List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Electronics and Communication Engineering*

Programme Name : *B.Tech.*

Academic Year : 2021-22

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	MA201TBS01	Mathematics-I
02.	PH201TBS02	Physics
03.	EC201TES01	Basic Electrical & Electronics Engineering
04.	IT201TES02	Introduction to Information Technologies
05.	EN201THS01	English Communication
06.	PH201PBS01	Physics Lab
07.	ME201PES01	Engineering Graphics
08.	ME201PES02	Workshop Technology & Practices
09.	EC201PES03	Basic Electrical Engineering Lab
10.	MA202TBS03	Mathematics-II
11	CY202TBS04	Chemistry
12	CE202TES03	Engineering Mechanics
13	CS202TES04	Computer Programming
14	CM202TES05	Basic Civil & Mechanical Engineering
15	CY202PBS02	Chemistry Lab
16	CE202PES04	Engineering Mechanics Lab
17	CS202PES05	Computer Programming Lab
18	EC203TPC01	Electronic Devices
19	EC203TPC02	Digital Logic Design
20	EC203TPC03	Network Theory
21	EC203TPC04	Signals and Systems
22	EC203TBS05	Mathematics-III
23	EC203THS02	Engineering Economics
24	EC203PPC01	Electronics Devices Lab
25	EC203PPC02	Digital Logic Design Lab
26	EC204TPC05	Analog Circuits

27	EC204TPC06	Analog Communication
28	EC204TPC07	Control System
29	EC204TES05	Data Structure with C++
30	EC204TBS06	Numerical Methods
31	EC204TMC02	Environmental Sciences
32	EC204PPC05	Analog Circuits Lab
33	EC204PES05	Data Structure with C++ Lab
34	EC205TPC08	LIC & its Application
35	EC205TPC09	Digital Communication
36	EC205TPC10	Digital Signal Processing
37	EC205TES06	Electromagnetic Waves
38	EC205THS03	Probability Theory & Random Process
39	EC205THS04	Effective Technical Communication
40	EC205PPC06	LIC Lab
41	EC205PPC07	Analog and Digital Communication Lab
42	EC205PPC08	Digital Signal Processing Lab
43	EC206TPC11	CMOS Digital VLSI Design
44	EC206TPC12	Data Communication & Computer Networks
45	EC206TPC13	Microprocessor & Microcontroller
46	EC206TES07	Electronic Measurements and Sensors
47	EC206TPE01	Information Theory & Coding
48	EC206TPE02	Advance Signal Processing
49	EC206TPE03	Renewable Energy Sources
50	EC206TPE04	Introduction to MEMS
51	EC206PPC09	CMOS Digital VLSI Design Lab
52	EC206PPC10	Data Communication & Computer Networks Lab
53	EC206PES06	Electronic Measurement and Sensors Lab
54	EC07TPC14	Fiber Optics Communication
55	EC07TPC15	Embedded Systems
56	EC07TPC16	Mobile Communication & Network
57	EC07TPE09	Digital Image Processing
58	EC07TPE10	Analog & Digital VLSI Design
59	EC07TPE11	Estimation and Detection Theory
60	EC07TPE12	Advanced Power Electronics
61	EC07TPE13	Microwave Theory & Techniques

62	EC07TPE14	Radar & Satellite Comm
63	EC07TPE15	Machine Learning
64	EC07PPC12	Fiber Optics Communication Lab
65	EC07PPC13	Design and Simulation Lab
66	EC07PPS01	Seminar on Industrial Training
67	EC07PPS02	Project - I
68	EC08TPC17	VLSI Fabrication Technology
69	EC08TPE16	Millimeter Wave Technology
70	EC08TPE17	Video Processing
71	EC08TPE18	Biomedical Electronics
72	EC08TPE19	Neural Network & Fuzzy logic
73	EC08TPE20	Next Gen. Comm. Technology
74	EC08TPE21	Wireless Sensor Networks
75	EC08TOE05	Intellectual Property Rights
76	EC08TOE06	Principles of Management
77	EC08TOE07	Introduction to IOT
78	EC08PPS03	Project - II
79	EC08PPS04	Comprehensive viva
80	ECPATT1	Linear Algebra
81	ECPATT2	Wireless Communication & Network
82	ECPATT3	Optoelectronic Devices
83	ECPATP1	ction to Signal Processing
84	ECPATP2	Introduction to Embedded & IOT System
85	ECPATP3	Microstrip Antenna
86	ECPATP4	Estimation & Detection Theory
87	ECPATP5	Digital Image Processing
88	ECPATP6	Network Security & Cryptography
89	ECPATP7	Modern Digital Communication
90	ECPATP8	Antenna for Modern wireless Communication
91	ECPBTT1	Advanced VLSI Fabrication
92	ECPBTT2	Millimeter Wave Technology
93	ECPBTP1	Machine Learning
94	ECPBTP2	Optical Communication System
95	ECPBTP3	Next Generation Communication Technologies
96	ECPBTP4	Advanced Digital Signal Processing

