NOTIFICATION

No. 55 /2018 Date : 14 /06/2018

Subject :- Continuation of Prospectus No. 131712 prescribed for Sem. V & VI B.E. (CGS) for the session 2018-2019.

It is notified for general information of all concerned that the Prospectus No.131712 prescribed for Semester **V & VI B.E./B.Tech./B.Text. (CGS)** for the session 2012-2013 and continued upto the session 2017-2018 shall be continued for the academic session 2018-2019 with the following substitutions (revised syllabi) for the examinations **B.E. Sem. V & VI [Electronics & Telecommunication]** as per **Appendix- A** appended herewith as given below **:**

Sd/-
Registrar
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Appendix – A

SEMESTER - V

	Subject (Th): 5ET1- ANALOG ELECTRONICS – II	**L**
	Course Requisites: 1. (3ET3) Electronic Devices and Circuits 2. (4ET3) Analog Electronics- I	
	Course Objectives: 1. To provide basic understanding and design concepts of voltage regulators. 2. To apply concepts of Op-Amp in designing the circuits for linear and non-linear applications. 3. To study and synthesize the waveform generators using IC 8038, 566, 555 and IC 565. 4. To demonstrate applications of Op-Amp in temperature monitoring.	
	Course Outcomes: After completing the course, the students will be able to: 1. Acquire and apply knowledge for design of voltage regulator circuits using ICS and discrete components. 2. Analyze and design electronic circuits for various linear and non-linear applications. 3. Design waveform generator circuits using different ICs. 4. Design temperature monitoring system using Op-Amp and sensors.	
Unit-1	Series Voltage Regulator using transistor, overload protection, voltage regulators using IC 723, LM 317, dual tracking regulators using 78xx and 79xx series.	**8**
Unit-2	Design of scaling, summing, differential amplifier, design of integrator and differentiator, sinusoidal RC oscillators; RC-phase shift, Wein bridge oscillator using IC 741.	**10**
Unit-3	Design of Op-amp IC 741 based comparator, zero-crossing detector, window detectors, Schmitt trigger, astable multivibrator as square and triangular wave generator, monostable multivibrator, IC 8038 and IC 566 VCO as waveform generators.	**10**
Unit-4	IC 555 based design of astable, monostable multivibrator and their applications, PLL IC 565 based designs.	**8**
Unit-5	Design of Butterworth first and second order low pass, high pass, band pass, band stop filters, all pass filter, design of notch filter, design of UJT based relaxation oscillator and triggering circuit.	**8**
Unit-6	Design of instrumentation amplifier, bridge amplifier, temperature controller /indicator using thermocouple, RTD, thermo sensors AD 590, LM 35.	**8**
	TOTAL	**52**
	Text Book : R.A. Gayakwad, “OP-AMP and Linear Integrated Circuits”, Prentice Hall/ Pearson Education Publications.	
	References: 1. Sergio Franco, “Design with Linear Integrated Circuits & Op-Amps”, TMH Publications. 2.Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley Intl. Publication. 3. Paul Horowitz, W. Hill, “The art of Electronics”, Cambridge Publications. 4. S.N. Talbar, Dr. T.R. Sontakke, “Electronic Circuit Design”.	
	Subject (Th): 5ET2- POWER ELECTRONICS AND DRIVES	**L**
	Course Requisite: 1. (3ET3) Electronic Devices and Circuits. 2. (1B4) Electrical Engineering.	

	Course Objectives: 1. To introduce power electronics devices; SCR, TRIAC, IGBT, MOSFET and to learn their characteristics. 2. To develop the ability to analyze the dynamics in power electronic converters/drives systems. 3. To study AC-AC, DC-AC, DC-DC converters. 4. To understand the operation of various DC and AC motors. 5. To study different speed control techniques for DC and AC motors.	
	Course Outcomes: By the end of the course the student will be able to: 1. Analyze the characteristics of various power electronics devices . 2. Understand SCR firing circuits, commutation techniques. 3. Design and develop power electronic circuits for various applications. 4. To illustrate the operation of various DC and AC motors. 5. Know various applications of power converters in AC and DC drives.	
Unit-1	SCR, Triac, Diac-construction, characteristics, two transistor analogy for turning ON-OFF a SCR, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuit using UJT. Introduction to GTO, power transistor, power MOSFET, IGBT - their construction & characteristics,	**10**
Unit-2	Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of freewheeling diode, single phase dual converters. Three phase half controlled bridge and fully controlled bridge rectifier	7
Unit-3	Classification of circuit for forced commutation, series inverter, improved series inverter, parallel inverter, output voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorized bridge inverter, current source inverter, harmonics reduction techniques.	9
Unit-4	Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, step-up chopper and AC chopper. Basic principle of cycloconverter, single phase to single phase cycloconverter.	**8**
Unit-5	**DC Motor**: Principle of Operation, Types of Motor, Speed Control of Shunt Motor: Flux Control, Armature voltage control, using phase controlled rectifier, Speed Control of Series Motor: Flux Control, Rheostatic Control, chopper control. **Stepper Motor**: Construction, Working, characteristics and applications. Application of power electronic circuit in single phase DC drives.	**8**
Unit-6	**Single phase induction motor:** Construction, Working, characteristics and applications. **Three phase induction motor**: Working, characteristics, speed control method: Armature voltage, V/F control, rotor control, slip power recovery scheme and applications. **AC servo motor**: Principal of operation and characteristic.	**8**
	TOTAL	**50**
	Text Books: 1.M. Ramamoorthy, Thyristor and their applications. 2.B.L. Theraja: "Electrical Technology", Volume-2, S. Chand Publications.	
	References: 1. M. H. Rashid, "Power Electronics Circuits, Devices and Application", Pearson Edu. 2. Joseph Vithayathil, "Power Electronics: Principles and Applications", McGraw-Hill. 3. M.D.Singh, K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill. 4. Devdatta Y. Shingare, "A Text book of Industrial & Power Electronics", Electrotech Pub. 5. Nagrath Kothari, "Electrical Machines", TMH Publications.	
	Subject (Th): 5ET3 - MICRO PROCESSOR & MICRO CONTROLLER	**L**
	Course Requisite: 1. (4ET3) Digital Electronics.	
	Course Objectives: 1. To study fundamentals of microprocessor systems. 2. Understanding microprocessor Assembly Language Programming concepts and different data transfer schemes**.** 3. To deal interfacing of different peripheral devices with Microprocessor. 4. To study fundamentals of microcontroller systems. 5. Understanding microcontroller Assembly Language Programming concepts. 6. To get knowledge of interfacing different peripheral devices with Microcontroller. 7.	
	Course Outcomes: Upon completion of this course, students will demonstrate the ability to : 1. Understand architectural difference between Microprocessor and Microcontroller. 2. Equipped with Assembly Language Programming concepts of Microprocessor & Microcontroller. 3. Capable of interfacing of different peripheral devices with Microprocessor and Microcontroller.	

