DEPARTMENT OF TECHNOLOGY

THIRD YEAR B.TECH

Scheme of Teaching and Examination

Semester – V (Electronics & Telecommunication Engineering)

Course code	Course	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credit	Scheme	Max. marks	Min. Passing $	Scheme	Max. marks	Min. Passing
ETE 311	Power Electronics	03	-	-	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE312	Electromagnetic Fields	03	-	-	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE313	Microcontrollers	03	-	-	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE 314	Signals & Systems	03	-	-	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE 315	Computer Networks	03	-		03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	---------
ETE311L	Power Electronics Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
ETE312T	Electromagnetic Fields Tutorial	---	01	---	01	--------	-------	--------	IOE	50	20
ETE313L	Microcontrollers Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
ETE315L	Computer Networks Laboratory	---	---	02	01	--------	-------	--------	EOE	50	20
ETE316L	Advanced programming techniques	03	---	02	04	--------	-------	--------	IPE	50	20
ETE317	Internship-I	---	--	---	02	--------	-------	--------	IOE	50	20
	Total	**18**	**01**	**08**	**25**	--------	**500**	--------	--------	**300**	--------

Audit Course III

RM 311	Research Methodology	02	---	---	----	Evaluation at institute/ department level	Based on total marks obtained out of 50, the grade to be given by the course auditor (teacher)

Total contact hours per week: 27+02=29

$ In theory student should appear for the CIE (Mid Semester Exam), submit the assignment and must secure 40% marks in SEE.

CIE : Continuous Internal Evaluation SEE : Semester End Examination

IPE : Internal Practical Evaluation IOE : Internal Oral Evaluation

EPE : External Practical Evaluation EOE : External Oral Evaluation

Note : Tutorials and Practical shall be conducted in batches with batch strength not exceeding 18 students.

DEPARTMENT OF TECHNOLOGY
THIRD YEAR B.TECH
Scheme of Teaching and Examination
Semester – VI (Electronics & Telecommunication Engineering)

Course code	Course	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Total	Scheme	Max. marks	Min. Passing $	Scheme	Max. marks	Min. Passing
ETE321	Digital Signal Processing	03	---	---	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE322	Digital Communication	03	---	---	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE323	Antenna & Wave Propagation	03	---	---	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE324	VLSI Design	03	---	---	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	--------
ETE325	Control Systems	03	---	---	03	CIE	30	40	--------	-------	--------
						SEE	70		--------	-------	---------
ETE321L	Digital Signal Processing Laboratory	---	---	02	01	--------	-------	--------	IPE	50	20
ETE322T	Digital Communication Laboratory			02	01	--------	-------	--------	EPE	50	20
ETE323L	Antenna & Wave Propagation Laboratory	---	---	02	01	--------	-------	--------	EPE	50	20
ETE324L	VLSI Design Laboratory	---	---	02	01	--------	-------	--------	EOE	50	20
ETE325T	Seminar	02	---	---	02	-------	-------	--------	IOE	50	20
ETE326L	Mini Project and Seminar Laboratory	---	---	02	04	-------	-------	-------	IPE	50	20
	Total	**17**	**00**	**10**	**25**	--------	**500**	--------	--------	**300**	--------

Audit Course IV

FL 321	Introduction to foreign language	02	---	---	----	Evaluation at institute/ department level	Based on total marks obtained out of 50,the grade to be given by the course auditor

Total contact hours per week: 27+02=29

$ In theory student should appear for the CIE (Mid Semester Exam), submit the assignment and must secure 40% marks in SEE.

CIE : Continuous Internal Evaluation SEE : Semester End Examination
IPE : Internal Practical Evaluation IOE : Internal Oral Evaluation
EPE : External Practical Evaluation EOE : External Oral Evaluation

Note : Tutorials and Practical shall be conducted in batches with batch strength not exceeding 18 students.

Note: After semester IV & VI during vacation period, students will undergo Internship I and Internship II for minimum 4 weeks in a reputed industry from standpoint of electronics engineering principles. The students will submit a report of the training. This particular activity is equivalent to one credit and it carries 50 marks as an Internal Oral Evaluation (IOE) which is included in Semester V and semester VII.

For submission of the activity report, all the students will follow one specific format recommended by the Program Advisory Board.

Equivalence of Third Year B.Tech (Electronics & Telecommunication Engineering) Semester V and VI

The above detailed syllabus is a revised version of the Third Year B.Tech (Electronics & Telecommunication Engineering) Program being conducted by the Shivaji University at the Technology Department of the University. This syllabus is to be implemented from June 2022. (Academic year 2022-23)

The Equivalence for the courses/courses of Electronics and Communication Technology at Third Year B Tech Semester V and VI pre-revised Program under the faculty of Engineering and Technology is as follows.

Third Year B.Tech Semester V (Electronics and Communication Technology)

Sr.No	Third Year B.Tech (Electronics and Communication Technology) Semester V Pre-revised syllabus	Third Year B.Tech (Electronics & Telecommunication Engineering) Semester V Revised syllabus	Remark
1.	Digital Communication Technology	No equivalence for semester 5	Course shifted to semester 6
2.	Electromagnetic Fields	Electromagnetic Fields	Syllabus revised
3.	Microcontrollers	Microcontrollers	Syllabus revised
4.	Signals & systems	Signals & systems	Syllabus revised
5.	Computer Networks and data communication	Computer Networks	Title changed and syllabus revised
6.	Electronic System Design	No equivalence for semester 5	Course removed
7.		Advanced programming techniques	New course added
8.	Internship-I	Internship-I	No change
9.	Research methodology	Research methodology	No change in audit course
10.		Power Electronics	New course added

Third Year B.Tech Semester VI (Electronics & Telecommunication Engineering)

Sr. No	Third Year B. Tech (Electronics and Communication Technology) Semester VI Pre-revised syllabus	Third Year B. Tech (Electronics & Telecommunication Engineering) Semester VI Revised syllabus	Remark
1.	Digital Signal Processing	Digital Signal Processing	Syllabus revised
2.		Digital Communication	Title changed, course shifted from semester 5, syllabus revised
3.		Seminar	New course introduced
4.	Control Systems	Control Systems	Syllabus revised
5.	Mini project and Seminar	Mini project and Seminar	Syllabus revised
6.	Operating Systems	No equivalence in semester 6	Course shifted to semester 8
7.	Antenna & Wave Propagation	Antenna & Wave Propagation	Syllabus revised
8.	VLSI Design	VLSI Design	Syllabus revised
9.	Introduction to foreign language	Introduction to foreign language	No change in audit course

Audit course have not been assigned any credits. The students will be evaluated for these courses by the concerned course in charge. There will be grade conferred to the student. The grade will be based on conversion of marks obtained out of 50. (Obtaining passing grade is essential). Please refer to chart in the detail examination scheme. The chart shows the marks range and the respective grade.

Class, Part & Semester	**:**	**T. Y. B.Tech (Electronics and Telecommunication Engineering) Part III, Semester V**					
Course Title	**:**	**Power Electronics**			***Course Code*:**	**:**	**ETE311**
Teaching Scheme (Hours)	**:**	Lecture :	03 Hrs/week		***Total Credits***	**:**	04
		Practical :	02 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites	**:**	----					
Course Domain	**:**	Program Core					

Course Rationale: *The course contains power processing electronic circuits like controlled rectifiers, AC voltage controllers, DC-DC converters and inverters. Course introduces the basics of power semiconductor devices like SCRs, power BJTs, IGBTs and MOSFETs. The analysis of power circuits presented in detail along with the waveforms and control techniques.*

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Explain the Difference between power devices and low power devices.	**1.**	Describe structure and working of power devices.
2.	Explain internal mechanism, limitations of the different power devices.	**2.**	Analyze triggering methods, Commutation methods and protection circuits used for SCR.
3.	Analyze configurations of controlled rectifier circuit.	**3.**	Calculate different parameters of controlled rectifier.
4.	Analyze chopper circuits and its voltage control methods.	**4.**	Calculate different parameters of chopper circuit.
5.	Explain different Inverter Circuits.	**5.**	Describe different inverters and industrial application of power devices.
6.	Explain different application of power electronics in industry.	**6.**	Demonstrate and validate power electronics circuits in the laboratory.

Curriculum Content	**Hours**
UNIT I Power Devices & Driving Circuits Construction, working, V-I Characteristics: Power Diode, Power BJT, Schokkttey Diode, Diac, Triac, GTO, MOSFET, IGBT.	06
UNIT-II Silicon Controlled Rectifier SCR, Construction, V-I Characteristics, gate triggering Characteristics, rating & specifications, SCR triggering methods- R, RC, UJT triggering (using pulse Transformer), PUT, SUS, SBS triggering methods. SCR Turn off method - Class A, Class B, Class C, Class D, Class E, & Class F, SCR protection circuits.	09
UNIT III Single & Three Phase Controlled Rectifier 1 Φ Half Wave, Full Wave and semi controlled Rectifier, 3 Φ Half, Full and Semi Controlled rectifier with and without freewheeling diode. Study and Analysis for R, RL, RLE loads of	09

load voltage and current. 1 Φ and 3 Φ dual converter.	
UNIT-IV Inverters Concept of inverter, types of inverters. Thyristorised inverters: series inverter, parallel inverter, IGBT based inverters: 1-phase half and full bridge inverter. 3-phase bridge inverter (120 and 180 mode of conduction) Voltage control of 1-phase and 3-phase inverter, harmonic reduction techniques.	05
UNIT-V Choppers IGBT based Choppers: Step up and Step down chopper, Type A, Type B, Type C, Type D and type E choppers, voltage control techniques of choppers (TRC). Case Study: DC to DC converter in Solar System.	05
UNIT-VI Applications High frequency heating: Induction Heating, Electric welding: Introduction, Resistance welding, energy storage welding. Ultrasonic wave generation, AC voltage stabilizer, UPS - basic configuration and types. Electric Vehicle charging system.	05
Assignments: Based on the following activity The Report on Industrial Visit The simulation of the Power Electronics circuits using Simulation Tool. Implementation of one of the circuit from said curriculum. Solving miscellaneous questions based on said curriculum.	
Suggested Text Books:	
1. P.C. Sen, “Power Electronics”, 1st Edition, Tata McGraw Hill.	
2. M.D. Singh, K.B. Khanchandani, “Power Electronics”, 2nd Edition, Tata- McGraw Hill	
Suggested Reference Books:	
1. Mohan, Undeland, Riobbins, “Power Electronics” 3rd Edition, Wiley.	
2. M.H. Rashid, “Power Electronics”, TMH	
3. Dubey, Doralda, Joshi,Sinha, “Thyristorised Power Controllers”, New Age International Edition.	

