**	

Books & References:

Sr. No.	Title	Authors	Publisher	Edition	Year

1	RF MEMS and Their Applications	Vijay K. Varadan K.J. Vinoy, K.A. Jose	Wiely	First Edition	2003
2	RF MEMS Circuit Design for Wireless Communications	Héctor J. De Los Santos	Artech House	First Edition	2002
3	RF MEMS Theory, Design, and Technology	Gabriel M. Rebeiz	Wiley- Interscience	First Edition	2003
4	Micro Electro Mechanical System Design	James J. Allen	Taylor & Francis	First Edition	2005
5	RF Circuit Design	John E. Blyler	Newnes	Second Edition	2007
6	Microwave Engineering	David Pozar	McGraw Hill Education	Fourth Edition	2014

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	www.besserassociates.com	https://www.besserassociates.com/Courses/Course-Description/CTID/273	M1-M6

Suggested List of Practical / Experiment:

Professional Elective Courses- RF MEMS Lab will be conducted in the form Capstone Project. Students are required to complete one project in group of 3 students form following list of projects.

1. Design of RF MEMS Switch
2. Design of MEMS Inductor for RF application
3. Design of MEMS Capacitor for RF application
4. Design of Micromachined RF Filters
5. Design of Ferrite phase shifters
6. Design of Semiconductor phase shifters
7. Design of Distributed MEMS phase shifters
8. Design of Micromachined frequency reconfigurable Microstrip antenna
9. Design of Micromachined Microstrip antenna for bandwidth enhancement.
10. Design of Micromachined Microstrip antenna for lobe switching.
11. Design of Micromachined smart antenna for wireless communication
12. Design of Micromachined Microstrip antenna for

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

B.E. (Electronics and Telecommunication Engineering)							**B.E. (SEM: VII)**		
Course Name: Professional Elective IV (VLSI and CMOS Design)							**Course Code:** PEC-ETC7024		
Teaching Scheme (Program Specific)					**Examination scheme**				
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	

@-Professional Elective Courses Lab will be conducted in the form of Capstone Project
IA: Internal 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 (20%)
Prerequisite: Digital Circuit Design, Electronic Devices and Circuits-I & II, Microelectronics and Mixed signal design

Course Objective: To impart the knowledge about VLSI design trends, methodologies and allied systems used in digital design.

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

Sr. No.	Course Outcomes	Cognitive Levels as per Blooms Taxonomy
1	Demonstrate a clear understanding of choice of technology, Explain the process of fabrication and list down the MLD rules and draw the MLD	L1,L2
2	List different parameters, Concept of static and dynamic analysis, compare different types of Inverters.	L1,L2,L3,L4
3	Explain different design styles used in digital design like PTL, Transmission gates etc. Implement concept of sizing. Implementation of various circuits using different design styles.	L1,L2,L3
4	Explain different memory structures; explain working of memory units, its modes of operation and its peripheral circuitry.	L1,L2,L3
5	Explain different types of adder circuits, Compare it's performance. Explain multiplier circuits and allied circuitry.	L1,L2
6	Explain clocking phenomenon, clock generation and distribution. Understand importance of Low power design and implement protection circuitry, Explain Interconnect model and scaling.	L1,L2,L3