97	ECPBTP5	Computer Vision
98	ECPBTP6	Digital Communication Receiver
99	ECPBTP7	Optical Instrumentation
100	ECPBTP8	Satellite Communication
101	ECPCPT1	Dissertation Stage–I
102	ECPDPT1	Dissertation Stage–II

विभागाध्यक्ष (इलें. एव संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Sub Code	L	T	P	Duration	IA	ESE	Total
EC205THS04	2	-	-	3hours	-	-	-

Effective Technical Communication

Course Objectives:

Objective of the course are to make Students will able to learn:

1. To participate actively in writing activities (individually and in collaboration)
2. To understand how to apply technical information and knowledge in practical documents
3. To practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing.
4. To recognize, explain, and use the genres of technical communication: technical abstracts, data based research reports, instructional manuals, technical descriptions, and web pages
5. To recognize and develop professional format features in print, html, and multimedia modes, as well as use appropriate nonverbal cues and visual aids.

Unit–I

Information Design and Development: Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

Unit-II

Grammar and Editing: Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style.

Unit-III

Oral communication: Public speaking, Group discussion, Oral presentation, Interviews, Graphic presentation, Presentation aids.

Unit-IV

Technical Writing: Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

UNIT-V

Ethics: Business ethics, Engineering ethics Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Work culture in jobs

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey, NewYork, 2004.
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN:07828357-4)

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205PPC06	-	-	2	2 hours	30	20	50	1

LIC & ITS APPLICATIONS LAB

Course Objectives:

1. To develop basic operations of IC 741.
2. To design and implement different linear and nonlinear applications of OPAMP.
3. To design different filter, oscillator, and waveform generator circuits using OPAMP ICs.
4. To design different multivibrator, modulator circuits using IC 555.

LABORATORY KITS/ LTSPICE or EQUIVALENT SOFTWARE

1. To use IC 741 as Inverting and Non-inverting Amplifier and to study the effect of frequency on the performance (frequency response) of OPAMP IC 741.
2. To use IC 741 as Adder and Subtractor circuit.
3. To use IC 741 as an Integrator and Differentiator and to study corresponding effect of frequency on the performance (frequency response).
4. To study IC 741 performance as LOG and ANTI-LOG Amplifier.
5. To design and study the performance of Timer IC 555 as Multivibrator: i) Astable, ii) Bistable and iii) Monostable modes of operation.
6. To design and study IC 741 and IC 555 performance as Schmitt Trigger Circuit.
7. To design and study IC 741 performance as Low-Pass Filter of 1^{ST} and 2^{ND} order.
8. To design and study IC 741 performance as High-Pass Filter of 1^{ST} and 2^{ND} order.
9. To design and study IC 741 performance as Wide and Narrow Band-Pass Filter of 1^{ST} and 2^{ND} order.
10. To design and study IC 741 performance as Phase-Shift Oscillator.
11. To design and study IC 741 performance as Wein-Bridge Oscillator.
12. To design and study IC 741 performance as Half-wave Rectifier.
13. To design and study IC 741 performance as Full-wave Rectifier.
14. To design and study Timer IC 555 performance as PWM Modulator.

Course Outcomes:

After successful completion of the course, students will be able to

1. Design and develop different linear and nonlinear applications of OPAMP.
2. Demonstrate and design filter, oscillator, and waveform generator circuits using OPAMP ICs.
3. Implement different multivibrator, modulator circuits.
4. Analyze different circuits using ICs.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205PPC07	-	-	2	2Hours	30	20	50	1

ANALOG AND DIGITAL COMMUNICATION LAB

Course Objectives:

To Study the basics analog and digital modulation technique and get the real time and practical exposure of communication system with detailed analysis of analog and digital communication techniques.