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Electromagnetic Fields**			***Course Code*:**	**:**	ETE312
Teaching Scheme (Hours)	**:**	Lecture:	03 Hrs./week		***Total Credits***	**:**	04
		Tutorial:	01 Hrs./week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs.
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(If any)*	**:**	ETE211, ETE212, ETE213					
Course Domain	**:**	Program Core					

Course Rationale:

To acquaint students with the electromagnetic fundamentals underlying the operation of devices and components used in communication and transmission systems. The emphasis is on the physical concepts of fields and waves and their applications in engineering problems. To provide in depth knowledge of fields and waves and to serve as prerequisite for advanced courses.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Introduce vector analysis related to electromagnetic vector fields.	**1.**	Describe the basic mathematical concepts of vectors and their physical significance related to electromagnetic vector fields.
2.	Define and derive different laws in Electrostatic fields.	**2.**	Illustrate the physical concepts of static electric fields.
3.	Define and derive different laws in Electromagnetic fields.	**3.**	Describe the physical concepts of static magnetic fields.
4.	Explain Maxwell's equations and their significance	**4.**	Apply the maxwell equations to solve problems in electromagnetic field theory.
5.	identify, formulate and solve electromagnetic waves propagation problems	**5.**	Analyze the propagation of wave in different media
6.	Introduce transmission line and its behavior	**6.**	Determine the various parameters of transmission lines

Curriculum Content	**Hours**
Unit I Introduction: Introduction and Significance of Electromagnetic Fields, Scalar, Vector, Vector	05

Calculus, Coordinate Systems, Concepts of Gradient, Divergence and Curl.	
Unit II Electrostatic Field Coulomb's Law, Electric Field Intensity, Electric Field due to Distributed Charges, Flux Density, Gauss Law and Applications, Divergence Theorem, Work Done, Electric Potential, Potential Gradient, Electric Dipole, Polarization, Electrostatic Energy Density, Boundary Conditions for Electrostatic Field.	08
Unit III Magnetostatic Field Biot-Savart Law, Ampere's Circuital Law and Application, Stoke's Theorem, Magnetic Flux Density, Magnetic Scalar & Vector Potential, Energy Stored in Magnetic Field, Boundary Conditions for Magnetic Field.	07
Unit IV Maxwell's Equations Continuity Equation for Static Conditions, Displacement Current, Faraday's Law, Inconsistency of Ampere's Law, Maxwell's Equations in Point and Integral Form, Maxwell's Equations for Time Varying Fields, Comparison of Field & Circuit Theory	06
Unit V Uniform Plane Wave Wave Propagation in Perfect Dielectric, Lossy Dielectric and Conducting Media, Wave Equations for Sinusoidal Time Variations, Poynting Theorem and Power Flow in Electromagnetic Field, Skin Depth, Phase Velocity and Group Velocity.	06
Unit VI Transmission Lines Types of Transmission Lines, Transmission Line Equation, Transmission Line Parameters, The Terminated Transmission Line, Reflection Coefficient, VSWR, Group Velocity, Phase Velocity, Impedance Matching Techniques, Smith Chart and Applications.	07
Suggested list of Assignments: Based on the syllabus content students have to complete any one of the following activities: 1. Simulation based small project work 2. Case study work 3. Site visit 4. Solve technical quiz 5. Solve home assignments	

Suggested Text Books:	
1.	William Hayt, "Engineering Electromagnetics", Mc Graw Hill.
2.	R.K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill India,
3.	Matthew. N.O. Sadiku, "Elements of Electromagnetics", Oxford University Press
Suggested Reference Books:	
1.	E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India
2.	K.D. Prasad, "Antenna & Wave Propagation" Satya Prakashan
3.	N. Narayana Rao, "Elements of Engineering Electromagnetics", Prentice Hall
4.	Griffiths David J, "Introduction to Electrodynamics", Pearson Education

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Microcontrollers**			***Course Code*:**	**:**	ETE313
Teaching Scheme (Hours)	**:**	Lecture :	03 Hrs/week		***Total Credits***	**:**	04
		Practical :	02 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE214, ETE215					
Course Domain	**:**	Program Core					

Course Rationale:

This course deals with the study of architecture, device interfacing, assembly and C language programming for MCS-51, PIC microcontrollers. After learning this course students will be able to develop microcontroller based systems.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Discuss the fundamentals of microprocessors and microcontrollers	**1.**	Compare between microprocessors and microcontrollers.
2.	Explain the architecture of MCS 51 family	**2.**	Describe the architectural features of 8051 microcontroller.
3.	Illustrate the assembly language instructions and write assembly language programs	**3.**	Develop programs in assembly for 8051 microcontroller
4.	Illustrate C language programming for 8051 microcontroller	**4.**	Develop programs in C language for 8051 microcontroller
5	Describe interfacing and device programming	**5**	Interface the devices to microcontroller and write program to control the devices
6.	Discuss the architecture and programming for PIC microcontrollers.	**6.**	Describe architecture of PIC microcontrollers and develop programs.

Curriculum Content	**Hours**
Unit I- Fundamentals of Microcontrollers Evolution of microprocessors & microcontrollers, microprocessors v/s microcontrollers 8/16/32 bit processors & controllers, CISC v/s RISC architectures, registers, memory & types of memory, bus, interrupts	05
Unit II- MCS-51 Microcontroller family Introduction to MCS-51 architecture, 8051 microcontroller hardware, Input /output pins, external memory, register files, counters and timers, interrupts, serial communication, development tools IDE	07
Unit III- Instruction set and assembly language programming Addressing modes, instruction set of 8051 microcontroller, assembly language programs	07
Unit IV- Embedded C programming Comparison of assembly and embedded c language programming, data types, variables,	07

operators, storage classes, arrays, strings, C language programming for 8051 microcontroller	
Unit V- MCS-51 Microcontroller interfacing and programming Interfacing of LEDs, DC motors, stepper motors, buzzers, switches, matrix keyboards, seven segment displays, LCD displays, ADC, DAC, relays, thumbwheel , interfacing I2C,SPI bus devices,RS232	06
Unit VI- Introduction to PIC microcontroller family Microchip PIC 16F8XX microcontroller family , CPU architecture, register file structure, I/O ports and TRIS registers, interrupts, timers, oscillator configurations, reset alternatives, WDT, sleep mode , on chip resources, interrupt structure, instruction set, assembly and C language programming	07

Suggested list of Assignments:

Based on the syllabus content students have to complete any one of the following activity

1) simulation based small project work
2) case study work
3) site visit
4) solve technical quiz
5) Solve home assignments

General Instructions:

In semester end examination for question paper setting 60 % weightage should be given for programming and interfacing part.

Suggested Text Books:

1.	Kenneth Ayala, "The 8051 Microcontroller Architecture, programming and Applications" Penram Intrnational
2.	Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded systems" Pearson Education Asia LPE
3.	Ajay Deshmukh, " Microcontrollers: Theory and applications ", Tata McGraw hill edition
4	Microchip PIC 16F877 family Microcontrollers Data sheet

Suggested Reference Books:

1.	Intel or Atmel MCS 51 Family Microcontrollers Data Sheets
2.	Mike Predcko "8051 Microcontrollers programming and practice"
3.	John B. Peatman, "Design with PIC Microcontrollers " Pearson Education Asia. LPE
4.	Microchip PIC 16F8XX family Microcontrollers Data sheet

Class, Part & Semester	**:**	**T. Y. B.Tech (Electronics and Telecommunication Engineering) Part II, Semester IV**					
Course Title	**:**	**Signals and Systems**			***Course Code*:**	**:**	**ETE314**
Teaching Scheme (Hours)	**:**	Lecture :	03Hrs/week		***Total Credits***	**:**	03
		Tutorial :	-- Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites	**:**	----					
Course Domain	**:**	Program Core					

Course Rationale: In typical applications of science and engineering, we have to process signals, using systems. The applications may vary from communication systems to control systems, but the basic analysis and design tools can be common. In this course, we are going to study all the fundamental mathematical signal processing tools like convolution, Fourier analysis, Laplace and Z transform. Main aim of the course is to study the use of these said tools in the analysis of linear time-invariant (LTI) systems. This course is fundamental course in the field of Signal Processing. This course builds concrete base for advanced courses like Digital Signal Processing, Audio and Speech Signal Processing, Image processing, Biomedical signal processing etc.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Explain classification of continuous and discrete time signals and systems	1.	Differentiate between different types of signals.
2.	Demonstrate Analysis and Characterization of the CT and DT systems through Time domain method.	2.	Identify type of Systems.
3.	Discuss Spectral analysis of CT periodic and aperiodic signals using CT Fourier methods.	3.	Analyze LTI systems in time domain.
4.	Explain Characterization of the CT systems through Laplace Transform and Fourier Transform.	4.	Apply Fourier techniques to transform the signals in frequency domain.
5	Explain Analysis and Characterization of the DT systems through Z Transform.	5	Analyze LTI systems using Laplace transform and Z- transforms.
6.		**6.**	Demonstrate signals and interdependencies of time and frequency domain parameters.