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	**CMOS**	4	L1,L2
	Fabrication Process: N-MOS and CMOS-nWell. **Mask layout Diagram:** Rules of mask layout diagram and Mask lay out diagram of CMOS		
2	**MOSFET Inverters**	6	L1, L2,L3,L4
	Types of MOS inverters: Active and passive load and their comparison. **Circuit Analysis of MOS Inverters:** Static Analysis resistive and CMOS inverter: Calculation of all critical voltages and noise margins. Design of symmetric CMOS inverter and its mask layout diagram Dynamic Analysis of CMOS inverter: Calculation of rise time, fall time and propagation delay. **Logic Circuit Design:** Analysis and design of 2-I/P NAND, NOR and complex Boolean function using equivalent CMOS inverter for simultaneous switching.		
3	**MOS Circuit Design Styles**	10	L1, L2, L3
	Design Styles: Static CMOS, pass transistor logic, transmission gate, Pseudo NMOS, C2MOS, Dynamic, Domino,NORA and Zipper. **Circuit Realization:** Basic gates,SR Latch, JK FF, D FF, 1 Bit Shift Register, MUX using above design styles.		
4	**Semiconductor Memories**	9	L1, L2, L3
	SRAM: 6T SRAM, operation, design strategy, leakage currents, read/write circuits, sense amplifier. **DRAM**: 1T_DRAM, operation modes, leakage currents, refresh operation, physical design. **ROM Array**: NAND and NOR PROM, Nonvolatile read/write memories classification and programming techniques.		
5	**Data Path Design**	6	L1, L2
	Adder: CLA adder, MODL, Manchester carries chain and high-speed adders like carry skip, carry select and carry save. **Multipliers and shifter:** Array multiplier and barrel shifter		
6	**VLSI Clocking and System Design**	10	L1, L2, L3
	Clocking: CMOS clocking styles, Clock generation, stabilization and distribution. **Low Power CMOS Circuits:** Various components of power dissipation in CMOS, Limits on low power design, low power design through voltage scaling **I/O pads and Power Distribution:** ESD protection, input circuits, output circuits, simultaneous switching noise, power distribution scheme **Interconnect:** Interconnect delay model, interconnect scaling and crosstalk.		
	Total Hrs	**45 hrs**	

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	VLSI Design	Debaprasad Das	Oxford	1st Edition	2011
2	Low-Power CMOS VLSI Circuit Design	Kaushik Roy and Sharat C. Prasad	Wiley	Student edition	2009
3	CMOS VLSI Design	Neil H. E. Weste, David Harris and Ayan Banerjee	Pearson Education	3rd edition	2009

4	CMOS Digital Integrated Circuits Analysis and Design	Sung-Mo Kang and Yusuf Leblebici	Tata McGraw Hill, 3rd Edition.	3rd edition	2011

Online References:

S. No.	Website Name	URL	Modules Covered
1	www.udemy.com	https://www.udemy.com/course/svac_c1_ic_design_manufacturing_process/	M1,M2,M3
2	www.online.stanford.edu	https://online.stanford.edu/courses/ee271-introduction-vlsi-systems	M1,M2,M3,M6
3	www.classcentral.com	https://www.classcentral.com/course/swayam-cmos-digital-vlsi-design-12964	M1,M2,M3,M4,M5. M6
4	www.mooc-list.com	https://www.mooc-list.com/course/vlsi-cad-logic-layout-coursera/	M3,M4,M5,M6+advance topics

B.E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

<table>
<tr><td colspan="7">BE (Electronics & Telecommunication Engineering)</td><td colspan="4">B. E. (SEM: VII)</td></tr>
<tr><td colspan="7">Course Name: Professional Elective IV (Wireless Sensor Networks)</td><td colspan="4">Course Code: PEC-ETC7025</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="2">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE</td><td rowspan="2">25</td><td rowspan="2">25</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2@</td><td>5</td><td>4</td><td>25</td><td>75</td></tr>
<tr><td colspan="10">@-Professional Elective Courses Lab will be conducted in the form Capstone Project
IA: In Semester Assessment- Paper Duration – 1.5 Hours
ESE: End Semester Evaluation- 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%)</td></tr>
<tr><td colspan="10">Prerequisite: Computer Networks, Mobile Communication Systems</td></tr>
</table>

Course Objective: Course aims to make students understand the concepts of wireless sensor and adhoc networks, the major challenges and designing issues, various MAC and routing protocols in wireless sensor and adhoc networks and heterogeneous network architecture including MANET, WLAN, Cellular 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	Understand and describe the concept of wireless sensor networks, Adhoc networks, and their applications.	L1, L2
2	Describe and evaluate the performance of various routing protocols in wireless sensor and adhoc networks.	L1, L2, L3
3	Explain the broadcasting and Geocasting routing techniques in MANATES	L1, L2, L3, L4, L5
4	Describe and examine the performance of Multicasting protocols.	L1, L2, L3
5	Understand and describe the various design issues and challenges in Wireless Sensor Networks.	L1, L2, L3, L4
6	Understand and explain the heterogeneous network architecture comprised of MANETs, WLANs and Cellular Networks.	L1, L2, L3, L4, L5