Unit-1	**Introduction to Microprocessor** 8085: Architecture and Pin Diagram, Register Structure, Addressing modes, Instruction set of 8085, Timing diagrams.	**8**
Unit-2	**Assembly Language Programming** Assembly Language Programming of 8085, Stack, Subroutine, Data transfer schemes, Address space partitioning schemes, Interrupt system of 8085.	**8**
Unit-3	**I/O Interfacing and programming of 8085** Architecture, Programming and interfacing of: PPI 8255, PIT 8254, USART 8251.	**8**
Unit-4	**Introduction to 8051 Microcontroller** Introduction to 8051 microcontroller; Pin diagram, architecture, Ports Structure, memory organization, SFR's, Counters/Timers, Serial port of 8051. Interrupt structure.	**8**
Unit-5	**Assembly Language Programming of 8051** Addressing modes, Instruction set of 8051, Assembly language programming examples, counter/timer programming in various modes. Serial communication and its Operating modes.	**8**
Unit-6	**Interfacing and programming of 8051** Interfacing and programming of external RAM &ROM, keyboard, LCD display, ADC0808 & DAC0808, Stepper motor, DC Motor.	**10**
	TOTAL	**50**
	Text Books: 1. Gaonkar R.S. : Microprocessor Architecture Programming and Applications with the 8085, Penram International Pub. 2. M.A. Mazidi, J.G. Mazidi and R.D. McKinley: "The 8051Microcontroller and Embedded Systems using Assembly and C", Pearson Education (2nd Ed.)	
	Reference: K.J. Ayala: "The 8051 Microcontroller", Penram Int. Pubs., 1996.	
	Subject (Th): 5ET4 - COMMUNICATION ENGINEERING – II	**L**
	Course Requisite: 1. (4ET1) Signals & Systems 2. (IA1) Engineering Mathematics-I	
	Course Objectives: 1. To understand the fundamentals of Probability theory and random processes. 2. To study principles of Electromagnetic Wave propagation. 3. To study various pulse modulation and demodulation techniques used in transmission of analog signal. 4. To understand the concept of sampling and quantization in digital transmission system. 5. To study multiplexing and basics of telephone switching system.	
	Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Apply the concepts of Probability theory in communication systems. 2. Understand the propagation of electromagnetic waves in free space. 3. Analyze the performance of various pulse modulation schemes. 4. Develop the ability to compare and contrast the strengths and weaknesses of various pulse communication systems. 5. Understand switching in telephone networks.	
Unit-1	**Probability Theory and Basics of Random Variables:** Introduction to Probability Theory, Axioms of probability. Elementary properties of Probability, Conditional probability, Random variables, Several random variables, Statistical averages, Joint moments, Guassian distribution, Central Limit Theorem, Transformation of random variables. [T1,R2]	**8**
Unit-2	**Random Processes:** Introduction, Random vectors obtained from random processes, Stationary, Mean, Correlation & Covariance function, Properties of autocorrelation function, Time averages and Ergodicity, Properties of Power spectral density, Cross correlation function, Cross spectral densities, Narrowband Random Process, Envelope and phase of Random Process. [T1,R2]	**8**
Unit-3	**Wave Propagation :** Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading, single hop and multi hop propagation, duct propagation. [R1,R3]	**8**
Unit-4	**Pulse Analog Modulation:** Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. PAM PWM & PPM. [T1,R4]	**8**
Unit-5	**Digital Transmission of Analog Signal:** Digital representation of Analog signal, PCM Generation and Reconstruction: Quantization, Companding, Quantization Noise, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation. [T1,T2,R4]	**10**

Unit-6	**Multiplexing and Telephone switching:** Comparison of methods for Analog signal transmission: PCM verses Analog modulation, Comparison of communication systems: Power – Bandwidth Trade-off. Time Division multiplexing, TDM-PCM telephone system, Frequency Division multiplexing, Comparison of TDM and FDM. Telephone switching: Elemental phone system, Central switching, Traffic load and service grade, Hierarchy of switching offices, Common control method of switching, two and four wire connections, Time Division Switching, Space Division Switching, Combined Space and Time Switching. [T2,R4]	**10**
	TOTAL	**52**
	Text Books: 1.Simon Haykin, "Communication System, John Wiley, Eastern Ltd., New York, (3rd Ed.) 1994**.** 2.K. Shammugham, "Digital and Analog Communication".	
	References: 1.Wayne Tomasi, "Electronic Communication Systems" Pearson Education, (Fifth Edition). 2.B. P. Lathi, "Modern Digital and Analog Communication systems" 3rd Ed., Oxford Uni. Press, New Delhi. 3.Kennedy G.,"Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi(3rd Ed.). 4.Taub and Schilling D.L., "Principles of Communication Systems", Mc-Graw Hill Co., New Delhi (Second Ed.).	
	Subject (Th): FE5ET5 Free Elective – I (1) ELECTRONIC TEST INSTRUMENTS	**L**
	Course Objectives: 1. To introduce students to the use of various electrical/electronic testing and measuring instruments. 2. To provide students with opportunities to develop basic skills in the use of electronic equipments.	
	Course Outcomes: After successfully completing the course, the students will be able to: 1. Understand the basic techniques of electronic testing and measuring equipments. 2. Identify electronic instruments, their use and errors associated with the instruments. 3. Explain the use of electronic instruments for testing and measurement in various applications.	
Unit-1	Analog meters, digital meters, dc voltmeter, ac voltmeters, RF probes, ammeters, ac ammeters, ohm-meters, 4-wire ohm measurements, multi-meters, meter range, other multi-meter functions: continuity indicators, diode tests, frequency counters, minimum, maximum, average read-outs, capacitance and temperature measurements, specifications	**8**
Unit-2	Floating and grounded outputs, sine wave sources, imperfections in sine wave sources,: frequency accuracy, frequency stability, amplitude accuracy, distortion, spurious responses, close-in-sidebands , Function Generators: Arbitrary waveform generators, arbitrary waveforms, AM and FM modulation, bursts, Frequency Shift Keying, Frequency sweep, sync output, phase locking, pulse generators, RF signal generators	**8**
Unit-3	Oscilloscopes: the concept of oscilloscope, digital scope block diagram, sample rate, real time and repetitive sampling, triggering, acquisition/sweep control, vertical amplifier, vertical resolution, ac and dc coupling, bandwidth limit, X-Y display mode, High impedance inputs, 50 ohm inputs, digital acquisition and display techniques, specifications of oscilloscopes, mixed signal oscilloscope, oscilloscope probes, probe compensation, active probes, differential measurements, high voltage probes, current probes	**8**
Unit-4	Oscilloscope measurements, basic waveform measurements, voltage gain measurements, phase measurements, frequency measurements, digital signal measurements, frequency response measurements, square wave tests, linearity measurements, curve tracer measurement techniques, diode I-V and resistor I-V characteristics, amplitude modulation measurements, power measurements, FFT measurements, basic time domain reflectometry	**8**
Unit-5	Spectrum and network analyzers: spectrum analyzer, bank-of filters spectrum analyzers, FFT spectrum analyzers, wavemeters, resolution bandwidth, narrow-band and broadband measurements, swept spectrum analyzers, spectrum analyzer measurements, Network Analyzers, distortion analyzers, RF power measurements, RF power meter	**8**
Unit-6	Logic Analyzers: logic probes, oscilloscope logic measurements, logic analyzers, timing analyzers, glitch detect, state analyzers, data formats, state displays, timing displays, microprocessor measurements, trigger events and sequencing, microprocessor program flow, logic analyzer probing, combined scope and logic analyzer, PC-hosted logic analyzers	**8**
	TOTAL	**48**
	Text Book : Robert A.Witte, "Electronic Test Instruments: Analog and Digital", Second Edn., Pearson Education.	