Curriculum Content	**Hours**
UNIT.1 Introduction to Signals Signals, Continuous and discrete time signals, Classification of Signals , Periodic aperiodic, even & odd energy and power signals, deterministic and random signals, complex exponential and sinusoidal signals , periodicity properties of discrete time signals, complex exponential, unit impulse, unit step, impulse functions, transformation of independent variable.	05
UNIT.2 Systems and Time domain analysis Properties of systems: Linearity, Causality, Time invariance, Stability, Invertability. Time domain analysis of LTI systems: System modeling, Solution of Differential equation with	08

initial conditions, Zero state response and Zero input response, representation of LTI system by impulse response (continuous and discrete Convolution), Identifying properties of system from impulse	
UNIT.3 Frequency domain Analysis of systems Fourier series representation of continuous time and discrete time periodic signals (Exponential), properties of continuous time and discrete time Fourier series. Continuous time and discrete time Fourier Transform, properties of the CT and DT Fourier Transform, Characterization using differential and difference equation, Parseval's relation, convolution in time and frequency domains, applications of Fourier transform.	08
UNIT.4 Sampling Theorem Representation of continuous time signals by its sample, Sampling theorem, aliasing effect, antialiasing , methods reconstruction of a Signal from its samples, Interpolation techniques, discrete time processing of continuous time signals, sampling of band pass signals.	03
UNIT.5 Laplace Transform Introduction, pole-zero plot, ROC, Properties of Laplace Transform, Inverse Laplace transform using partial fraction method, transfer function of LTI-CT system, impulse response and transfer function, convolution and de-convolution using LT, stability in S domain, system realization of LTI system in S domain. Application: solution of electronics circuit, solution of differential equation.	08
UNIT.6 Z-Transform Basic principles of z-transform, z-transform definition, region of convergence, properties of ROC, Properties of z-transform, Poles and Zeros, inverse z-transform using residue Theorem, power Series expansion and partial fraction expansion, Computation of Impulse response & Transfer function using Z Transform, stability of LTI Systems, system realization of LTI system in Z domain. Applications: solution of difference equation.	07

Assignments: Based on the following activity

- The Numerical based Assignment work for practice.
- The Demonstration / validation of the different concepts from curriculum using MATLAB or SCILAB.
- Solution of the problems based on GATE examinations.

Suggested Text Books:

1.	Nagoor Kani, "Signals & Systems", Tata McGraw Hill
2.	Anand Kumar, "Signals & Systems", PHI

Suggested Reference Books:

1.	John G.Proakis and Dimitris G.Manolakis , "Digital Signal Processing, Principles, Algorithms and Applications" , 3rd editionn., PHI.
2.	AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, "Signals & Systems", Pearson Education, 1997.
3.	M.J.Roberts , "Signals and Systems Analysis using Transform method and MATLAB" , TMH 2003
4.	K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
5.	Michael J. Roberts "Fundamentals of signals & systems", Tata McGraw Hill, 2007

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Computer Networks**			***Course Code*:**	**:**	ETE315
Teaching Scheme (Hours)	**:**	Lecture :	3 Hrs/week		***Total Credits***	**:**	04
		Practical :	2 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE 214, ETE 222					
Course Domain	**:**	Program Core					

Course Rationale: The course covers fundamental concepts of computer networks. This course will introduce basics of networking from reference models (OSI and TCP), network categories, topologies and various transmissions medium. It includes all the protocols at data link and network layer. Introduction to IEEE standards and different connecting devices.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Introduce the student with fundamental concept of computer networking	**1.**	Explain and Compare OSI and TCP/IP reference models
2.	Introduce network categories, topologies and various transmissions medium.	**2.**	Discuss different guided and unguided transmission media and switching techniques
3.	Explain Working of Protocols at Data link layer	**3.**	Discuss error detection and correction mechanism for data link layer
4.	Introduce different addressing mechanism	**4.**	Explain multiple access protocols and Data link control protocols
5	Explain connecting devices respect to OSI model.	**5**	Illustrate IEEE standards and connecting devices
6.		**6.**	Explain congestion control, traffic shaping and protocols at network layer

Curriculum Content	**Hours**
UNIT I: Introduction to Computer Networks Introduction to Computer Networks, components, data representation, data flow: simplex, half duplex, full duplex, networks, Network topology: Mesh, Star, Bus, Ring, Network Categories: LAN, MAN, WAN, internet, Network Models: OSI model, TCP-IP protocol suite, Comparison of OSI and TCP-IP model, types of addressing.	8
UNIT II: Physical Layer Types of Guided transmission media, Types of Unguided transmission media, switching - circuit switched networks, datagram networks, virtual circuit networks. Structure of switch.	5

UNIT.III Data Link Layer Error detection and correction: types of errors, Block coding : error detection and error correction, Linear Block Codes Hamming code, Cyclic Redundancy check ,Checksum	6
UNIT.IV Data link control and Medium Access Control Sublayer Framing, flow control and error control DLL protocols: Noiseless channels and noisy channels, sliding window protocols HDLC point to point protocol Channel allocation, multiple access protocols: random access, controlled access, channelization.	8
UNIT.V Wired and Wireless LANS IEEE Standards, Ethernet, wireless LAN IEEE 802.11, addressing mechanism, hidden station and exposed station problem, Bluetooth, zigbee, wifi, Wi-max, Connecting devices.	5
UNIT.VI Network Layer and Security Network layer services, Packet switching, performance, congestion control algorithms, IPv4 address, IPv6 address, Transition from IPv4 to IPv6, Routing Protocols (RIP, OSPF, BGP), QoS. **Network Security:** Authentication, Autherization accounting (AAA), Multifactor authentication Virtual private Network(VPN) Remote VPN, IPSEC VPN/ Tunnel, Remote browser VPN	7

Assignments: Based on the following activity

Based on the syllabus content students have to complete any one of the following activity

1) simulation based small project work
2) case study work
3) site visit
4) solve technical quiz
5) Solve home assignments

Suggested Text Books:	
1.	Behrouz Forouzan, "Data Communications and Networking", Fourth Edition, TMH
2.	Andrew S. Tanenbaum, "Computer Networks",Fourth Edition, PHI Publications
3.	W. Stallings, "Data and Computer Communications", Sixth Edition, PHI Publications
Suggested Reference Books:	
1.	Leon Couch, "Digital & Analog Communication Systems", MacMillan,

Class, Part& Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Power Electronics Laboratory**			***Course Code*:**	**:**	ETE311L
Teaching Scheme (Hours)	**:**	Practical :	02 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE/IOE= NA	EPE= 50	Total= 50	***Duration of EPE***	**:**	03 Hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	NA					
Course Domain	**:**	Program Core					

Course Rationale: In this laboratory course students can learn practical knowledge about power electronics. Experiments can be done on kits and may also on the simulation tool.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Explain the Difference between power devices and low power devices.	**1.**	Describe structure and working of power devices.
2.	Explain internal mechanism, limitations of the different power devices.	**2.**	Analyze triggering methods, Commutation methods and protection circuits used for SCR.
3.	Analyze configurations of controlled rectifier circuit.	**3.**	Calculate different parameters of controlled rectifier.
4.	Analyze chopper circuits and its voltage control methods.	**4.**	Calculate different parameters of chopper circuit.
5	Explain different Inverter Circuits.	**5.**	Describe different inverters and industrial application of power devices.
6.	Explain different application of power electronics in industry.	**6.**	Demonstrate and validate power electronics circuits in the laboratory.

Sr. No.	***List of Experiments***
1.	VI Characteristics of SCR.
2.	Single phase Half wave controlled rectifier.
3.	Single phase full wave controlled rectifier.
4.	Single phase Bridge Full controlled rectifier.
5.	SCR Triggering Circuits.

6.	SCR Commutation Circuits.
7.	3 Phase controlled rectifier.
8.	Cyclo-converter circuit
9.	Step down chopper.
10.	Step up chopper.
11.	Series inverter.
12.	Parallel inverter.
13.	Bridge inverter.
General Instructions: Minimum eight experiments should be conducted based on above list.	
Suggested Text Books/ Reference Books/Manual	
1.	P.C. Sen, "Power Electronics", 1st Edition, Tata McGraw Hill.
2.	M.D. Singh, K.B. Khanchandani, "Power Electronics", 2nd Edition, Tata- McGraw Hill
3.	
4.	

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	Electromagnetic Fields Tutorial			***Course Code*:**	**:**	ETE 312T
Teaching Scheme (Hours)	**:**	Tutorial:	01 Hrs./week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IOE=50	EPE/EOE= NIL	Total=50	***Duration of EPE***	**:**	Nil
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE211, ETE212, ETE213					
Course Domain	**:**	Core					

Course Rationale:

To acquaint students with the electromagnetic fundamentals underlying the operation of devices and components used in communication and transmission systems. The emphasis is on the physical concepts of fields and waves and their applications in engineering problems. To provide in depth knowledge of fields and waves and to serve as prerequisite for advanced courses.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Introduce vector analysis related to electromagnetic vector fields.	**1.**	Understand the basic mathematical concepts of vectors and their physical significance related to electromagnetic vector fields.
2.	Define and derive different laws in Electrostatic fields.	**2.**	Illustrate the physical concepts of static electric fields.
3.	Define and derive different laws in Electromagnetic fields.	**3.**	Describe the physical concepts of static magnetic fields.
4.	Explain Maxwell's equations and their significance	**4.**	Apply the maxwell equations to solve problems in electromagnetic field theory.
5	identify, formulate and solve electromagnetic waves propagation problems	**5.**	Analyze the propagation of wave in different media
6.	Introduce transmission line and its behavior	**6.**	Determine the various parameters of transmission lines

List of Tutorials	
Sr. No.	Tutorial
1.	Examples on dot product, cross product and coordinate systems
2.	Examples on curl, divergence and gradient
3.	Examples on Coulomb's Law, Electric Field, Electric Flux Density, Potential
4.	Gauss Law and application
5.	Boundary Conditions for Electrostatic Field
6.	Examples on Biot-Savart Law, Ampere's Circuital Law and Application
7.	Boundary Conditions for Magnetic Field.
8.	Maxwell's Equations in point and integral form, Maxwell's equation for time varying fields
9.	Wave Propagation, Poynting Theorem and Power Flow, Skin Depth, Phase and Group Velocity
10.	Transmission Line Parameters, Reflection Coefficient, VSWR
11.	Any other tutorial based on above syllabus.

General Instructions:

1. Minimum eight tutorials should be conducted based on above list
2. Students must be encouraged to understand underlying principles as well as to solve engineering mathematical problems in assignment and tutorials.