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to MANET and Wireless Sensor Networks** Introduction to WSN and MANET. WPAN: Bluetooth, ZigBee, UWB WLAN: Architecture, PHY and MAC layer, 802.11a, 802.11b, 802.11n. Application of sensor Network, Sensing and Communication Range, Energy and Clustering of sensors	08	L1, L2
2	**Routing in Adhoc Networks** Topologies - Based Routing Protocols: DSDV, WRP, OLSR, DSR, AODV, TORA, ZRP. Position-Based Routing: Location Services: DREAM, Quorum based, Grid based Forwarding Strategies: Greedy packet forwarding, Expected zone routing, Relative Distance Micro-Discovery Ad Hoc Routing. Other Routing Protocols: Signal Stability Routing Protocol, Power Aware Routing, Associativity-Based Routing, QoS Routing.	10	L1, L2, L3
3	**Broadcasting and Geo-casting in MANET** Introduction, The Broadcast Storm, Broadcasting: Ad Hoc Broadcast Protocol, Lightweight and Efficient Network-Wide Broadcast Geo-casting: Location-Based Multicast, Voronoi Diagram Based Geo=casting, Flooding-Based GeoGRID, Route Creation Oriented	08	L1, L2, L3, L4, L5
4	**Multi-casting in MANET** Tree-Based Approaches: Multicast Ad Hoc On-Demand Distance Vector Protocol, Location Guided Tree Construction Algorithm for Small Group Multicast, Multicast Zone Routing. Mesh-Based Approaches: On-Demand Multicast Routing Protocol, Stateless Approaches: Differential Destination Multicast, Hybrid Approaches: Ad Hoc Multicast Routing Protocol	08	L1, L2, L3
5	**Design Issues & Challenges in Wireless Sensor Networks** Introduction, Design Issues & Challenges: Energy, Self Management, Hardware, Operating System, Middleware, QoS,; Medium Access Schemes, Network and transport layer. Fundamentals of Network Security..	06	L1, L2, L3, L4
6	**Integrating MANETs, WLANs and Cellular Networks** Introduction, Ingredients of a Heterogeneous Architecture, Protocol Stack, Comparison of the Integrated Architectures.	05	L1, L2, L3, L4, L5
	Total Hours	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year

1	Adhoc & Sensor Networks Theory and Applications	Cordeiro, Agrawal	Cambridge University Press India Pvt. Ltd	Second Edition	2010
2	Adhoc Wireless Networks Architecture and Protocols	C.Siva Ram Murthy and B.S.Manoj	Pearson	Second Edition	2016
3	Adhoc & Sensor Networks	Houda Labiod	Wiley	First Edition	2010
4	Wireless Communication and Networking	Vijay Garg	Elsevier Inc.	First Edition	2004
5	Embedded Systems: An Integrated Approach	Lyla Das	Pearson Publication	First Edition	2013
6	Wireless and Mobile Networks, Concepts and Protocols	Manvi, Kakkasageri	Wiley	Second Edition	2014

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/106/105/106105160/	M1, M2, M4
2	NPTEL	https://ict.iitk.ac.in/courses/wireless-ad-hoc-and-sensor-networks/	M1. M2
4	Swayam	https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview	M4, M5, M6

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

BE (Electronics & Telecommunication Engineering)							**B.E. (SEM : VII)**		
Course Name: Finance Management							**Course Code :** HSMC-ETC701		
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	25	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 practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Basic Mathematics									

Course Objectives: The course intends to give an overview of Indian financial system, instruments and market along with basic concepts of value of money, returns and risks, corporate finance, working capital and its management. It also exhibit knowledge about sources of finance, capital structure, dividend policy.