	FE5ET5 FREE ELECT. – I (2) FIBER OPTICS AND SATELLITE COMMUNICATION	L
	Course Objectives: 1. To introduce and understand optical fiber communication system. 2. To understand and elaborate different components of fibre optic communication system. 3. To understand basics of orbital mechanism, the types of satellite orbits and orbital aspects of satellite communication. 4. To understand the various services of satellite.	
	Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Understand functioning of optical sources and detectors. 2. Describe optical fiber communication system and its performance measures. 3. Understand orbital aspects of satellite communication. 4. Know orbital effects in communication system performance. 5. Elaborate the satellite link model. 6. Describe satellite services; GPS.	
Unit-1	**Introduction to Satellite Communication :** Satellite frequency bands, Satellite types-LEO, MEO, GEO, HEO, Kepler's laws, Satellite orbits, Geo-stationary Satellite. Orbital Aspects of Satellite Communication: Orbital period and velocity, Effect of orbital inclination, Azimuth and Elevation, Converge angle and Slant range, Orbital effect in communication system performance. [T1,R1]	**8**
Unit-2	**Satellite Channels:** Electromagnetic field propagation, Atmospheric losses, Receiver noise, Carrier to Noise ratio, Satellite system link model: Uplink, Downlink, Cross link, Transponder, Satellite system parameters, Satellite link analysis. [R1]	**8**
Unit-3	**Satellite Services:** Satellite Navigation and Global Positioning System (GPS): Radio and Satellite navigation, Position, Location in GPS, GPS receivers and codes, GPS navigation message and signal levels, Timing accuracy, GPS receiver operation, Differential GPS. [T1]	**8**
Unit-4	**Optical Fiber Communication System:** Basic optical laws and definitions, Optical fiber modes and configurations, N.A. Attenuation: Units, absorption, scattering losses radioactive losses, core and cladding losses. Material dispersion, wave guide dispersion, intermodal dispersion. [T2,R2]	**8**
Unit-5	**Optical Sources:** Light Emitting Diodes: Structure, Light source materials. Laser Diodes: Structure, threshold conditions, Modulations of laser diodes. Light source linearity, reliability considerations. [T2,R2]	**8**
Unit-6	**Optical Detectors:** Physical principles of photodiodes, Photo detector noise, Detectors response time, Avalanche multiplication noise, Temperature effect on avalanche gain. [T2,R2]	**8**
	TOTAL	**48**
	Text Books: 1. Pratt Timothy and Bostian W.Charles,"Satellite Communication", Willey Int. Pub.,New York. 2. G. Keiser, "Optical Fibre Communication", McGraw Hill International.	
	References: 1. Robert M Gagliardi, "Satellite Communication", CBS Pub. 2. Seniors J. M., "Optical Fibre Communication and Applications", Prentice Hall of India Pvt. Ltd., New Delhi.	
	5ETp6- ANALOG ELECTRONICS - II LAB.	
	Course Requisite: 1. (3ET3) Electronic Devices and Circuits 2. (4ET3) Analog Electronics- I 3. (5ET1) Analog Electronics- II	
	Course Objectives: 1. To understand characteristics, and data sheets of ICs; IC741, IC555, IC565, IC566, IC8038. 2. To develop knowledge for designing various linear and non linear applications by using IC 741. 3. To design voltage regulator. 4. To design waveform generator circuits using various ICs. 5. To understand functionalities of PLL and its use in frequency multiplier.	
	Course Outcomes: After completing the course, the students will be able to: 1. Design various linear and non linear applications by using IC 741. 2. Design voltage regulators using discrete components and ICs. 3. Implement various waveform generators using IC555, IC565, IC566, IC8038. 4. Design frequency multiplier using IC565.	

	Experiment List :	
Expt- 01	Design transistorized series voltage regulator for V_o = 15 V at 100 mA. Input Voltage applied is 25±10%V with r_o= 10 Ohm.	
Expt- 02	Design a low voltage variable regulator for output voltage of 2 to 7 V using IC 723.	
Expt -03	Design a summing amplifier using IC 741 for $V_0 = V_1 + 2V_2 - 6V_3$.	
Expt -04	Design a Schmitt trigger with input 5V rms, 10 KHz frequency for specific threshold voltage levels.	
Expt -05	Design of integrator and differentiator for cut-off frequencies f_o=1KHz.	
Expt -06	Design of sinusoidal RC phase shift oscillator for f_o=1KHz using Op-Amp IC 741.	
Expt -07	Design and setup a Wien-bridge oscillator for a frequency of 1KHz using Op-Amp IC 741.	
Expt -08	Design the square and triangular wave generator using IC 741 for f_o=2 KHz.	
Expt -09	Design a Butterworth high pass filter for the following specifications with supply ± 15V: 1) Filter pass band gain 10 2) Stop band gain: 40 dB/decade 3) Cut–off frequency 22kHz.	
Expt-10	Design an instrumentation amplifier with Gain 10.	
Expt-11	Design function generator for sine wave, triangular and square wave for output frequency of 10 KHz using IC 8038.	
Expt-12	Design a monostable multivibrator using IC555 for a pulse width of 1ms and 5V amplitude.	
Expt-13	Design a frequency multiplier using PLL IC565 to multiply input frequency by a factor of 2.	
	* Minimum 10 experiments based on/relevant to the above list.	
	5ETp7- POWER ELECTRONICS & DRIVES – LAB	
	Course Requisite: 1. (1B4) Electrical Engineering. 2. (3ET3) Electronic Devices and Circuits. 3. (5ET2) Power Electronics & Drives.	
	Course Objectives: The course aims to: 1. To understand the characteristics of power electronic devices like SCR, TRIAC, MOSFET. 2. To verify the effect of firing angle in phase controlled converters. 3. To understand the turn off mechanism of SCR. 4. To examine the basic working principle of DC and AC Motors. 5. To understand speed control techniques of DC and AC motors.	
	Course Outcomes: Upon successful completion of this course, students will be able to: 1. Analyze the characteristics of various power electronics devices . 2. Understand SCR firing circuits, commutation techniques.. 3. Design and develop power electronic circuits for various applications. 4. Illustrate the operation of various DC and AC motors. 5. Use different speed control techniques for DC and AC motors. 6. Understand the operation of various DC and AC motors.	
	Experiment List :	
Expt- 01	To verify the characteristics of SCR. Obj: 1. To plot V-I characteristics of SCR. 2. To measure Latching and Holding current of SCR.	
Expt- 02	To verify the characteristics of DIAC/TRIAC. Obj: 1.To plot V-I characteristics of DIAC/TRIAC when MT1 is +ve w.r.t. MT2. 2. To plot V-I characteristics of DIAC/TRIAC when MT1 is -ve w.r.t. MT2.	
Expt -03	To verify the characteristics of Power MOSFET. Obj: 1. To plot V-I characteristics of Power MOSFET	
Expt -04	To verify the effect of firing angle on output voltage in single phase half wave/ Full wave controlled rectifier Obj:- 1. To study basic working of single phase half wave/ Full wave controlled rectifier 2. To study the effect of firing angle on output voltage	
Expt -05	To verify the working of SCR Commutation Obj:- 1. To examine class A, class B, class C, class D and class E commutation of SCR 2. To draw the waveforms at different points for commutation circuit	
Expt -06	To verify the working of basic /improved series inverter Obj:- 1. To examine the basic working principle of series inverter 2. To examine the basic working principle of improved series inverter	
Expt -07	To verify the working of parallel inverter Obj:- 1. To examine the basic working principle of parallel inverter 2. To analyze working of parallel inverter with class C commutation	
Expt -08	To verify the basic working principle of Jones chopper Obj:- 1. To examine the basic working principle of Jones chopper 2. To observe & plot waveforms at different points	
Expt -09	To verify the speed control of D.C. shunt motor. Obj:- 1. To examine the basic method of speed controlling of D.C. motor. 2. To observe and plot the speed vs. current characteristics.	