Suggested Text Books/ Reference Books/Manual	
1.	William Hayt, "Engineering Electromagnetics", Mc Graw Hill.
2.	R.K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill India,
3.	Matthew. N.O. Sadiku, "Elements of Electromagnetics", Oxford University Press
4.	E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India
5.	K.D. Prasad, "Antenna & Wave Propagation" Satya Prakashan
6.	Griffiths David J, "Introduction to Electrodynamics", Pearson Education
7.	N. Narayana Rao, "Elements of Engineering Electromagnetics", Prentice Hall

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Microcontrollers Laboratory**			***Course Code*:**	**:**	ETE313L
Teaching Scheme (Hours)	**:**	Practical :	02 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE/IOE= 00	EPE =50	Total= 50	***Duration of EPE***	**:**	03
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE- 214, ETE-215					
Course Domain	**:**	Program Core					

Course Rationale:

This course deals with the study of architecture, device interfacing, assembly and C language programming for MCS-51, PIC microcontrollers. After learning this course students will be able to develop microcontroller based systems.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Discuss the fundamentals of microprocessors and microcontrollers	1.	Compare between microprocessors and microcontrollers.
2.	Explain the architecture of MCS 51 family	2.	Describe the architectural features of 8051 microcontroller.
3.	Illustrate the assembly language instructions and write assembly language programs	3.	Develop programs in assembly for 8051 microcontroller
4.	Illustrate C language programming for 8051 microcontroller	4.	Develop programs in C language for 8051 microcontroller
5	Describe interfacing and device programming	5.	Interface the devices to microcontroller and write program to control the devices
6.	Discuss the architecture and programming for PIC microcontrollers.	6.	Describe architecture of PIC microcontrollers and develop programs.

List of Experiments

Sr. No.	**Practical List**
1.	Bit handling operations
2.	Serial communication using assembly and embedded C language
3.	Programming 7 segment displays using assembly and embedded C language
4.	Programming LCD displays using assembly and embedded C language

5.	Programming DC motor using assembly and embedded C language
6.	Programming geared motor using assembly and embedded C language
7.	Programming stepper motor using assembly and embedded C language
8.	Traffic light control system using assembly and embedded C language
9.	Programming timer and counter using assembly and embedded C language
10.	Relay interfacing and programming in assembly and embedded C
11.	Buzzer interfacing and programming in assembly and embedded C
12.	Programming ADC/ DAC using assembly and C language
General Instructions: Assembly and C language programming should be practiced in laboratory	
Suggested Text Books/ Reference Books/Manual	
1.	Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow
2.	Intel or Atmel MCS 51 Family Microcontrollers Data Sheets
3.	Mike Predcko "8051 Microcontrollers programming and practice"
4.	Microchip PIC 16X family Microcontrollers Data sheets

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Computer Networks**			***Course Code*:**	**:**	ETE 315L
Teaching Scheme (Hours)	**:**	Practical :	2 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE/IOE= Nil	EOE=50	Total=50	***Duration of EOE***	**:**	3 Hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE 214, ETE 222					
Course Domain	**:**	Program Core					

Course Rationale: The course covers fundamental concepts of computer networks. This course will introduce basics of networking from reference models (OSI and TCP), network categories, topologies and various transmissions medium. It includes all the protocols at data link and network layer. Introduction to IEEE standards and different connecting devices.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Introduce the student with fundamental concept of computer networking	**1.**	Explain and Compare OSI and TCP/IP reference models
2.	Introduce network categories, topologies and various transmissions medium.	**2.**	Discuss different guided and unguided transmission media and explain switching techniques
3.	Explain Working of Protocols at Data link layer	**3.**	Discuss error detection and correction mechanism for data link layer
4.	Introduce different addressing mechanism	**4.**	Explain multiple access protocols and Data link control protocols
5	Explain Working of connecting devices respect to OSI model	**5.**	Illustrate IEEE standards and connecting devices
6.		**6.**	Explain congestion control, traffic problems and protocols at network layer

List of Experiments

Sr. No.	
1.	Study of Half duplex and full duplex communication by using coaxial and twisted pair cable.
2.	Study of Half duplex, Full duplex file transfer between two PC by using RS – 232.

3.	Implementation of Local area network in packet tracer(simulation)
4.	Implementation of Mesh, Bus, Star, Ring topology in packet tracer (Simulation)
5.	Demonstration of bit stuffing.
6.	Demonstration of Stop and wait protocol.
7.	Demonstration of Go Back N protocol.
8.	Demonstration of Selective repeat protocol.
9.	Demonstration of error detection method using Hamming code method
10.	Demonstration of error detection method using CRC method
11.	Shortest path routing algorithm (By simulation)
12.	Study of QOS by using NETFLOW and Liveaction Softwares.
General Instructions: Minimum 8 experiments should be conducted based on above experiment list or based on syllabus	
Suggested Text Books/ Reference Books/Manual	
1.	Behrouz Forouzan, "Data Communications and Networking", Fourth Edition, TMH
2.	Andrew S. Tanenbaum, "Computer Networks",Fourth Edition, PHI Publications
3.	W. Stallings, "Data and Computer Communications", Sixth Edition, PHI Publications

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Advanced programming techniques**			***Course Code*:**	**:**	ETE316L
Teaching Scheme (Hours)	**:**	Lecture :	03 Hrs/week		***Total Credits***	**:**	04
		Practical :	02 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=NIL	SEE = NIL	Grand Total=NIL	***Duration of SEE***	**:**	---
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE-215, ETE-225					
Course Domain	**:**	Core					

Course Rationale:
This course deals with programming using Python language.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Illustrate Python installation	**1.**	Demonstrate Python installation
2.	Discuss numeric and string operations	**2.**	Experiment on numeric types and strings
3.	Illustrate lists and dictionaries	**3.**	Demonstrate lists and dictionaries operations
4.	Explain tuples and file operations	**4.**	Demonstrate tuples and file operations
5.	Explain statements and functions	**5.**	Use statements and functions
6.	Discuss modules and packages	**6.**	Experiment modules and packages

Curriculum Content	**Hours**
Unit I- Introduction and installation of python Introduction and advantages, Python versions, installation on different OS like Windows MacOS, Ubuntu Linux, OpenIDLE , Interactive window, python shell, editor, operators , variables in python,	6
Unit II- Numeric types and strings Numeric types: Basics, literals, variables, expressions, numeric display formats, comparison, division, integer precision, complex numbers, Hex-octal-binary numbers and conversions, decimal, fractional, sets, Booleans. **Strings:** Basics, string literals, basic string operations- indexing and slicing, string methods, string formatting expressions	7
Unit III- Lists and dictionaries Basics of list, list operations, list iterations, dictionaries and operations in dictionaries	7
Unit IV- Tuples and file operations Tuples, File operations	6
Unit V- Statements and functions If, if-else, while loop, for loop, pass, continue, break, loop else, loop coding techniques. **Functions:** Coding functions, calls, polymorphism, recursive functions	7
UNIT VI- Modules and packages Modules, search path, module creation, module uses, module namespaces, module reloading, **Package:** package basics, package imports, search path settings	6

Suggested list of Assignments:

Students should complete software based micro project for IPE work

General Instructions:

A group of maximum TWO students is formed among practical batch. Students have to complete small project using Python. Students have to submit report to department in given format. Students have to demonstrate the project and present details using PPT.

Suggested Text Books:

1.	Mark Lutz, " Learning Python ", O'Reilly media
2.	Miles, " Begin to code with Python", Pearson
3.	Anurag Gupta, G. Biswas, "Python Programming", TMH

Suggested Reference Books:

1.	Qingkai Kong, Timmy Siauw, Bayen , " Python programming and numerical methods- A guide for engineers and scientists", Elsevier

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Advanced Programming Techniques laboratory**			***Course Code*:**	**:**	ETE316L
Teaching Scheme (Hours)	**:**	Practical :	02 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE/IOE= 50	EPE = NIL	Total= 50	***Duration of IPE***	**:**	02
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE-215, ETE-225					
Course Domain	**:**	Core					

Course Rationale:
This course deals with programming using Python language.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Illustrate Python installation	1.	Demonstrate Python installation
2.	Discuss numeric and string operations	2.	Experiment on numeric types and strings
3.	Illustrate lists and dictionaries	3.	Demonstrate lists and dictionaries operations
4.	Explain tuples and file operations	4.	Demonstrate tuples and file operations
5	Explain statements and functions	5.	Use statements and functions
6.	Discuss modules and packages	6.	Experiment modules and packages

List of Experiments

Sr. No.	**Practical List**
1.	Write a program to demonstrate basic data types in Python
2.	Write a program to perform different arithmetic operations
3.	Write a program to create, concatenate and print a string and accessing substring from a given string.
4.	Write a python script to print the current date
5.	Write a python program to create, append and remove lists in python.
6.	Write a program to check odd /even number
7.	Write a program to demonstrate list and tupple in python
8.	Write a program to demonstrate working with dictionaries in python
9.	Write a python program to find largest of three numbers

10.	Write a python program to convert temperature to and from Celsius to fahrenheit
11.	Write a python program to construct the given pattern using nested for loop
12.	Write a python program to print prim numbers less than 50
13.	Write a python program to find factorial of a number using recursion
14.	Write a python program to define a module to find Fibonacci Numbers and import the module to another program
15.	Write a python program to define a module and import a specific function in that module to another program
16.	Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order
17.	Write a Python class to convert an integer to a roman numeral.
18.	Write a program to find area of given structure like triangle, circle, equilateral triangle etc.

General Instructions:
A group of maximum TWO students is required to form among practical batch. Students have to complete small project using Python. Students have to submit report to department in given format. Students have to demonstrate the project and present details using PPT.