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 Levels
1	Understand Indian Financial System with respect to financial Instruments, financial markets and institutions	L1,L2
2	Understand the concepts of Returns and risks along with time value of money	L1, L2,L3
3	Understand Corporate Finance and perform financial ratio analysis	L1, L2,L3
4	Importance of Capital Budgeting	L1,L2,L3,L4
5	Identify Sources of Finance and capital structure	L1,L2,L3,L4
6	Analyze the Dividend Policy concepts for financial decisions	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Overview of Indian Financial System** Characteristics, Components and Functions of Financial System. **Financial Instruments:** Meaning, Characteristics and Classification of Basic Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. **Financial Markets:** Meaning, Characteristics and Classification of Financial Markets — Capital Market, Money Market and Foreign Currency Market **Financial Institutions:** Meaning, Characteristics and Classification of Financial Institutions — Commercial Banks, Investment-Merchant Banks and Stock Exchanges	08	L1,L2
2	**Concepts of Returns and Risks** Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio. **Time Value of Money:** Future Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Present Value of a Lump Sum, Ordinary Annuity, and Annuity Due; Continuous Compounding and Continuous Discounting	08	L1, L2,L3
3	**Overview of Corporate Finance** Objectives of Corporate Finance; Functions of Corporate Finance—Investment Decision, Financing Decision, and Dividend Decision. **Financial Ratio Analysis:** Overview of Financial Statements—Balance Sheet, Profit and Loss Account, and Cash Flow Statement; Purpose of Financial Ratio Analysis; Liquidity Ratios; Efficiency or Activity Ratios; Profitability Ratios; Capital Structure Ratios; Stock Market Ratios; Limitations of Ratio Analysis.	08	L1, L2,L3
4	**Capital Budgeting** Meaning and Importance of Capital Budgeting; Inputs for Capital Budgeting Decisions; Investment Appraisal Criterion—Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR) **Working Capital Management:** Concepts of Meaning Working Capital; Importance of Working Capital Management; Factors Affecting an Entity's Working Capital Needs; Estimation of Working Capital Requirements; Management of Inventories; Management of Receivables; and Management of Cash and Marketable Securities	10	L1,L2,L3, L4
5	**Sources of Finance** Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance. **Capital Structure:** Factors Affecting an Entity's Capital Structure; Overview of Capital Structure Theories and Approaches— Net Income Approach, Net Operating Income Approach; Traditional Approach, and Modigliani-Miller Approach. Relation between Capital Structure and Corporate Value; Concept	07	L1,L2,L3, L4

	of Optimal Capital Structure		
6	**Dividend Policy**	04	L1, L2, L3,L4
	Meaning and Importance of Dividend Policy; Factors Affecting an Entity's Dividend Decision; Overview of Dividend Policy Theories and Approaches—Gordon's Approach, Walter's Approach, and Modigliani-Miller Approach		

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	Fundamentals of Financial Management	Eugene F. Brigham and Joel F. Houston	Cengage Publications, New Delhi	Thirteenth Edition	2015
2	Analysis for Financial Management	Robert C. Higgins	McGraw Hill Education	Tenth Edition	2013
3	Indian Financial System	M. Y. Khan	McGraw Hill Education, New Delhi	Ninth Edition	2015
4	Financial Management	I. M. Pandey	S. Chand (G/L) & Company Limited, New Delhi	Eleventh Edition	2015

Online References:

S. No.	Website Name	URL	Modules Covered
1	www.splessons.com	https://www.splessons.com/lesson/indian-financial-system-overview/	M1,M3
2	finance.zacks.com	https://finance.zacks.com/concepts-return-investment-risk-3049.html	M2
3	www.edupristine.com	https://www.edupristine.com/blog/capital-budgeting	M4
4	efinancemanagement.com	https://efinancemanagement.com/sources-of-finance	M5
5	www.businessmanagementideas.com	https://www.businessmanagementideas.com/financial-management/dividends/meaning-and-types-of-dividend-policy-financial-management/3968	M6

BE (Electronics & Telecommunication Engineering)							B.E. (SEM: VII)		
Course Name : Project-I							Course Code : PROJ-ETC701		
Teaching Scheme (Program Specific)					Examination Scheme (Formative / Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory		Practical/Oral/ Presentation	Term Work	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	50
-	-	6	6	3	-	-	25	25	
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: All courses in the syllabus									

Course Objective:

1. To do extensive literature survey and identify gap.
2. Integrate information from multiple sources.
3. Identify, analyze, and solve problems creatively through sustained critical investigation.
4. Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal areas of study.
5. Demonstrate an awareness and application of appropriate personal, societal, and professional ethical standards.
6. Use effective oral and written communication and demonstrate an ability to work in teams.