Expt-10	To perform load test on D.C. series motor. Obj:- 1. To examine the basic working principle of D.C. series motor. 2. To observe and plot the various characteristics of D.C. Series motor.	
Expt-11	To use TRIAC in the speed control of universal motor. Obj: 1. To observe and plot speed Vs. voltage characteristics of universal motor.	
Expt-12	To perform load test on 3 phase Induction Motor. Obj:- 1. To study the basic working of 3 phase Induction Motor. 2. To examine various characteristics of 3 phase Induction Motor.	
	* Minimum 10 experiments based on/relevant to the above list.	
	5ETp8- MICROPROCESSOR & MICROCONTROLLER - LAB	
	Course Requisite: 1. (5ET3) Microprocessor and Microcontroller.	
	Course Objectives: 1. To become familiar with the architecture and Instruction set of Intel 8085microprocessor and 8051 microcontroller. 2. To provide practical hands on experience with Assembly Language Programming of 8085 and 8051. 3. To familiarize the students with interfacing of various peripheral devices with 8085 and 8051.	
	Course Outcomes: 1. Develop skill of writing programs in ALP for various applications of 8085 & 8051. 2. Interface various peripherals with 8085 & 8051.	
Exp. No.	**Experiment List :**	
Expt- 01	Write and execute 8085 µp ALP for Addition and Subtraction of two 8 bit numbers from memory& Store result at next location of memory.	
Expt- 02	Write and execute 8085 µp ALP for Multiplication of two 8 bits from memory & Store result in memory.	
Expt -03	Write and execute 8085 µp ALP for addition of series of 8 bit numbers from memory & Store result in memory.	
Expt -04	Write and execute 8085 µp ALP for smallest / largest number from an array of memory.	
Expt -05	Write and execute ALP for sorting array in ascending/descending order from memory.	
Expt -06	Interface 8255 PPI with 8085, CWR address is 0BH & write ALP to generate square wave of 50% duty cycle on port A.	
Expt -07	Write a program in assembly language for 8051 to toggle port P1 continuously and debug and simulate it using Keil software.	
Expt -08	Write a Program to interface LED to any one pin of port P1 and ON & OFF it 100 times.	
Expt -09	Write a program to interface SEVEN SEGMENT display to 8051 and display all hexadecimal number repeatedly on it.	
Expt-10	Interface a DC Motor with Microcontroller 8051 and rotate it clockwise and anticlockwise for same duration using assembly language.	
Expt-11	Write a program to interface STEPPER Motor with 8051 and rotate it clockwise and anticlockwise for same duration using assembly language.	
Expt-12	Write a program to interface 16x2 LCD Display with 8051 and Display a word/sentence on it.	
Expt- 13	Interface Matrix Hex Keypad with 8051 Microcontroller using assembly language.	
	* Minimum 5 experiments each on 8085 and 8051 respectively based on/relevant to the above list.	
	5ETp9 - SKILL DEVELOPMENT LAB-III (Simulation)	**L**
	Course Requisite: 1. (4ET1) Signals & Systems. 2. (4ET5) Communication Engineering-I.	
	Course Objectives: 1. To familiarize the students in introducing and exploring MATLAB & SIMULINK / SCILAB & XCOS environment. 2. To enable the students on how to approach for solving Engineering problems using simulation tools. 3. To provide a foundation in use of these software for real time applications. 4. To prepare the students to use MATLAB & SIMULINK / SCILAB & XCOS in their project works.	
	Course Outcomes: On completion of this course the student should be able to: 1. Use MATLAB & SIMULINK / SCILAB & XCOS for interactive computations. 2. Able to use basic flow controls (if-else, for, while) and familiarize with strings and matrices and their use. 3. Able to write program scripts, functions and simulate experimental models using the MATLAB & SIMULINK / SCILAB & XCOS development environment. 4. Able to generate different plots and explore results to draw valid conclusions and inferences in engineering problems.	
Unit-1	Fundamentals of MATLAB / SCILAB: MATLAB Environment, operators, data types, variables, arrays, characters and strings, structures, built-in functions, input-output data handling, script writing, creating functions, conditional statements, introduction to toolboxes.	**9**

Unit-2	Graphics in MATLAB / SCILAB: Plotting data, legends and markers, 3D mesh and surface plot, use of other special plots: error graphs, scatter plot, polar plot, quiver plot etc. Graphical User Interface (GUI): Creating and displaying a GUI, GUI components, Panels and button groups, dialog boxes, menus	**9**
Unit-3	Simulink/XCOS: Simulink Environment, resources in Simulink (Blockset), model creation and design, Introduction to S-Function.	**8**
	TOTAL	**26**
	Text Books: 1. Stephen J. Chapman, "MATLAB Programming for Engineers", 4th edition, Cengage Learning. 2. Philippe Roux (Author), Claude Gomez (Preface), Perrine Mathieu (Translator), "Scilab from Theory to Practice - I. Fundamentals", Scilab Enterprise.	
	References: 1. Brian R. Hunt, Ronald L. Lipsman, Johathan M. Rosenberg, "A Guide to MATLAB for Beginners and Experienced Users" 3rd edition Cambridge. 2. Dr. M. Affouf, "Scilab by Example", Create Space Independent Publishing Platform.	
	Experiment List :	
Expt- 01	Signals and their properties. 1. To represent basic signals in MATLAB/SCILAB like impulse, step, ramp, sinusoidal and exponential. 2. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting) in MATLAB/SCILAB.	
Expt- 02	System and their properties. 1. To identify a given system as linear or non-linear. 2. To explore the time variance and time invariance property of a given system. 3. To explore causality and non-causality property of a system.	
Expt -03	Analyze LTI system response. 1. To demonstrate convolution and correlation of two continuous-time signals. 2. To demonstrate convolution and correlation of two discrete-time signals.	
Expt -04	Sampling and signal reconstruction 1. To demonstrate the time domain sampling of band limited signals (Nyquist theorem). 2. To demonstrate the time domain sampling of non-band limited signals and antialiasing filter. 3. To demonstrate the signal reconstruction using zero-order hold and first-order hold filters.	
Expt -05	Simulation of Amplitude Modulator and Demodulator using MATLAB/SCILAB: 1. To generate the amplitude modulated signal (AM wave) by using given message signal and carrier signals in MATLAB software 2. To demodulate the AM wave using envelope detector principle	
Expt -06	Simulation of Amplitude Modulator and Demodulator using Simulink/XCOS: To generate amplitude modulated wave using Simulink/XCOS and demodulate the modulated wave.	
Expt -07	Simulation of AM-DSBSC Modulator and Demodulator using MATLAB/SCILAB: 1. To generate the AM-DSBSC modulated signal (DSBSC wave) by using given message signal and carrier signals 2. To demodulate the DSBSC wave using synchronous detector	
Expt -08	Simulation of AM-DSBSC Modulator and Demodulator using Simulink/XCOS: To generate DSB-SC Modulated wave using Simulink/XCOS and demodulate the modulated signal.	
Expt -09	Simulation of Frequency Modulator and Demodulator using MATLAB/SCILAB: 1. To generate frequency modulated signal and observe the characteristics of FM wave. 2. To demodulate a Frequency Modulated signal.	
Expt-10	To measure the performance Characteristics of Receiver: Sensitivity, Selectivity, and Fidelity using MATLAB/SCILAB.	
Expt-11	Simulation of Frequency Modulator and Demodulator using Simulink/XCOS: To generate frequency modulated and demodulated signal using communication block set of Simulink/XCOS.	
	* Minimum 10 experiments based on/relevant to the above list.	
	SEMESTER - VI	
	6ET1- MICRO CONTROLLER PROGRAMMING & APPLICATIONS	**L**
	Course Requisite: 1. (4ET4) Digital Electronics. 2. (5ET3) Micro Processor & Micro Controller. 3. (3ET2) Object Oriented Programming.	
	Course Objectives: 1. To familiarize with various members of AVR family and its architecture. 2. To understand AVR assembly language instructions. 3. To develop logic in assembly and C programming for AVR. 4. To understand in built peripherals of AVR microcontroller. 5. To make a system by interfacing different IO devices. 6. To be familiar with advanced serial protocols.	