Suggested Text Books/ Reference Books/Manual

1.	Mark Lutz, " Learning Python ", O'Reilly media
2.	Miles, " Begin to code with Python", Pearson
3.	Anurag Gupta, G. Biswas, "Python Programming", TMH
4.	Qingkai Kong, Timmy Siauw, Bayen , " Python programming and numerical methods- A guide for engineers and scientists", Elsevier

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, V**					
Course Title	**:**	**Internship 1**			***Course Code*:**	**:**	ETE317
Teaching Scheme (Hours)	**:**	**4 week internship**			***Total Credits***	**:**	02
Evaluation Scheme (Marks)	**:**	IOE= 50	EPE = NIL	Total= 50	***Duration of IOE***	**:**	02
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	NIL					
Course Domain	**:**	Core					

Course Rationale:
Students will be familiar with industrial environment. Students have to work for 4 weeks in industry as intern after completion of 4th semester.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Describe benefits of working in the industrial working environment	**1.**	Know the industrial working environment
2.	Guide to utilize the technical resources	**2.**	Utilize the technical resources
3.	Guide on PPT and interview skills	**3.**	Write technical documents and appear for interview / power point presentations/ technical discussions
4.	Develop attitude of a team player and ability of life-long learning	**4.**	Develop attitude of a team player and ability of life-long learning
5	Develop professional skills required for employability	**5.**	Adapt and develop professional skills required for employability
6.	Motivate for entrepreneurship	**6.**	Motivation for entrepreneurship

General Instructions:
Students have to be familiar with industrial environment. After completion of 4th week students have to complete 4 weeks industrial training. Its evaluation will be conducted in 5th semester. Students have to submit the report in given format to department. Students have to make individual presentations explaining about the skills and experience they obtained in industry.

Suggested Text Books/ Reference Books/Manual

1.	Website / manual etc of industry in which students worked as interns.

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III,V**				
Course Title	**:**	Research Methodology		***Course Code*:**	**:**	RM 311
Teaching Scheme (Hours)	**:**	Lecture : 02 Hrs/week Tutorial : -- Hrs/week		***Total Credits***	**:**	--
Evaluation Scheme (Marks)	**:**	CIE=100	SEE = --- Grand Total=100	***Duration of SEE***	**:**	---
Revision:	**:**	Fourth		***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**					
Course Domain	**:**	**Research Methodology**				

Course Rationale: Introduction of scientific methods of research and concepts thereof to students as they will be doing projects in coming semesters.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	To develop understanding of the basic framework of research process.	**1.**	Demonstrate knowledge of research processes (reading, evaluating, and developing);
2.	To develop an understanding of various research designs and techniques.	**2.**	Perform literature reviews using print and online databases;
3.	To identify various sources of information for literature review and data collection.	**3.**	Identify, explain, compare, and prepare the key elements of a research proposal/report;
4.	To develop an understanding of the ethical dimensions of conducting applied research.	**4.**	Compare and contrast quantitative and qualitative research
5.	Appreciate the components of scholarly writing and evaluate its quality	**5.**	Describe sampling methods, measurement scales and instruments, and appropriate uses of each;

Curriculum Content	**Hours**
UNIT 1 Introduction to Research Methodology Meaning and significance of research. Objective of Research, Types of Research, Research Methods and Methodology, Scientific method of Research, Research Process	**03**
Unit II **Research Formulation** – Defining and formulating the research problem -Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem –Literature review – Primary and econdary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Summarizing a Technical Paper - summary template Online tools - Google, CiteSeer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Searching patents	**06**

Unit III **Research Design** Research design, sampling design and scaling techniques – Research design – Basic Principles- Need of research design –– Features of good design – important concepts relating to research design, basic principles of experimental designs, implications of sample design, steps in sample design, criteria of selecting sampling procedure, characteristics of good sampling design, different types of sample design. Scaling techniques: measurement scales, sources of error, technique of developing measurement tool, important scaling techniques, scale construction techniques.	**06**
Unit IV **Data Collection and analysis:-** Observation and Collection of primary and secondary data – Methods of data collection, processing operations, types of analysis, statistics in research, measures of central tendency, measures of dispersion, measures of asymmetry, measures of relationships, simple regression analysis, multiple correlation and regression, partial correlation.	**03**
Unit V **Reporting and thesis writing** – Structure and components of scientific reports - Types of report –Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation –Practice – Making presentation – Use of visual aids -Importance of effective communication - Documentation and presentation tools: LATEX	**03**
Unit VI **Types of technical papers** - Journal papers, Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, Organization and flow of thesis/ Project report, Research proposal: preparation, budgeting, presentation, funding agencies for engineering research, Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights	**05**

Suggested list of Tutorials and Assignments: Assignments

1. **Prepare a research problem tree**
2. **Discuss components of research paper**
3. **Discuss methods of data collection**

Suggested Text Books:	
1.	C.R.Kothari "Research Methodology" New Age International (P) Ltd.
2.	D.K.Bhattachary "Research Methodology";; Excel Books
3.	Goodday &Hack "Research Methodology"
Suggested Reference Books:	
1.	C.R.Kothari "Research Methodology" New Age International (P) Ltd.
2.	D.K.Bhattachary "Research Methodology";; Excel Books
3.	Goodday &Hack "Research Methodology"
4.	Hilary Glasman-Deal "Science Research Writing", Imperial College Press, London, UK

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**Digital Signal Processing**			***Course Code*:**	**:**	**ETE321**
Teaching Scheme	**:**	Lecture :	03 Hrs/week		***Total Credits***	**:**	04
		Practical:	02 Hrs/week				
Evaluation Scheme	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites	**:**	ETE 314					
Course Domain	**:**	Program Core					

Course Rationale: The course covers theory and methods for digital signal processing including basic principles, relationship between DTFT and DFT, Discrete Fourier transforms and z-transforms, computation of DFT & IDFT, FFT algorithms and its implementation, impulse response, finite and infinite impulse response, digital filter design and implementation, DSP applications in different fields.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Expalin DFT and its properties, IDFT, FFT algorithms, circular convolution, correlation.	**1.**	Calculate DFT, IDFT and convolution .
2.	Discuss different algorithms to find linear convolution, DFT and IDFT	**2.**	Apply different algorithms for linear convolution and DFT, IDFT.
3.	Analyze FIR filter design using different methods.	**3.**	Design FIR filters using different techniques.
4.	Analyze study FIR filter design using different methods.	**4.**	Design IIR filters using different methods
5	Explain adaptive signal processing and adaptive filters.	**5**	Describe adaptive signal processing and adaptive filter models.
6.	Study applications of Digital Signal Processing in different fields.	**6.**	Illustrate the role of DSP in different areas

Curriculum Content	**Hours**
Unit I Introduction to DSP System DSP, Basic elements of DSP, Advantages of Digital Signal Processing, Comparison between Digital and Analog Signal Processing, Applications.	06
Unit II Discrete Fourier Transform (DFT) DFT, Properties of DFT, Circular Convolution and Circular Co-relation using DFT and IDFT , Linear Convolution using Circular Convolution, Fast Convolution. Overlap Save and Overlap add algorithm. Relationship between DTFT, DFT and ZT. FFT Algorithms – Radix 2: DIT-FFT and Radix 2: DIF.- FFT	06

Unit III FIR Filter Design FIR Filter, Characteristics of FIR Filters, Properties of FIR Filters, FIR filter design using Windowing Technique :Rectangular, Hamming , Kaiser Window, FIR filter Design using Frequency Sampling Technique, FIR filter realization- Direct Form I and Direct Form II, Cascade and Parallel form realization	06
Unit IV IIR Filter Design Introduction to IIR Filters, IIR Filter Design using Impulse Invariant method and Bilinear Transformation method, Butterworth Approximation, Chebyshev filters design, IIR filter realization- Direct form I and Direct form II, Cascade and parallel realization.	07
Unit V Adaptive Filter Introduction to adaptive filters, Applications of adaptive filters, Adaptive direct form FIR filter and its use, Adaptive algorithm: Least Mean Square (LMS) algorithm.	07
Unit VI Application of Digital Signal Processing Mobile communication, Bio-medical Engineering, image processing, Acoustic Noise Canceller, Dynamic range compression, LPC analysis and synthesis, SSB modulation, Radar tracking & implementation ,Study of architecture of TMS 320C6XXX processor	07

Suggested list of Assignments:

Based on the syllabus content students have to complete any one of the following activity

1) simulation based small project work
2) case study work
3) solve technical quiz
4) Solve home assignments

Suggested Text Books:

1.	John G Prokis , "Digital Signal Processing ,Principles, Algorithms and Application", PHI
2.	S.K.Mitra, "Digital Signal Processing", TMH
3.	Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation using DSP, Microprocessors with examples from TMS 320C6XXX", Thomas Publication

Suggested Reference Books:

1.	A.V.Oppenheins and R.W. Schalfer , "Discrete Time Signal Processing", PHI
2.	S. Salivahanam, A Vallavaraj, C. Guanapriya, "Digital Signal Processing",TMH
3.	Raghuveer M. Rao and Ajit S. Boperdikar , "Wavelet Transforms – Introduction to theory and applications", Pearson Education.
4.	Smith, "Scientist and Engg. Guide on Digital Signal Processing"

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**Digital Communication**			***Course Code*:**	**:**	**ETE322**
Teaching Scheme (Hours)	**:**	Lecture :	03 Hrs/week		***Total Credits***	**:**	04
		Practical:	02 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites	:	ETE222, ETE214, ETE 314					
Course Domain	:	Program Core					

Course Rationale: This course deals with analysis of statistics of probability theory, random process, information theory, source coding, digital communication blocks, modulation techniques and spread spectrum techniques.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	To understand the building blocks of digital communication system.	**1.**	Differentiate analog and digital communication system.
2.	To prepare mathematical background for communication signal analysis	**2.**	Compare different source encoding techniques
3.	To understand and analyze the signal processing in a digital communication system.	**3.**	Analyze baseband and passband communication system.
4.	To analyze error performance of a digital communication system in presence of noise.	**4.**	Apply channel encoding technique to detect and correct errors in digital communication.
5.	To understand concept of spread spectrum communication system	**5.**	Discuss spread spectrum modulation and demodulation techniques.
6.		**6.**	Observe and validate results of different digital communication system blocks/elements