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	Identify the relevant literature and interpret it correctly to understand the gap covered by the proposed method.	L1, L3, L4, L5
2	Integrate collected information from various sources for the solution of identified problem.	L1, L3, L4, L5
3	Investigate the identified problem and categorize it to find appropriate solution identified from collected information.	L1, L3, L4, L5
4	Apply learned concepts from the various areas learned in academics to solve the identified problem.	L1, L3, L4, L5
5	Understand the importance of ethics at personal, societal and professional level.	L1,L3
6	Communicate with outer world from technical and non-technical areas and gain managerial skill while working in a team.	L2, L3, L5

Project-I:

Guidelines for Assessment of Project-I:

Project-I should be assessed based on following points

- Quality of problem selected
- Clarity of Problem definition and Feasibility of problem solution
- Relevance to the specialization
- Clarity of objective and scope
- Breadth and depth of literature survey
- Project I should be assessed through a presentation by the student project group to a panel of Internal and external examiners appointed by the Head of the Department/Institute of respective Programme.

B. E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme

BE (Electronics and Telecommunication Engineering)					**B. E. (SEM : VII)**				
Course Name: Professional Skills VII					**Course Code :** HME- ETCPS701				
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**	**75**
1	-	2	3	2	-	-	25	50	
Audit Course Evaluated by Mentors Mid Semester Assessment for Term Work will be on Continuous Basis									
Prerequisite: Basics of Computer									

Course Objective:

The objective of the course is to give the basics understanding of Latex tool which is used for Documentation. The course intends to develop necessary skills for becoming skilled personnel in Documentation.

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

S.N.	Course Outcomes	Cognitive level attainment as per revised Bloom's Taxonomy
1	Able to install Latex and understand basic Latex layout.	L1, L2
2	Able to format Word, Line and paragraph in Latex.	L1, L2, L3, L4
3	Design pages according to the requirement	L1, L2, L3, L4
4	Creating List & Adding Figures, Tables in Latex Document	L1, L2, L3, L4, L5
5	Able to insert mathematical formula or function.	L1, L2, L3, L4
6	Able to apply Cross-Reference in the Latex Document	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
1	**Introduction** Introduction to Latex, Installation of Latex, First Latex Document, Basic layout, Title pages	2	L1, L2
2	**Formatting Words, Lines, and Paragraphs** Exploring the document structure, Understanding LaTeX commands, breaks and empty lines, special characters in text, switching fonts, font family, grouping by braces, font sizes, adding intelligent spacing, creating a narrow text column, line breaks	3	L1, L2, L3, L4
3	**Designing Pages** Adjust the margins, Change the line spacing, Section the document, create a table of contents, Design headers and footers, Control page breaking, set footnotes and modify their appearance	3	L1, L2, L3, L4
4	**Creating List & Adding Figures, Tables** Bulleted lists, Numbered lists, Definition lists, lining up text and data in columns, typesetting complex tables, including pictures in our documents, adding captions to pictures and tables, Controlling the placement of figures and tables	3	L1, L2, L3, L4, L5
5	**Math Functions** Writing basic formulas, embedding formulas within text and text within formulas, Cantering and numbering equations, aligning multi-line equations, typesetting math symbols such as roots, operators, Greek letters, and arrows, building fractions, stacking expressions, Building matrices	2	L1, L2, L3, L4
6	**Cross- Referencing & Bibliography** Refer to sections, footnotes, list items, tables, and more, refer to page numbers and ranges, Make LaTeX refer verbosely to adjacent pages, automate naming of references, create references to external documents, Creating a bib file	2	L1, L2, L3, L4, L5
	Total Hours	**15**	

Books & References:

SN	Title	Authors	Publisher	Edition	Year
1	LaTeX Beginner's Guide	Unmesh Gundecha	packt	first	2011
2	LaTeX Cookbook	Stefan Kottwitz	packt	second	2015
3	LaTeX A Document Preparation System	Leslie Lamport	Addison-Wesley Publishing Company	second	1985

Online References:

S. No.	Website Name	URL	Modules Covered
1	https://www.edx.org/	https://www.edx.org/course/latex-for-students-engineers-and-scientists-2	M1, M2, M3, M4, M5, M6
2	https://www.lynda.com/	https://www.lynda.com/LaTeX-kurs-tutorial/3141-0.html	M3,M4