Syllabus Content:

1. To Study of Amplitude Modulation and demodulation.
2. To Study of SSB-SC modulation and demodulation.
3. To Study of Frequency Modulation and demodulation.
4. To Study of Phase modulation and demodulation.
5. To Study of Sampling Techniques.
6. To Study of Pulse Amplitude Modulation and Time Division Multiplexing.
7. To Study of Pulse Width Modulation & demodulation
8. To Study of Pulse Position Modulation & demodulation
9. To Study of Pulse Code Modulation & demodulation
10. To Study of Line Coding, Performance of Unipolar and Bipolar systems.
11. To Study of ASK, FSK and PSK Modulation schemes.

Text/Reference Books:

1. Principles of communication system by Taub & Schilling, 3rd Ed., McGraw-Hill Education
2. Modern Digital and Analog Communication Systems by B.P. Lathi,3 rd Ed., Oxford university press.
3. Digital communications by Simon Haykin, Wiley India Private Limited,2006
4. Lathi B.P.; Modern Analog & Digital Communication Systems; John Wiley

Course Outcome:

Students will try to learn:

1. To analyze the fundamental concepts of analog communication systems.
2. To perform sampling process
3. Implement the various the pulse modulation schemes for digital communication
4. Examine the performance of coding in digital system
5. Demonstrate the various digital modulation technique

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC205PPC08	-	-	2	2 hours	30	20	50	1

DIGITAL SIGNAL PROCESSING LAB

Course Objectives:

5. To develop basic signal operation such as Linear and Circular Convolution.
6. To implement different transformation algorithms
7. To design FIR and IIR filters using different methods.
8. To analyze the concept of sampling rate conversion
9. To implement real DSP modules for real time application

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. To generate the random sequences and determine the correlation.
2. To verify Linear and Circular convolutions.
3. To compute DFT of sequence and its Spectrum Analysis.
4. To implement 8-point FFT algorithm.
5. To design of FIR filters using rectangular window techniques.
6. To design of FIR filters using triangular window techniques.
7. To design of FIR filters Using Kaiser Window.
8. To design of Butterworth IIR filter.
9. To design of Chebyshev IIR filter.
10. To generate the down sample (decimation) by an Integer factor,
11. To generate the up sample (interpolation) by an Integer factor
12. To remove the noise in 1-D and 2-D signals

Course Outcomes:

Upon successful completion of the course, students will be able to

5. Design and develop basic modules for signal generation and its operation
6. Demonstrate the applications of FFT to DSP.
7. Implement digital filters for various applications of DSP.
8. Implement multirate system
9. Analyze effect of DSP systems.

SubCode	L	T	P	Duration	IA	ESE	Credits
EC206TPC11	3	1	0	4hours	30	70	4

CMOS DIGITAL VLSI DESIGN

Course Objectives:

1. Impart knowledge of MOS transistor theory
2. To learn basic CMOS Circuits
3. Impart knowledge on architectural choices and performance trade offs involved in designing and realizing the circuits in CMOS technology.
4. To understand various aspects of memory
5. To impart knowledge of VHDL language

Unit I: FUNDAMENTALS OF MOSFETS:

Introduction to MOS transistor, basic operation, threshold voltage ,V-I characteristic ,Depletion MOSFET ,trans conductance, PMOS and its V-I characteristic, aspect ratio and its implication, channel length modulation, substrate bias effect, electrical parameters of MOSFETS.P - Mos and N -Mos Inverters

Unit II: CMOS INVERTER:

Introduction, ideal inverter, Logic level standards, VTC of inverter, Noise margin, Basic NMOS inverter, CMOS inverter, design technique, inverter switching characteristic, delay times, transient effects, power dissipation, introduction to bi-CMOS inverter

Unit III: STATIC AND DYNAMIC LOGIC CIRCUITS:

Introduction, Various Static CMOS logic gate design ,Pseudo-nMOS gates ,pass transistor logic, transmission gates, tristate buffer, dynamic logic, Evaluate logic, Domino CMOS logic, Non ideal effects of dynamic logic circuits

Unit IV: SEQUENTIAL AND COMBINATIONAL CIRCUITS:

Types of regenerative circuits, bi-stability principle, basics S-R flip flop, JK flip-flop, Master slave Flip Flop, D latch, Static Vs Dynamic latch ,memory system, types of semiconductor memory, Dynamic RAM, Static RAM.