Curriculum Content	**Hours**
Unit I Waveform Coding Sampling theorem and recovery of original signal, Quantization – Uniform & Non uniform , PCM, DPCM, Cumulative error in DPCM, minimization of error in DPCM, need of predictors, implementation of predictors at transmitter, Bandwidth requirement in each system, Delta Modulation , limitations of DM, ADM, comparison between DM, PCM and ADM.	07
Unit II Digital Carrier Modulation and Detection Schemes ASK, PSK, FSK, DPSK, QPSK, M-ary PSK, QAM, *carrier recovery circuits:* squaring loop	08

Unit III Probability and Information Theory Probability, joint & conditional probability, statistical average, continuous random variables – PDF and statistical averages, random processes- stationary, time average & ergodicity, power spectral density of stationary random processes, *Information Theory:* Unit of information, entropy, rate of information, mutual information, channel capacity, Shannon‟s theorem, Shannon Hartley theorem, Shannon fano coding, Huffman coding, Trade-off between bandwidth and S/N ratio.	07
Unit IV Baseband Data Communication Introduction, Baseband pulse shaping, Shaping of transmitted spectrum, Baseband signal receiver, Integrate and Dump filter, optimum filter, matched filter transfer function, correlate filter transfer function, Inter symbol interference, Eye Diagrams, Synchronization: bit, symbol and frame.	07
Unit V Error Control Coding Types of error & codes, Error control coding, Linear Block codes: encoder, decoder, implementation of Linear Block codes. Cyclic codes: encoder, syndrome calculator, decoder. Convolutional codes: encoding and sequential decoding and viterbi decoding.	07
Unit VI Spread spectrum techniques Generation and characteristics of PN sequence, Direct sequence spread spectrum, frequency hopping spread spectrum, applications of spread spectrum.	03

Suggested list of Assignments: " Based on the syllabus content students have to complete any one of the following activity"

1) simulation based small project work
2) case study work
3) site visit
4) solve technical quiz
5) Solve home assignments

General Instructions: Final Exam should contain at least 40 % problems.

Suggested Text Books:

1.	Taub & Schling, “Principles of communication system” TMH
2.	Apurba Das, „Digital Communication: Principles and system modeling‟ Springer Publications

Suggested Reference Books:

1.	John G Proakis, “Digital Communications”, TMH Publication
2.	K. Sam Shanmugan, “Digital & Analog Communication systems” Wiley Publication
3.	B.P. Lathi, “ Modern Digital & Analog Communication System” Oxford University Press
4.	Siman Haykin, “Digital Communication “, Wiley Publication
5.	Bernard Scalar, “Digital Communication Fundamentals & Applications” PHI
6.	Todd Moon, “Error Correcting coding‟, Willy Publication
7.	Singh & Sapre , “Communication System Analog & Digital “, TMH.

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	Antenna & Wave Propagation			***Course Code*:**	**:**	ETE323
Teaching Scheme (Hours)	**:**	Lecture:	03 Hrs./week		***Total Credits***	**:**	04
		Practical:	02 Hrs./week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 Hrs.
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE312					
Course Domain	**:**	Program Core					

Course Rationale: Antennas are an indispensable part of wireless communication systems. Wave propagation effects play a crucial role in wireless systems, although they are often overlooked. In practice, designing a working system such as mobile phone networks, Wi-Fi, RFID, Embedded systems, Satellite communication, Radars, GPS etc. requires a good understanding of these components. This course teaches the fundamentals of antenna and wave propagation and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concepts, various types of antennas, arrays, and wave propagation effects.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Explain the basic terminology and concepts of Antennas.	**1.**	Describe the radiation mechanism of antenna and calculate antenna parameters
2.	Estimate the electric and magnetic fields from various wire antennas.	**2.**	Identify and analyze various wire antennas with applications.
3.	Compare and contrast the working of patch antenna and their specialties	**3.**	Design and analyze Microstrip Patch Antenna
4.	Discuss working of antenna arrays	**4.**	Analyze array of antennas and their applications
5	Discuss working of aperture antennas	**5**	Design and analyze aperture antennas for different applications
6.	Explain wave propagation and modes	**6.**	Evaluate effect of wave propagation on communication systems

Curriculum Content	**Hours**
Unit I Antennas and Fundamental Parameters Introduction, Radiation Mechanism, Radiation Pattern, Basic Antenna Parameters: Beam Width, Beam Area, Directivity, Radiation Intensity, Beam Efficiency, Gain, Radiation Resistance, Front to Back Ratio, Antenna Aperture, Effective Height, Bandwidth, Reflection Coefficient , Polarization, The Radio Communication Link: Friis Transmission Equation.	08
Unit II Wire antennas Infinitesimal Dipole, Small Dipole, Half-Wavelength Dipole, Ground Effect, Monopole Antenna, Folded Dipole, Loop Antenna, Helical Antenna.	08

Unit III Microstrip Patch Antenna Introduction, Regular Shape MSAs (Rectangular, Circular, Equilateral, Triangular), Feeding Techniques, Transmission Line Model, Design of Rectangular MSA, Mobile Phone Antenna	05
Unit IV Antenna Arrays Linear arrays, Array of Two Isotropic Point Sources, Linear Arrays of N Elements, Broadside and End-fire Array, Principle of Pattern Multiplication, Yagi Uda Antenna, Log Periodic Antenna.	07
Unit V Aperture Antennas Horn Antennas: E-Plane Sectoral Horn, H-Plane Sectoral Horn, Pyramidal Horn, Conical Horn, Reflector Antennas: Introduction, Parabolic Reflector, Parabolic Reflector Feeding Techniques.	04
Unit VI Wave Propagation Structure of Atmosphere, Modes of Wave Propagation: Ground Wave, Sky Wave Space Wave Propagation, Virtual Height, Maximum Usable Frequency, Critical Frequency, Angle of Incidence, Lowest Usable Frequency, Skip Distance.	07

Suggested list of Assignments:

Based on the syllabus content students have to complete any one of the following activities:

1. Simulation based small project work
2. Case study work
3. Site visit
4. Solve technical quiz
5. Solve home assignments

Suggested Text Books:

1.	John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill.
2.	C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley.

Suggested Reference Books:

1.	Girish Kumar, K.P. Ray, "Broadband Microstrip Antennas", Artech House Publishers
2.	K. D. Prasad, "Antenna and Wave Propagation", Satya Prakashan.
3.	G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education.
4.	E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**VLSI Design**			***Course Code*:**	**:**	ETE324
Teaching Scheme (Hours)	**:**	Lecture :	03 Hrs/week		***Total Credits***	**:**	04
		Practical :	02 Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites (if any)	**:**	ETE214, ETE215					
Course Domain	**:**	Program Core					

Course Rationale:
This course deals with understanding working of MOS transistors, MOS transistor based circuits, chip manufacturing and chip design, programming and prototyping.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Illustrate the construction, characteristics of MOS transistors.	1.	Describe the structure, working principle and characteristics of MOS devices
2.	Discuss CMOS IC manufacturing process	2.	Explain CMOS IC fabrication technology
3.	Illustrate Verilog and other HDLs	3.	Experiment using Verilog language and explain features of HDL
4.	Learn Hardware Description Language	4.	Develop Verilog code for different digital circuits
5.	Develop Verilog codes to design various digital circuits	5.	Describe construction and features of programmable logic devices
6.	Describe IC Design flow	6.	Explain the IC design flow

Curriculum Content	**Hours**
Unit I- MOS Devices Introduction to MOS Technology, I – V Characteristics of NMOS and PMOS, Transfer Characteristics Of CMOS Inverter, Detailed analysis of CMOS inverter, Logic realization using nMOS and CMOS circuits, effect of parasitic elements.	06
Unit II- CMOS IC Fabrication and Layout Basic CMOS Technology: Self aligned CMOS process, N well, P well, Twin tub, Layout of CMOS Inverter, CMOS Layout and Design rules. Silicon on Insulator technology	07
Unit III- Introduction to Verilog Abstraction levels, modules, port, declarations, registers, arrays, identifiers, parameters, arithmetic and logical operators, expressions, procedural statements, blocking and non-blocking statements, control statements, delays, memory modeling, VHDL V/s Verilog comparison	08

Unit IV- Circuit Design using Verilog Designing basic gates, combinational circuit, designing general purpose processor, datapath, ALU, encoder, decoder, comparator, adder, subtractor, multiplexer, de-multiplexer, tri-state drivers, PIPO, SIPO, sequential circuits	06
Unit V- Circuit Design Using CPLD & FPGA Introduction, study of architecture of CPLDs and FPGAs. Function block architecture, input/output Block and interconnect, switch matrix, FPGA fabric. Study of architecture of Xilinx 9500 series and Altera MAX 7000 series CPLD . Study of architecture of Xilinx Spartan 4000 architecture.	06
Unit VI- IC design flow Logic synthesis, floor-planning, synthesis, block level layout, IC level layout, latest trends in IC design	06

Suggested list of Assignments:

Based on the syllabus content students have to complete any one of the following activity

1) simulation based small project work
2) case study work
3) site visit
4) solve technical quiz
5) Solve home assignments

General Instructions:

In semester end examination for question paper setting minimum 40 % weightage should be given for programming.

Suggested Text Books:	
1.	N. Weste and K. Eshranghian, "Principles of CMOS VLSI Design", Addison Wesley
2.	Angsuman Sarkar, Swapnadip De, Ckandan Kumar Sarkar, "VLSI Design and EDA tools", Scitech
3.	Amar Mukharjee, "Introduction to nMOS and cMOS VLSI systems design", Prentice Hall
4.	Samir Palnitkar, "Verilog HDL, A guide to digital design and synthesis", Pearson
Suggested Reference Books:	
1.	Stephen Brown and Zvonko, " Vranesic, Fundamaentals of Digital Logic with VHDL design", Tata McGraw Hill
2.	BushnellAgrawal , "Essentials of Electronic Testing for digital memory and mixed signal VLSI circuits", Kulwar Academic Publisher

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	Control Systems			***Course Code*:**	**:**	ETE325
Teaching Scheme (Hours)	**:**	Lecture :	3 Hrs/week		***Total Credits***	**:**	03
		Tutorial :	-- Hrs/week				
Evaluation Scheme (Marks)	**:**	CIE=30 (20+10)	SEE = 70	Grand Total=100	***Duration of SEE***	**:**	3 hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE 211, ETE212					
Course Domain	**:**	Core					

Course Rationale: Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. This subject will develop the theory, concepts tools used in engineering disciplines such as mechanical, electrical, engineering. The knowledge acquired by the students will help them to design control system.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	To study mathematical modeling of physical system.	**1.**	Describe the basic principles, types of control systems and I/P –O/P relationship by using mathematical model and transfer function.
2.	To study and analyse time domain and frequency domain methods.	**2.**	Understand and analyze parameters of a feedback control system and its transient behavior.
3.	To study stability of linear control system using different methods.	**3.**	Evaluate the stability of a system by using different stability criteria.
4.		**4.**	Plot the Root locus and Nyquist plot, for a given control system for stability analysis.
5.		**5.**	Plot the Bode for a given control system for stability analysis.
6.		**6.**	Analyze performance of control system by using state space.