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**	Installation of Latex	2	L1
2		Creating a document in Latex	2	L1, L2
3	**Design Experiments**	Inserting sections, subsections and paragraph in the document	2	L1, L2, L3
4		Implementing Hierarchy of sectioning elements in Latex Document	2	L1, L2, L3
5		Inserting breaks and empty lines, special characters in Latex Document	2	L1, L2, L3
6		Switching fonts, font family, grouping by braces, font sizes in Latex Document	2	
7	**Advanced Experiments**	Designing Pages, Adjust the margins, Change the line spacing in Latex Document	4	L1, L2, L3
8		Create a table of contents, Design headers and footers in Latex Document	4	L1, L2, L3
9		Creating List in Latex document	2	L1, L2, L3
10		Adding Figures in Latex Document	2	L1, L2, L3
11 to 15	**Mini/Minor Projects/ Seminar/**	1. Generating a document with Mathematical Functions and Formulas, 2. Writing Report in Latex 3. Writing a Research paper in Latex 4. Writing an Article in Latex 5. Writing Black Book in Latex	6	L1, L2, L3
		Total Hours	**30**	

T.E. Semester –VII

BE (ALL BRANCHES)					**SEM: VII**		
Course Name: Research Based Learning III					**Course Code:** HSD-ETCRBL701		
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**	**AC**	**AC**	**TW**
-	-	2	2	1	25	25	50
Assessment for Term work will be on continuous basis							
Prerequisite: Subject knowledge, Domain knowledge							

Course Objectives: This course is focused to engage the learner in testing & validation, developing business models & exploring possibilities in areas of research and consultancy.

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	Upgrade the knowledge of latest technologies, development tools and project development aspects to increase the quality of Projects.	L1, L2, L3
2	Develop skills of competitive business environment.	L1, L2, L3,L4
3	Test their competitive and research skills for participation in consultancy, grant and other competitions.	L1, L2, L3,L4
4	Upgrade research and analytical skills by publishing papers	L1, L2, L3,L4,l5

Detailed Syllabus:

Module No.	Topics	Cognitive level attainment as per revised Bloom Taxonomy
1	**Industry association: Search of relevant industry/labs/start-ups for project area**	L1, L2, L3
	Identification of Industry for the cause, opportunity, documentation. Testing of mathematical modeled as per standards available and based on the inputs received from Industry/Subject Experts. **Submission of report/Presentation and evaluation**	
2	**Business plan of Prototype/ Business canvas development**	L1, L2, L3,L4
	Preparing Business plan covering the following parameters: I. Key Partners II. Key Activities III. Value Propositions IV. Customer Relationships Customer Segments V. Key Resources VI. Channels VII. Cost Structure VIII. Revenue Streams	

	Presentation of Pitch and evaluation	
3	**Participation in competition/ research grant group/consultancy.** **I. Participation in project competitions** **a)** Participating at institute /national level /university level /participate in competitions. b) Participation in funded project/consultancy projects II. Research grant: Identifying research grant proposal like University level, industry level etc, Proposal writing and preparing budget. III Evaluation: Evaluation based on level of participation **Competition and evaluation**	L1, L2, L3,L4
4	**Publish paper at institute /national level conference and Journals** I. Identification of conference and track on the basis research proposal/theme (Institute/National/International) II. Participating at conference and publishing papers in reputed Journals. **Evaluation of research review paper.**	L1, L2, L3,L4,L5

References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1.	Guide to Competitive Programming: Learning and Improving Algorithms Through Contests	Antti Laaksonen	Springer	Kindle	2018
2.	Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers	Alexander Osterwalder, Yves Pigneur	John Wiley & Sons.	1st	2013
3.	How to Write a Good Research Paper	Peter Haisler	Samfundslitteratur	Kindle	2009

Online References:

Sr. No.	Website Name	URL	Modules Covered
1.	https://canvanizer.com	https://canvanizer.com/new/business-model-canvas	M2
2.	https://www.researchgate.net	https://www.researchgate.net/publication/224372998_Idea_Generation_Techniques_among_Creative_Professionals	M3
3.	https://www.startupindia.gov.in	https://www.startupindia.gov.in/content/sih/en/reources.html	M3
4.	https://www.slideshare.net	https://www.slideshare.net/AsirJohnSamuel/1introduction-to-research-methodology?next_slideshow=1	M4