	Course Outcomes: After completing the course, the students will be able to: 1. Use various members of AVR family. 2. Program AVR Microcontroller in assembly language and C language. 3. Use different inbuilt block of AVR. 4. Implement a system for dedicated applications. 5. Understand different serial protocols and IDE tools for AVR.	
Unit-1	Introduction to AVR Microcontroller: AVR microcontroller, History, Features and AVR family and its inbuilt Peripherals, Architecture: signal description, registers of AVR, Data Memory, data formats and directives, RISC architecture in AVR.	**8**
Unit-2	Instruction Set and Addressing Modes: Load and Store instruction, Data transfer instruction, Arithmetic instruction, logical and compare instruction rotate and shift instruction, branch instruction and looping, call instruction and stack, bit-accessible instruction, accessing EEPROM, and addressing modes of AVR.	**8**
Unit-3	AVR Programming: AVR advanced assembly language programming, Micros, AVR programming in C: Data types, I/O programming, logical operation, data convergence program, data serialization and memory allocation in C.	**8**
Unit-4	Peripherals of AVR microcontroller, Memory, Flash, SRAM, EEPROM, I/O Ports structure, Timer Structure, Watch dog timer, UART, Interrupt Structure, Serial Ports, Analog to Digital convertors.	**8**
Unit-5	AVR Application and Programming in C: LCD and keyboard, Sensors, relay, opto-isolator and stepper motor, Timer, Interrupts and serial port programming, Input capture and wave generation, PWM programming and DC motor control.	**8**
Unit-6	Serial Bus Protocol: SPI bus protocol, SPI programming in AVR, MAX2221 interfacing and programming, I2C bus protocol, I2C programming in AVR, DS1307 RTC interface and Programming, ISA bus, IrDA Data link, CAN bus, AVR System Development Tool: Code assembler, Code simulator, Evaluation boards, AVR emulator, Device Programmer.	**8**
	TOTAL	**48**
	Text Books: 1. "AVR Microcontroller and Embedded systems using assembly and C", Muhammad Ali Mazidi, Sarmad Naimi and Sephers Naimi, Pearson Education, Inc. publishing as Prentice Hall 2013. 2. "Programming and Customizing the AVR Microcontroller", Dhananjay V. Gadre, McGraw Hill Education (India) Private Limited 2003.	
	References: 1. "Tiny AVR microcontroller Projects for the Evil Genius", Dhananjay V. Gadre and Nehul Malhotra, Tata McGraw Hill Education (India) Private Limited. 2. "Embedded C Program and the Atmel AVR", Bartnett. Cox and O'Cull, Delmar Cengage learning. 3. "Embedded C", Michal J. Pont, Addison Wesley Pearson Education.	
	6ET2 - CONTROL SYSTEM ENGINEERING	**L**
	Course Requisite: 1. (IA1) Mathematics-I 2. (IB1) Mathematics-II 3. (4ET1) Signals and Systems	
	Course Objectives: 1. To understand the fundamental concepts of Control systems and mathematical modeling of the physical systems. 2. To study time response of the LTI system and its stability analysis. 3. To know concept of frequency response of the LTI system, 4. To study State Variable Analysis of the system. 5. To carry out analysis and stability of the digital control system.	
	Course Outcomes: At the end of the course the student will be able to: 1. Determine transfer function models of electrical, mechanical and electromechanical systems. 2. Determine specified transfer functions from block diagrams and signal flow graph. 3. Determine transient response and steady state response parameters. 4. Analyze stability/relative stability of the LTI system. 5. Determine the state model and the response of the system using state variable method. 6. Analyze the response of the discrete time system.	
Unit-1	**Introduction:** Basic definition, Closed and open loop systems, Transfer function, Mathematical models of the physical systems (Electrical, Mechanical, Electromechanical), block diagram representation, block diagram reduction technique, signal flow graphs, basic control actions.	**10**
Unit-2	**Time Response Analysis:** Standard test signals, Time response of first order and second order system, impulse response function, Transient domain specifications, Steady state analysis: steady state error and error constants, dynamic error coefficients.	**7**

Unit-3	**1.Stability Analysis:** Concept of stability, necessary conditions for stability, Routh stability criterion, Relative stability analysis. **2. Roots Locus Technique:** Introduction, Root locus concepts, Construction of root locus, construction rules, Stability analysis of systems using root locus, Concept of dominant closed loop pole pair, Root contour, Effect of addition of open loop zeros & poles.	**9**
Unit-4	**Frequency response analysis:** Introduction, correlation between time and frequency response, Polar plots, Bode plots, general procedure for construction, Gain margin and phase margin, Stability analysis of systems using Bode plots, Nyquist stability criterion, relative stability analysis.	**10**
Unit-5	**State Variable Analysis:** Concepts of state, state variables and state space, Space model representation of LTI systems using physical, phase and canonical variables, Diagonalization, Relationship between state variable model and transfer function, state transition matrix and its computation, Solution of state equations, Controllability and observability.	**9**
Unit-6	**Digital Control Systems :** Introduction, Representation of sampled data (Discrete) systems, sampling, signal reconstruction, Zero order hold, Pulse Transform functions of open loop, closed loop systems with different sampler locations, Z transform analysis of sampled data control systems, Digital controllers, Z and S domain relationship, stability analysis of discrete time system using bilinear transformation.	**6**
	TOTAL	**51**
	Text Book : Nagrath I. J. and M. Gopal, "Control Systems Engineering", 5th Edition New Age International.	
	References: 1. K. Ogata,"Modern Control Engineering", PHI, Fourth Edition. 2. F. Golnaraghi and B. C.Kuo, "Automatic Control Systems", 9th edn., John Wiley & Sons, inc. 3. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 11th edn., Pearson Educn. 4. John J. D'Azzo and Constantine H. Houpis Stuart N. Sheldon, "Linear Control System Analysis and Design with Matlab", 5th edition, Marcel Dekker Inc. 5. M. Gopal, "Digital Control Systems Principles & Design", TMH. 6. Norman S. Nise, "Control System Engineering", 5th Edition, Wiley. 7. Bhattarcharya, "Control System Engineering", 2nd Edition, Pearson Education. 8. Norman, "Control System Engineering", John Wiley & sons, 3rd edition.	
	Subject (Th): 6ET3- DIGITAL COMMUNICATION	**L**
	Course Requisite: 1. (4ET1) Signal and System 2. (4ET5) Communication Engineering I 3. (5ET4) Communication Engineering II	
	Course Objectives: 1. To study basic building blocks of digital communication system. 2. To learn information theory and theoretical bounds on the data rates of digital communication. 3. To understand and analyze communication channel. 4. To study and analyze different digital modulation techniques. 5. To study baseband transmission of the signal. 6. To understand importance of channel encoding and decoding in digital communication. 7. To study multiple access schemes and spread spectrum communication system.	
	Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Understand basic building blocks of digital communication system and formatting of digital signal. 2. Understand concepts of information theory and analyze information transmission over communication channel. 3. Analyze performance of different digital modulation techniques. 4. Understand methods to mitigate inter symbol interference in baseband transmission system. 5. Implement different error control coding schemes for the reliable transmission. 6. Understand various multiple access schemes and spreading techniques.	
Unit-1	**Introduction to Digital Communication System:** Functional Blocks of Digital Communication System; Source Encoder and Decoder, Channel Encoder and Decoder, Modulator and Demodulator. **Line Coding:** Need for Line coding, Properties of Line Coding, Unipolar RZ and NRZ, Polar RZ and NRZ, Bipolar NRZ (AMI), Split Phase Manchester Coding, Polar Quaternary NRZ Coding, HDB3 Coding. Scrambler and Unscrambler.	**8**