Curriculum Content	**Hours**
Unit I **System Modeling**: Introduction to control system, Types of control system, Laplace transform review, Transfer function of electrical, mechanical, thermal, hydraulic system, Electrical circuits analogs, Block dia. Representation and reduction, types of feedback systems, signal flow graph , Mason's gain rule, SFG .	06
Unit II **Time domain Response** Time domain Response of first and second order system, Types of standard inputs,	06

response with additional pole and zeros, steady state error for unity feedback system, static error constants and systems type, steady state error specifications, Concept of stability for linear systems, Absolute and relative stability, Routh stability criterion and its application in special cases.	
Unit III **Frequency Domain Techniques** Frequency domain specification, Correlation between time and Frequency domain specifications, Bode plot, Nyquist criterion, stability, gain margin, phase margin by Nyquist diagram and bode plot, Effect of gain variation and addition of poles and zeros on Bode plot	06
Unit IV **Modelling in Time domain** state-space representation, Applying the state- space representation, converting the transfer function to state- space, converting from state -space to transfer function.	08
Unit V **Root Locus Techniques** Definition of root locus, Rules for plotting root loci, Root contour, stability analysis using root locus, effect of addition of pole and zero.	07
Unit VI **Feedback control systems** Feedback control system characteristics, error analysis, P , PI, PD and PID Controllers. Digital control system, Introduction ,Transfer function of digital control system.	06

Suggested list of Assignments:
i)Problems based on above course
ii)Case study of matlab based simulation.

Suggested Text Books:

1.	"Control System Engineering", Norman S. Nise,John willey and Sons, 6th Edition, 2015.
2.	"Control System Engineering",I.J. Nagrath and M. Gopal,New age International publication, 5th Edition, 2014.
3.	"Automatic Control Systems",Kuo B.C.,Prentice-Hall of India Pvt.Ltd.New Delhi.6th edition.1991

Suggested Reference Books:

1.	"Modern Control Engineering", Katsuhiko Ogata,Prentice Hall of India Pvt Ltd, 5th edition.
2.	"Automatic Control System", Benjamin C. Kuo, Prentice Hall of India Pvt Ltd, Wiley publication, 9th edition
3.	"Control Systems-Principles and Design", M.Gopal, Tata McGraw-Hill Education Pvt. Ltd, 4th edition, 2014.
4.	"Control System Engineering",R.Anandanatarajan,P.Ramesh Babu,Second Edition,Scitech publications Pvt.(India)Ltd.2008

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**Digital Signal Processing Laboratory**			***Course Code*:**	**:**	**ETE 321L**
Teaching Scheme	**:**	Practical :	02Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme	**:**	IPE=50	EPE =Nil	Total=50	***Duration of EPE***	**:**	**03 hours**
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites	**:**	ETE 314					
Course Domain	**:**	Program Core					

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Expalin DFT and its properties, IDFT, FFT algorithms, circular convolution, correlation.	**1.**	Calculate DFT, IDFT and convolution .
2.	Discuss different algorithms to find linear convolution, DFT and IDFT	**2.**	Apply different algorithms for linear convolution and DFT, IDFT.
3.	Analyze FIR filter design using different methods.	**3.**	Design FIR filters using different techniques.
4.	Analyze study FIR filter design using different methods.	**4.**	Design IIR filters using different methods
5	Explain adaptive signal processing and adaptive filters.	**5.**	Describe adaptive signal processing and adaptive filter models.
6.	Study applications of Digital Signal Processing in different fields.	**6.**	Illustrate the role of DSP in different areas

List of Experiments	
Sr. No.	Minimum 8 experiments should be carried out by using Matlab based on above syllabus
1.	Generation of Discrete Time sequence
2.	Convolution and correlation of signals.
3.	Computation of DFT & IDFT using standard formula
4.	Computation of circular convolution
5.	Computation of FFT & IFFT
6.	Design of FIR filter using windowing method
7.	Design of FIR filter using frequency sampling method.
8.	Design of IIR filter using impulse invariance method .
9.	Design of IIR filter using bilinear transformation method
10.	Study of DSP Processor TMS320C67XX .
Suggested Text Books/ Reference Books/Manual	
1.	Institute's Laboratory Course Manual

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**Digital Communication Laboratory**			***Course Code*:**	**:**	**ETE322**
Teaching Scheme (Hours)	**:**	Practical :	02 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE=Nil IOE=NA	EPE= 50 EOE= NA	Total= 50	**Duration of EPE**	**:**	--
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites	**:**	ETE222L					
Course Domain	**:**	Core					

Course Rationale: This course deals with experimental study of different modulation techniques, pulse coding techniques and spread spectrum techniques in digital communication systems*.*

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	To understand the building blocks of digital communication system	**1.**	Differentiate analog and digital communication system.
2.	To prepare mathematical background for communication signal analysis	**2.**	Compare different source encoding techniques
3.	To understand and analyze the signal processing in a digital communication system.	**3.**	Analyze baseband and passband communication system.
4.	To analyze error performance of a digital communication system in presence of noise.	**4.**	Apply channel encoding technique to detect and correct errors in digital communication.
5	To understand concept of spread spectrum communication system	**5.**	Discuss spread spectrum modulation and demodulation techniques.
6.		**6.**	Observe and validate results of different digital communication system blocks/elements

List of Experiments

Sr. No.	**Title**
1.	Experiment on ASK Modulation and Demodulation
2.	Experiment on FSK Modulation and Demodulation
3.	Experiment on PSK Modulation and Demodulation
4.	Experiment on QPSK Modulation and Demodulation

5.	Experiment on Delta Modulation and Demodulation
6.	Experiment on Adaptive Delta Modulation and Demodulation
7.	Experiment on TDM-PCM Modulation and Demodulation
8.	Experiment on DPCM Modulation and Demodulation
9.	Experiment on Eye pattern using oscilloscope
10.	Experiment on Hamming Code
11.	Experiment on DSSS Modulation and Demodulation
12.	Experiment on FHSS Modulation and Demodulation
General Instructions: Practical consists of minimum ten experiments from above list or based on theory and out of ten minimum two experiments should be based on Simulation tool.	
Suggested Text Books/ Reference Books/Manual	
1.	Apurba Das, 'Digital Communication: Principles and system modeling' Springer Publications
2.	Taub & Schling, "Principles of communication system" TMH

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	Antenna & Wave Propagation Laboratory			***Course Code*:**	**:**	ETE323L
Teaching Scheme (Hours)	**:**	Practical:	02 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE/IOE=Nil	EPE=50	Total=50	***Duration of EPE***	**:**	03 Hrs
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE312					
Course Domain	**:**	Program Core					

Course Rationale: Antennas are an indispensable part of wireless communication systems. Wave propagation effects play a crucial role in wireless systems, although they are often overlooked. In practice, designing a working system such as mobile phone networks, Wi-Fi, RFID, Embedded systems, Satellite communication, Radars, and GPS requires a good understanding of these components. This course teaches the fundamentals of antenna and propagation and shows the application in practical examples. The course covers the theory of radiation, fundamental antenna parameters and concepts, various types of antennas, arrays, and wave propagation effects.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Explain the basic terminology and concepts of Antennas.	**1.**	Describe the radiation mechanism of antenna and calculate antenna parameters
2.	Estimate the electric and magnetic fields from various wire antennas.	**2.**	Identify and analyze various wire antennas with applications.
3.	Compare and contrast the working of patch antenna and their specialties	**3.**	Design and analyze Microstrip Patch Antenna
4.	Discuss working of antenna arrays	**4.**	Analyze array of antennas and their applications
5	Discuss working of aperture antennas	**5.**	Design and analyze aperture antennas for different applications
6.	Explain wave propagation and modes	**6.**	Evaluate effect of wave propagation on communication systems

List of Experiments

Sr. No.	Name of Experiment
1.	Study of antenna trainer kit.