Unit V: INTRODUCTION TO VHDL:

Introduction and use of VHDL, Entity and Architecture Declaration, Types of Models of Architecture, Data objects, Data types, Operators ,concurrent and sequential statements, process statements, case ,if, when statements ,Design of sequential and combinational circuits.

Text/Reference Book:

1. Basic VLSI Design- Douglas A. Pucknell & Kamran Eshraghian, PHI 3rd Edition (original Edition – 1994).
2. CMOS VLSI Design- A Circuits and Systems Perspective- Neil H.E. Weste, David Harris, Ayan Banerjee, 3rd Edition, Pearson Education.
3. J Bhaskar A VHDL Primer,PearsonPub

Sub Code	L	T	P		IA	ESE	Credits
EC206TPC12	3	0	0	3 hours	30	70	3

DATA COMMUNICATION & COMPUTER NETWORK

Course Objectives:

Student will try to learn to:

1. Build an understanding of the fundamental concepts of data communication in computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
4. Develop an understanding of modern network architectures from a design and performance perspective.

Unit I: Model of a digital communication system, OSI reference model , TCP/IP, Analog and digital transmission ,parallel and serial transmission , Asynchronous and synchronous transmission. Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Layering concepts. Review of different types of encoding.

Unit II: Switching in networks: Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, Buffering, Multicasting.

Unit III: Multiplexing. Transport layer: Connectionless transport - User Datagram Protocol, Connection oriented transport – Transmission Control Protocol. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol. Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.

Unit IV: Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing

Unit V: Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.

Text Reference books:

1. William Stallings, "Data and computer communications", Prentice Hall
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition
3. J.F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition

Sub Code	L	T	P		IA	ESE	Credits
EC206TPC13	3	0	0	3 hours	30	70	3

MICROPROCESSOR AND MICROCONTROLLER

Course Objectives: Students will learn:

1. To develop basic concept of microprocessor and learn assembly language programming.
2. To learn about the memory interfacing and concept of advance microprocessor.
3. To learn the basic concept of various programmable interfacing devices.
4. To get the basic knowledge of concept of microcontroller and its programming tools.
5. To learn the interfacing of various devices with microcontroller and also learn the introductory part of embedded system.

UNIT-I: History and evolution of microprocessor and microcontroller, Microprocessor based system, Architecture and pin diagram of 8085 microprocessor, Register organization, Timing and control module. Multiplexing concept of buses, Instruction set and Assembly language program.

Unit-II Addressing modes, Memory interfacing, I/O interfacing, Address decoding, Interrupts, Instruction execution cycle, Subroutine instructions , Stack, Stack related instructions.

Advanced microprocessor, Intel 8086 Architecture, Register organization, Memory organization, Pipeline structure, Instructions set, 8086 interrupt.

Unit III 8255 PPI, various modes of operation, 8254 timer/ counter, Serial communication standards, serial data transfer schemes, 8251 USART architecture and Interfacing, DMA controller and its operation, Interrupt controller.

LCD & Keyboard Interfacing — ADC, DAC & Sensor Interfacing — External Memory Interface-Stepper Motor and Waveform generation.

Unit IV Microcontroller- Introduction to microcontroller, Embedded Vs external memory devices, CISC and RISC processor, Harvard and von Neumann architecture, 8051 microcontroller, Architecture, Register and memory organization, 8051 Assembly language programming tools.

Unit- V PIC microcontrollers: Introduction to PIC 16C6X/7X, family microcontroller, architectures, registers, register file structure, addressing mode, instruction set, interrupt structure, timers, counters, I/O port concepts, peripheral interfacing and application.

Basic of ARM Architecture: Introduction to Arm, microprocessor and its features, Architecture, programming model.

CISC and RISC architectures comparison, advantages of RISC

Introduction to embedded system, characteristics of embedded system, Designing issues and challenges in embedded system, various designing methods of embedded system.