Unit-2	**Information Theory:** Measure of Information, Entropy and Information Rate of Long Independent and Dependent Sequences, Markoff Statistical Model for Information Sources, Entropy and Information rate of Markoff Sources. Source Encoding: Huffman Encoding, Shannon's Encoding Algorithm, Shannon-Fano Algorithm. **Discrete Communication Channel:** Noiseless Channel, Deterministic Channel, Binary Symmetric Channel, Rate of Information Transfer over Discrete Channel, Capacity of Discrete Memoryless Channel. **Continuous Channel:** Shannon Hartley Theorem for channel capacity, Signal to Noise Ratio – Bandwidth Tradeoff.	**10**
Unit-3	**Bandpass Modulation and Demodulation techniques:** BPSK, BFSK, ASK and DPSK generation and reception, Signal space diagram, PSD and Bandwidth of BPSK and BFSK systems, QPSK and MSK Transmitter and Receiver, Signal space diagram, PSD and Bandwidth of QPSK and MSK, Probability of Error of ASK, BPSK and BFSK systems, Comparison of Digital modulation systems. **Coherent Detection:** Integrate and Dump Filter (SNR and Probability of Error), Optimum Filter (Transfer function and Probability of Error), Matched Filter (Impulse response and Probability of Error).	**10**
Unit-4	**Base Band Transmission:** Base Band Binary PAM systems, Inter Symbol Interference, Base Band Pulse Shaping and Nyquist Criterion, Eye Diagram, Correlative Coding: Duobinary Encoder with Pre-coder, Modified Duobinary Encoder, Modified Duobinary Encoder with Pre-coder. **Equalization:** Need for equalization, Transversal Equalizer (Problems Expected), Preset Equalizer, Adaptive Equalizer, Clock and Carrier Synchronization.	**8**
Unit-5	**Error Control Coding:** Introduction to Error Control Coding, Types of Errors, Methods of Controlling Errors, **Linear Block Codes:** Matrix Description of Linear Block codes, Hamming Distance, Hamming Weight, Minimum Hamming Distance, Hamming Codes, Encoder for Linear Block code, Syndrome Decoding, Syndrome Decoder for (n, k) Linear Block Code, Error Detection and Correction capability of Linear Block Codes (Derivation expected). **Cyclic Codes:** Properties of Cyclic Codes, Systematic and Non-Systematic generator Matrix, Parity Check Matrices for Cyclic Codes, Encoders for Cyclic Codes, Syndrome Decoding for Cyclic Codes. **Convolution Codes:** Time Domain Approach and Transform domain approach for convolution code generation, Code Tree and Code Trellis for Convolution code.	**10**
Unit-6	**Multiple Access Schemes and Spread Spectrum Communication:** Multiple Access schemes: Time Division Multiple Access, Frequency Division Multiple Access, Code Division Multiple Access, Space Division Multiple Access. **Spread Spectrum Systems:** Notion of Spread Spectrum, PN Sequence Generation (Problems Expected), Direct Sequence Spread Spectrum (DSSS), Jamming Margin, Processing Gain, Eb/No Ratio, Frequency Hopped Spread Spectrum, Slow and Fast frequency Hopping.	**6**
	TOTAL	**52**
	Text Books: 1. Shanmugam K.S., "Digital & Analog Communication Systems", John Wiley & Sons, New York, 1996. 2. Lathi B. P., "Modern Digital and Communication Systems", Holt Rinchart and Winston Inc., New York, 1993. 3. Simon Haykin, "Digital Communication", John Wiley and Sons,Pvt. Ltd., Singapore.	
	References: 1. Proakis J. K., "Digital Communication", Mc-Graw Hill Book Co., London (Second Edition). 2. Taub, Herbert, Schilling D. L., "Principles of Communication Systems", Mc-Graw Hill International Book Co., Tokyo. 3. W.C.Y. Lee, "Mobile Cellular Telecommunications Systems", Mc-Graw Hill International Editions, 1990. 4. Glover and Grant, "Digital Communication", Prentice Hall Publication.	
	6ET4- DIGITAL SIGNAL PROCESSING	**L**
	Course Requisite: 1. (4ET1) Signals and Systems.	
	Course Objectives: 1. Learn discrete signal and system fundamentals. 2. Learn the discrete-time signals in the frequency domain, using z-transform and DFT. 3. Understand the implementation of the DFT in terms of the FFT, 4. Learn the basic forms and design of FIR and IIR filters. 5. Learn the application filter bank in multi rate DSP. 6. Become aware of some applications of digital signal processing.	

	Course Outcomes: After successful completion of the course the student will be able to: 1. Manipulate the discrete time signals and identify the type system. 2. Compute the z-transform of a sequence, identify its region of convergence, and compute the inverse z-transform. 3. Evaluate the Fourier transform of a signal. 4. Design FIR and IIR filters. 5. Understand the concepts of Multirate Digital Signal Processing and need of Filter banks. 6. Understand the architecture of DSP processor TMS320C54XX.	
Unit-1	Discrete time signals and system: Classification of signals, singularity function, amplitude and phase spectra, simple manipulation, Classification of systems, representations of systems, analog to digital conversion of signal.	**10**
Unit-2	*Z*- transform: mapping of s-plane to *Z*-plane, Region of Conversion and its properties, Properties of *Z*-transform, evaluation of inverse *Z*-transform using long division method, PFE method and residue method, difference equation and its relation with system function, impulse response and frequency response .	**9**
Unit-3	Discrete and Fast Fourier Transform: Discrete convolution, Discrete Time Fourier Transforms (DTFT), Fast Fourier Transform (FFT), Computing an Inverse DFT by Doing a Direct DFT. Fast convolution, correlation.	**9**
Unit-4	Finite Impulse Response (FIR) filters: Magnitude and Phase response of digital filter, Frequency Response of linear phase FIR filter, Design techniques for FIR filter: Fourier series method, windowing method using Rectangular window, Half band digital filter. Realization of basic structure FIR system: Direct form, Cascade, linear phase.	**8**
Unit-5	Infinite Impulse Response (IIR) filters: IIR filter design by approximation of derivatives, impulse invariant method, Bilinear transformation method, Butterworth filter and Chebyshev filter. Realization of basic structure IIR system: Direct form I, Direct form II, Cascade and parallel.	**8**
Unit-6	Multirate Digital Signal Processing: Sampling, Sampling rate conversion, signal flow graph, filter structure, polyphase decomposition, digital filter design, multilevel filter bank. Overview and architecture of DSP processor TMS320C54XX.	**8**
	TOTAL	**52**
	Text Book : S. Salivahanan, A. Vallavaraj, "Digital Signal Processing", Tata McGraw-Hill Edn, 2001.	
	References: 1. Oppenheim & Schafer, "Discrete time Processing", PHI. 2. Proakis & Manolakis D.G., "Digital Signal Processing", PHI. 3. Mitra S.K., "Digital Signal Processing", TMH. 4. Roman Kuc, "Digital Signal Processing", MGH. 5. Ifeacher E.C., Jervis B. W., "Digital Signal Processing", Addison Wesley. 6. P. P. Vaidyanathan, "DSP and Multirate Systems", PHI.	
	FE6ET5 Free Elective – II (1) - CONSUMER ELECTRONICS	**L**
	Course Objectives: 1. To gain knowledge and competencies regarding various electronics devices / systems used in field of consumer electronics.	
	Course Outcomes: At the end of the course the student will be able to: 1. Understand audio and video systems commonly used in consumer electronics. 2. Explain the working of commonly used electronic appliances. 3. Describe recording and reproduction systems. 4. Acquire knowledge of working principle of calculator and In-Car-Computers 5. Observe occupational and safety practices in consumer electronics.	
Unit-1	**Audio Systems**: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalizers and Mixers, Electronic Music Synthesizers, Commercial Sound, Theater Sound System.	**8**
Unit-2	**Video Systems and Displays**: Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Remote Controls, Video Telephone and Video Conferencing.	**8**
Unit-3	**Domestic Appliances:** Washing machines, Microwave ovens, Air-conditioners and Refrigerators, Computers Office System: FAX, Xerox, Telephone Switching System, Mobile Radio System.	**8**
Unit-4	**Recording and Reproduction Systems**: Disc recording and reproduction, Magnetic recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System.	**8**
Unit-5	**Power Supplies and other systems**: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM, Dish washers	**8**
Unit-6	**Calculators:** Structure, internal organization, servicing; **In-Car-Computers**: electronic ignition, electronic ignition lock system, Antilock Braking System (ABS), Electronically controlled Suspension (ECS), Instrument panel displays, ultrasonic car safely belt system, Air Bag System, Vehicle proximity detection system, car navigation system.	**8**
	TOTAL	**48**