2.	Measurement of radiation pattern of Simple λ/2 Dipole Antenna.
3.	Study of monopole antenna
4.	Measurement of radiation pattern of folded Dipole Antenna
5.	Measurement of radiation pattern of Loop antenna.
6.	Study of Helical Antenna
7.	Measurement of radiation pattern of 3 element Yagi-UDA antenna
8.	Measurement of radiation pattern of 5 element Yagi-UDA antenna
9.	Measurement of radiation pattern of 7 element Yagi-UDA antenna
10.	Measurement of radiation pattern of Log Periodic Antenna
11.	Measurement of radiation pattern λ/2 Phase Array
12.	Study of broadside array antenna
13.	Study of end fire array antenna
14.	Any simulator based practical based on the above syllabus
General Instructions: Minimum 8 experiments should be conducted based on above experiment list**.**	
Suggested Text Books/ Reference Books/Manual	
1.	John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill.
2.	C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley.
3.	K. D. Prasad, "Antenna and Wave Propagation", Satya Prakashan.
4.	Girish Kumar, K.P. Ray, "Broadband Microstrip Antennas", Artech House Publishers
5.	G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education.
6.	E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**VLSI Design Laboratory**			***Course Code*:**	**:**	ETE324L
Teaching Scheme (Hours)	**:**	Practical :	02 Hrs/week		***Total Credits***	**:**	01
Evaluation Scheme (Marks)	**:**	IPE/IOE= 00	EPE =50	Total= 50	***Duration of EPE***	**:**	03
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE- 214, ETE-215					
Course Domain	**:**	Program Core					

Course Rationale:

This course deals with understanding working of MOS transistors, MOS transistor based circuits, chip manufacturing and chip design, programming and prototyping.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Illustrate the construction, characteristics of MOS transistors.	**1.**	Describe the structure, working principle and characteristics of MOS devices
2.	Discuss CMOS IC manufacturing process	**2.**	Explain CMOS IC fabrication technology
3.	Illustrate Verilog and other HDLs	**3.**	Experiment using Verilog language and explain features of HDL
4.	Learn Hardware Description Language	**4.**	Develop Verilog code for different digital circuits
5	Develop Verilog codes to design various digital circuits	**5.**	Describe construction and features of programmable logic devices
6.	Describe IC Design flow	**6.**	Explain the IC design flow

List of Experiments

Sr. No.	Practical List
1.	Simulation, modeling and characteristics study of nMOS & pMOS transistors (Custom and semicustom)
2.	Simulation, modeling and characteristics study of CMOS inverter circuitry (Custom and semicustom)
3.	Design and implementation of gates and combinational logic in CPLD / FPGA
4.	Design and implementation of adder in CPLD / FPGA
5.	Design and implementation of subtractor in CPLD / FPGA
6.	Design and implementation of ALU in CPLD / FPGA

7.	Design and implementation of encoder in CPLD / FPGA
8.	Design and implementation of decoder in CPLD / FPGA
9.	Design and implementation of multiplexer in CPLD / FPGA
10.	Design and implementation of demultiplexer in CPLD / FPGA
11.	Design and implementation of comparator in CPLD / FPGA
12.	Design and implementation of tristate driver in CPLD / FPGA
13.	Design and implementation of Flip-Flops in CPLD / FPGA
14.	Design and implementation of sequential circuits in CPLD / FPGA
General Instructions: Minimum 8 experiments should be conducted based on above experiment list**.** Simulation, circuit design , programming based experiments should be practiced in laboratory	
Suggested Text Books/ Reference Books/Manual	
1.	Institute's Laboratory Course Manual and equipment wise Standard Operating Procedure to follow

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**Seminar**			***Course Code*:**	**:**	ETE325T
Teaching Scheme (Hours)	**:**	**2 hrs per week**			***Total Credits***	**:**	02
Evaluation Scheme (Marks)	**:**	IOE= 50	EPE = NIL	Total= 50	***Duration of IOE***	**:**	02
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE 216					
Course Domain	**:**	Seminar					

Course Rationale:
This course deals with developing the presentation skills, stage daring qualities, convincing abilities of students.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Inform latest trends in industry/ research	**1.**	Know the latest trend in industry/ research
2.	Illustrate the use of technical resources	**2.**	Utilize the technical resources
3.	Describe the technical documentation reading process	**3.**	Read technical documents , understand it, prepare and present to audience
4.	Guide regarding presentation skills	**4.**	Develop presentation skills and stage daring qualities
5	Explain the professional skills required for employability	**5.**	Adapt and develop professional skills required for employability
6.	Motivate for public speaking	**6.**	Motivation for public speaking

General Instructions:
Every student has to give seminar on the topic selected by student / given by teacher (guide). The topic may be any recent technology, standard research paper from recognized journals, innovative project idea. Weekly schedule of the seminar will be arranged and students have to individually deliver seminar on given topic. Team of faculty members will assess the students seminar.

Assessment method- Assessment is based on topic selection, presentation, understanding of topic, question and answering, attendance for all sessions etc. and as determined by assessment panel.

Suggested Text Books/ Reference Books/Manual

1.	Research articles from standard journals
2.	Project magazines
3.	Innovative idea of student

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), Part III, VI**					
Course Title	**:**	**Mini project and Seminar**			***Course Code*:**	**:**	ETE326L
Teaching Scheme (Hours)	**:**	**2 hrs practical per week**			***Total Credits***	**:**	04
Evaluation Scheme (Marks)	**:**	IPE= 50	EPE = NIL	Total= 50	***Duration of IPE***	**:**	02
Revision:	**:**	Fourth			***Month***	**:**	January 2022
Pre-requisites *(if any)*	**:**	ETE- 316 L					
Course Domain	**:**	Project and Seminar					

Course Rationale:
This course deals with inculcating students skills for design, development, simulation, programming of electronics / software based systems to solve societal/ industrial problems.

Course Objectives: The Course teacher will		***Course Outcomes:*** Students will be able to	
1.	Illustrate basic steps in electronic system design	**1.**	Illustrate fundamental stages in development of electronics engineering projects
2.	Survey the problem and find technological solution	**2.**	Apply engineering knowledge for providing technological solutions
3.	Design small scale electronics systems to accomplish task	**3.**	Simulate and design the circuits
4.	Construct circuit models and simulate	**4.**	Work in team environment
5	Work in team to complete the task	**5.**	Write report and express technical details
6.	Manage project in given time	**6.**	Manage the project within time constraints

Curriculum Content
Group size and activities:
1) Mini project group size should not exceed three students per every group.
2) Project idea should be proposed and finalized in consultation with guide.
3) Proposed weekly plan of the project should be finalized with guide.
4) Project work should be carried out in following steps
   a) Selection of project & problem definition.
   b) Paper design (Circuit design and flow chart of software)
   c) Simulation if required.
   d) Hardware implementation
   e) Software implementation (if required)
   f) Testing and calibration

g) Report writing

5) Compulsory submission of mini project report by each group is a must.
6) Projects of two or more groups should not be same.
7) Seminar must be delivered after completion of project by each group preferably by using power point presentation.
8) Mini-project report must be submitted before/at the time of viva-voce .

Project Contents:

1) It should consists of hardware part and software part is optional.
2) Design of PCB by using suitable CAD tool, simulation if necessary, component mounting, soldering, testing , result analysis should be done by group.
3) Design and development of cabinet should be done for the project.

Guidelines for mini-project selection

Parameter monitoring, parameter / system controlling applications, data acquisition systems, microcontroller based systems, digital design, communication projects, VLSI based project, power supply and batteries

Suggested Text Books/ Reference Books/Manual

1.	Articles from reputed journals, magazines, websites, real world problems, case studies

Class, Part & Semester	**:**	**Third Year B. Tech (Electronics & Telecommunication Engineering), VI**									
Course Title	**:**	**Introduction To Foreign Language**						***Course Code***	**:**	FL321	
Teaching Scheme (Hours)	**:**	2 hr. /week= 2 x 14= 28 hours						***Total Credits***	**:**	Nil	
Evaluation Scheme (Marks)	**:**	Assignments Viva-voce	: :	50 25	Written Test Grand Total	: :	25 100	***Duration of SEE***	**:**	Not Applicable	
Revision	**:**	Fourth						***Month***	**:**	January 2022	
Pre-requisites *(If any)*	**:**	No									
Course Domain	**:**	Language									

Course Rationale: This course provides a competitive edge for engineering graduates in their career choices. They will be able to communicate in a second language. The course enhances listening, reading skills and memory. Our graduates may be able to participate more effectively and responsibly in a multi-cultural world if they know another foreign language in addition to the English.

Course Assessment Methods: The students will be given five assignments each for 10 marks. At the end of the course, there will be a written test of 25 marks and a viva voce of 25 marks. There will be assessment for a total of 100 marks. Based on the marks obtained, they will be awarded with a grade similar to other credit courses. Though it is an audit course, obtaining passing grade is essential.

Course Objectives: The Course Teacher will		**Course Outcomes: Students will be able to**	
1.	Help students to understand basics and deepen their knowledge in a chosen foreign language.	**1.**	Learn alphabets and acquire knowledge of basic grammar of the foreign language, common words and phrases therein.
2.	Guide them to communicate and translate in the chosen foreign languages.	**2.**	Learn to read the simple texts in foreign language.
3.	Help them describe, narrate, and ask/answer questions in the foreign language in the present time about a variety of topics related to family, daily activities, eating, and traveling.	**3.**	Speak a little using the greetings, well wishes etc. in Foreign Language.
4.	Comprehend the foreign language with sufficient ability to grasp the main idea and some supporting details in short conversations (spontaneous or recorded) that pertain to the topics mentioned above.	**4.**	Count numbers, answer to the questions like, what is your name, surname, tell age, and can initiate little communication in Foreign Language.
5	Explain how to write sentences and short paragraphs on familiar topics relating to personal interests and practical needs.	**5**	Translate both verbally and written, simple sentences in the foreign language.
6.	Narrate on how the foreign language functions with awareness and understanding of the language culture.	**6.**	Achieve institute's mission with respect to global education and foreign language education.

Curriculum Content	Hours
Unit I: General Information on Basic Grammar of the foreign language, Introduction to alphabets.	05

Unit II: Gender of Noun, Number of Noun, Pronouns, Adjectives, Verbs and their usage in simple sentences, Numbers (up to 10), Simple Greetings in foreign language.	05
Unit III: General Questions in foreign language, like What is your name/surname? Who/What is this? etc.	04
Unit IV: Simple narration about self/family/friend/University in foreign language chosen for studies. Practicing the learnt topics in the class itself.	05
Unit V: Formation of simple sentences using Parts of Speech, Information on Cases, One or Two simple lessons from any book.	05
Unit VI: Basic information on Country & Culture of language under study.	04

Suggested Reference Books:

1.	V.N.Wagner and V. G. Ovsienko, "Russian Language", Russian, People's Publishing House, New Delhi.
2.	S. Khavronina and A. Shirochenskaya, "Russian in Exercises", 1991.
3.	"Genki – Japan Times".
4.	Osamu & Nobuko Mizutani, "Aural Comprehension in Japanese".
5.	Osamu & Nobuko Mizutani, "An Introduction to Modern Japanese".
6.	Y. Yoshida, "Japanese for Today".
7.	Ed Swick, "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time".
8.	Ed Swick, "Living German".
9.	Eugene Jackson and Adolph Geiger, "German Made Simple: Learn to Speak and Understand German Quickly and Easily".
10.	Professor Martin Durrell, "Hammer's German Grammar and Usage" (Fifth Edition).