	Text Book : S.P.Bali, "Consumer Electronics", Pearson Ed 2005.	
	FE6ET5 Free Elective – II (2) INTRODUCTION TO WIRELESS TECHNOLOGY	**L**
	Course Objectives: 1. To be aware of evolution in wireless technology. 2. To study the fundamentals of cellular radio system. 3. To understand operation of various 2nd and 3rd generation cellular systems; GSM, IS95, CDMA2000, WCDMA. 4. To study wireless data communication networks.	
	Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Describe evolution of wireless networks. 2. Understand fundamentals of cellular radio system. 3. Demonstrate various 2nd and 3rd generation wireless cellular & data communication networks.	
Unit-1	**Overview of Wireless Networks:** Evolution of voice oriented and data oriented wireless networks, different generations of wireless networks (1G, 2G, 3G & beyond), comparison of wired and wireless media, radio propagation mechanism, Effects of multipath and Doppler: multipath fading, multiple delay spread, Doppler spectrum.[T1]	**8**
Unit-2	**Cellular Technology:** Cellular Topology- cellular concept, cellular hierarchy, cell fundamentals, Evolution of Mobile Systems (1G, 2G, 3G), Signal-to-interference ratio. Capacity Expansion: cell splitting and cell sectoring. Channel allocation techniques: Fixed, Dynamic & Hybrid channel allocation, channel borrowing technique. Handoff Management: Architectural issues in handoff, types of handoff, handoff algorithms. [T1]	**8**
Unit-3	**GSM System:** GSM Network Architecture, GSM Call Procedures: Registration procedure, call establishment, Handoff in GSM, GSM Signaling Protocol Architecture: Physical layer: power and power control, physical packet burst, frame hierarchy in GSM, Hand Off Procedures, Logical channels in GSM. [T1]	**8**
Unit-4	**CDMA Digital Cellular Standard (IS-95):** IS-95 Forward Channel, IS-95 Reverse Channel, packet and frame formats, mobility and radio recourse management: soft handoff and power control. **CDMA2000 and WCDMA:** Forward and Reverse Channel in CDMA2000 and WCDMA, Hand Off and Power Control in CDMA2000 and WCDMA. [T1]	**8**
Unit-5	**Wireless Local Area Network (WLAN):** IEEE 802 architecture, IEEE 802.11 architecture and Services, IEEE 802.11 medium access control, MAC frame format, 802.11 physical layer, 802.11 standards. [T2]	**8**
Unit-6	**Wireless PAN (WPAN-802.15):** Overview of 802.15, Bluetooth, Bluetooth protocol stack, usage models, piconets and scatternets, radio specification, baseband specifications: physical links, packets, payload format, error correction, logical channels, channel control, link manager specification. [T2]	**8**
	TOTAL	**48**
	Text Books: 1. K. Pahlavan and P. Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia Publication (2002). 2. William Stallings, "Wireless Communications & Networks", Prentice-Hall India, 2nd Edition.	
	6ET6 COMMUNICATION SKILLS	**L**
	Course Objectives: 1. Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies. 2. Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range while organizing their ideas logically on a topic. 3. Listen/view and comprehend different spoken discourses/excerpts in different accents 4. Read different genres of texts adopting various reading strategies.	
	Course Outcomes: Upon successful completion of this course, the student will be able to: 1. Acquire knowledge about the various principles of communication. 2. Learn the importance of verbal and non-verbal communication in the professional world. 3. Imbibe the knowledge of effective classroom speaking and presentation. 4. Learning the nuances of effective writing by using short and crisp sentences. 5. Synthesize and apply appropriate and effective conflict management strategies.	
Unit-1	Comprehension over an unseen passage Comprehension – A - word study: Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study: Simple and compound sentences, type of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only – but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.	**10**

Unit-2	Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), and important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectiveness and subject content. Non-verbal communication, types of graphics and pictorial devices.	**10**
Unit-3	Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day to day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews, methodology of conduction of meetings, seminars, symposia, conference and workshop.	**10**
	TOTAL	**30**
	Text Books: 1.Krishna Mohan, Meera Banerjee,"Developing Communication Skills", MacMillan India Ltd. 2.Chrissie Wright (Editor), "Handbook of Practical Communication Skills", Jaico Pub. House.	
	References: 1. Raman Sharma, "Technical Communication", Oxford University Press. 2. F. Frank Candlin, "General English for Technical Students", University of London Press Ltd.	
	6ETp7 – DIGITAL COMMUNICATION – LAB	
	Course Requisite: 1. (4ET5) Communication Engineering I 2. (5ET4) Communication Engineering II 3. (6ET3) Digital Communication	
	Note: Lab includes the experiments on the contents of following subjects 1. (5ET4) Communication Engineering II, 2. (6ET3) Digital Communication.	
	Course Objectives: 1. To understand various Pulse communication systems for transmission of analog signals. 2. To enable the students to understand different line coding used for representation of digital wave forms. 3. To understand operation of Scrambler and Unscrambler. 4. To study error correction and detection methods used in digital communication systems. 5. To understand Bandpass Modulation and Demodulation techniques. 6. To understand baseband transmission of signal.	
	Course Outcomes : After successfully completing the Course, the students will be able to : 1. Describe variouis line codes used for representation of Digital Waveforms. 2. Demonstrate diferenent working blocks of digital communication system. 3. Analyze the performance of Digital Communication System. **4.** Apply various control coding techniques in Digital Communication.	
	Experiment List :	
Expt-1	To verify the operation of Pulse Amplitude Modulation PAM and Demodulation.	
Expt -2	To verify the operation of Pulse Width Modulation (PWM) and Demodulation.	
Expt -3	To verify the operation of Pulse Code Modulation (PCM) and Demodulation.	
Expt -4	To verify the output of Delta Modulation and Demodulation process.	
Expt -5	To explore Time Division Multiplexing (TDM) Technique as a application of PAM.	
Expt -6	To implement various line coding schemes in MATLAB/SCILAB and observe their spectrum.	
Expt -7	Implementation of Scrambler and Unscrambler.	
Expt -8	Extraction and recovery of data in Base Band digital Transmission and Measurement of bit error rate.	
Expt -9	To analyze the performance of baseband system using Eye diagram.	
Expt -10	Implementation of cyclic Encoding and Decoding of BCD bit Sequence.	
Expt -11		
Expt -12	To analyze the performance of Amplitude Shift keying (ASK).	
Expt -13	To analyze and compare performance of 1) Phase Shift Keying (PSK). 2) Differential Phase Shift Keying (DPSK). 3) Quadrature Phase Shift Keying (QPSK)	
Expt -14	Generation of PN sequence and to determine auto and cross correlation..	
Expt -15	To implement Shanon-Fano / Huffman coding using MATLAB.	
	* Minimum 10 experiments based on/relevant to the above list.	
	6ETp8 - DIGITAL SIGNAL PROCESSING – LAB	
	Course Requisite: 1. (4ET1) Signals & Systems. 2. (6ET4) Digital Signal Processing.	

	Course Objectives: 1 To use software to visualize the real time signal processing applications. 2 To manipulate the discrete time signals and identify the type of given system. 3 To identify the discrete time signals in frequency domain, using z-transform and Fourier Transform. 4 Learn the basic forms and design of FIR and IIR filters. 5 To become aware of DSP processor TMS320C54XX.	
	Course Outcomes: After successful completion of this course the student will be able to 1. Generate different plots and explore results to draw valid conclusions and inferences in DSP problems. 2. Enable on how to approach for requirement of digital signal processing and digital system design using simulation tools. 3. Familiarize with the concepts of Multirate Digital Signal Processing. 4. Understand the architecture of digital filter and DSP processor.	
	Course Outcomes : After successfully completing the Course, the students will be able to : 1. Accomplish sound vocabulory and its proper use contextually. 2. Speak clearly, confidently, comprehensibly.. 3. Listen/view and comprehend different spoken discourses/excerpts in different accents. 4. Write cohesively and coherently and flawlessly avoiding grammatical erros.	
	Experiment List :	
Expt- 01	Study of Signal Processing Function used in MATLAB/SCILAB. 1. To study basics of MATLAB. 2. To study the basic commands used in MATLAB for signal processing.	
Expt- 02	Generate basic discrete signals: unit impulse, unit step sequence, unit ramp sequence, real exponential signal sinusoidal signal 1. To acquire the knowledge of basic discrete signals used in Digital Signal Processing. 2. To generate & plot basic discrete signal in MATLAB.	
Expt -03	System and their properties. 1. To identify a given system as linear or non-linear. 2. To explore the time variance and time invariance properties of a given system. 3. To explore causality and non-causality properties of a system.	
Expt -04	Plot impulse response of the given difference equation: 1. To understand impulse response of the system described by a given difference equation. 2. To analyze LTI system response.	
Expt -05	Find the Linear Convolution and Circular convolution of sequence 1. To evaluate the response of the system for given input. 2. To understand the circular symmetry property of convolution.	
Expt -06	Calculate of convolution of two sequences using DFT and IDFT. 1. To evaluate the convolution of given sequences. 2. To demonstrate the time domain and frequency domain representation of signal.	
Expt -07	Determine the stability, Pole Zero plot of given transfer function. 1. To demonstrate pole zero plot of given transfer function. 2. To identify the stability using complex Z-plane	
Expt -08	FIR filter design using Rectangular window 1. To design the FIR filter for given specifications. 2. To demonstrate the phase and frequency response of high pass, low pass, band pass and band stop filter.	
Expt -09	Filter design using Butterworth approximations with impulse Invariance method. 1. To explore the formulation of Butterworth approximation. 2. To understand the order of filter for required specification. 3. To identify the relation between s-domain transfer function with z-domain transfer function.	
Expt-10	Multirate Digital Signal Processing, 1. To demonstrate upsampling and downsampling of a given signal. 2. To demonstrate interpolation and decimation of a given signal.	
Expt-11	TMS 320C6711 DSP processor, 1. To verify the signal processing operation using hardware. 2. To understand the hardware implementation of digital system.	
* Minimum 08 experiments based on/relevant to the above list.		
6ETp9 - COMMUNICATION SKILLS – LAB		
	Course Requisite: 1. (6ET6) Communication Skills.	
	Course Objectives: 1. To improve the students fluency in English. 2. To enable to respond appropriately in different socio-cultural and professional contexts. 3. To communicate ideas relevantly and coherently in writing. 4. Imbibe the knowledge of effective speaking and presentation.	

	Course Outcomes : After successfully completing the Course, the students will be able to : 1. Accomplish sound vocabulory and its proper use contextually. 2. Speak clearly, confidently, comprehensibly.. 3. Listen/view and comprehend different spoken discourses/excerpts in different accents. 4. Write cohesively and coherently and flawlessly avoiding grammatical erros.	
	Experiment List :	
Expt-1	Listening Comprehension	
Expt -2	Reading Comprehension	
Expt -3	Vocabulary: Synonyms And Antonyms	
Expt -4	Jumbled Sentences	
Expt -5	Correction of Grammatical Errors	
Expt -6	Group Discussion	
Expt -7	Personal Interview	
Expt -8	Presentation Skills	
	* Minimum 08 experiments based on/relevant to the above list.	
	6ETp10- SKILL DEVELOPMENT - LAB-IV (Hardware)	**L**
	Course Requisite: 1. (3ET4) Instrumentation and Sensors 2. (5ET2) Power Electronics & Drives 3. (5ET3) Micro Processor & Micro Controller 4. (6ET1) Micro Controller Programming & Applications	
	Course Objectives: 1. To familiarize with interfacing of different IO devices, sensors and actuators. 2. To develop program logic with "C" language using IDE tools. 3. To be able to use different communication modes. 4. To enable the students to design a microcontroller based system.	
	Course Outcomes: After successful completion of this course the student will be able to: 1. Use different interfacing devices, sensors and actuators. 2. Write programs in "C" using different integrated development tools. 3. Use different communication modes and different models. 4. Design a microcontroller based systems using different IO device, sensors and actuators.	
Unit-1	Different input devices, switches, keypads, ADC, DAC, RTC, external memory, touch screen etc. Sensors: Temperature, Humidity, Light, Sound etc. Display devices: LED, 7 segment, Dot matrix, LCD, GLCD etc. Motors: DC motors, Stepper Motors, Servo Motors etc. Relay, Optoisolator, ULN 2803, L293D etc.	**9**
Unit-2	**Communication protocols and Wireless Modules** Serial Protocols: RS 232/423/485, I^2C, CAN, USB, SPI, USART, UART etc. Parallel protocols: PCI and PCI-X Bus Wireless protocols: IrDA, Bluetooth, Zig-bee, Wi-Fi etc. Wireless modules: RF, IR, Wi-Fi, Bluetooth, Zig-bee, X-bee, RFID, GSM etc.	**9**
Unit-3	**Programming and Interfacing of Microcontroller** Understanding architecture of AVR Microcontroller, its memory, timers and counters, Software development tools IDE, Simple Programming in embedded C, Timer programming, Interrupt programming, Serial port programming etc. in embedded C.	**8**
	TOTAL	**26**
Exp.No.	**Experiment List :**	
Expt-1	LED interfacing with microcontroller using timer with interrupt	
Expt -2	LCD and Keyboard interfacing with microcontroller in 4 bit and 8 bit mode	
Expt -3	ADC interfacing using I^2C bus with microcontroller	
Expt -4	DAC interfacing using I^2C bus with microcontroller	
Expt -5	Stepper motor, DC and servo motor interfacing with microcontroller	
Expt -6	Serial communication using RS232 with or without interrupt	
Expt -7	RTC and 7-segment display interface with microcontroller	
Expt -8	Memory interfaces using SPI to store and retrieve data with microcontroller	
Expt -9	Sensors and actuators interface with microcontroller	
Expt -10	Case study -A **Mini Project** based on above list of the experiments in a group of students.	
	Text Books: 1."AVR Microcontroller and Embedded systems using assembly and C", Muhammad Ali Mazidi, Sarmad Naimi and Sephers Naimi, Pearson Education, Inc. publishing as Prentice Hall. 2. "Programming and Customizing the AVR Microcontroller", Dhananjay V. Gadre, McGraw Hill Education (India) Private Limited. 3. "Tiny AVR Microcontroller Projects for the Evil Genius", Dhananjay V. Gadre and Nehu lMalhotra, Tata McGraw Hill Education (India) Private Limited. 4. "Embedded C Program and the Atmel AVR", Bartnett. Cox and O'Cull, Delmar Cengage. 5. "Embedded C", Michal J. Pont, Addison Wesley Pearson Education.	

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