Course outcome:

At the end of the semester, student will be able to

1. Make Assembly language program and project based on it.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC206TES07	3	0	0	3 hours	30	70	3

ELECTRONIC MEASUREMENTS AND SENSORS

Course Objectives:

Students will try to learn:

1. To explain basic concepts and definitions in measurement.
2. To describe the bridge configurations and their applications.
3. To elaborate discussion about the importance of signal generators and analyzers in Measurement.

UNIT – I: Measurements and Measurement system: Measurements, Significance of measurement, Methods of measurement- Direct and Indirect Method. Instruments and measurement system: Mechanical, Electrical, Electronic instruments; Classification of Instruments: Deflection and null type instruments. Analog and Digital mode of Operation, Application of measurement system, Characteristics of instrument and measurement system: static & dynamic; Elements of a Generalized Measurement System: Primary Sensing Element, Variable Conversion Element, Data presentation Element. Accuracy and precision, Significant figure, types of error, gross error, systematic error- Instrumental, Environmental, Observational Errors, Random error, Probability of error, Probable Error- of a finite number of readings, for combination of components, Limiting error.

UNIT –II: Electromechanical Indicating Instruments: Operating forces, Constructional Details, Types of Support, Torque/Weight Ratio, Control system, Damping- Air friction and Eddy current damping.

D´Arsonaval Galvanometer- construction, Torque Equation, Dynamic Behavior, Undamped, Damped, Over damped Motion, Response of Galvanometer. Ballistic Galvanometer. PMMC- Construction, Torque Equation, Voltage/Current Measurement: Ammeter, Voltmeter, Ohmmeter, Multimeter (V.O.M.), Ratiometer, Megger. High frequency Measurement: Q-meter

UNIT – III: AC Bridge: Introduction, Sources and Detectors, General equation for bridge balance,General form of AC Bridge. Maxwell´s Bridge, Hay´s bridge, Anderson´s bridge, De-Sauty´s bridge, Schering bridge, Wien´sbridge. **Electronic Instruments:** Introduction, Advantage of Electronic voltmeter, VTVM, Differential voltmeter, Electronic voltmeter using rectifier, True RMS reading voltmeter, Calorimeter, power meter, energy meter.

UNIT – IV: Sensor & Transducers: Classification of transducer, Primary & Secondary, Passive & Active, Analog & Digital, Potentiometer, loading effect, Strain Gauge, Thermistor, Construction of thermistor, Thermocouple, LVDT, Advantage & Disadvantage of LVDT, RVDT, Capacitive Transducer, Piezo-electric transducer, Hall-effect Transducer, Capacitive Transducer, Pressure Transducer, Mechanical) sensors, fiber-optic sensors, nano-sensors, magnetic field, microwave and radiation sensors, vision and imaging sensors, chemical sensor, comparisons and selection.

UNIT – V: Display devices: Digital display method, Segmental display- 7segment & 14 segment display,dot matrix, LED, LCD, TFT, Plasma display, DLP. **Digital voltmeter (DVM):** Types of DVM, Ramp type DVM, Integrating type DVM,

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC206PPC09	-	-	2	2Hours	30	20	1

CMOS DIGITAL VLSI DESIGN Lab

COURSE OBJECTIVES:

1. To know the basic language features of Verilog HDL and the role of HDL in digital logic design.
2. To know the behavioural modeling of combinational and simple sequential circuits.
3. To know the data flow modeling of combinational and simple sequential circuits.
4..To know the Structural modeling of combinational and simple sequential circuits.
5.. To know the synthesis of combinational and sequential descriptions.

Name of Experiments

1. To design and Simulate various Gates using VHDL
2. To design and Simulate Half Adder using VHDL
3. To design and Simulate Full Adder using VHDL
4. To design and Simulate Multiplexer using VHDL
5. To design and Simulate Demultiplexer using VHDL
6. To design and Simulate Encoder using VHDL
7. To design and Simulate Decoder using VHDL
8. To design and Simulate Parity generator using VHDL
9. To design different types of Flip Flops using VHDL
10.To design and different types of counters using VHDL

COURSE OUTCOMES:

1. Demonstrate knowledge on HDL design flow, digital circuits design, Counter's FlipFlops
2. Design and develop the combinational and sequential circuits using behavioral modeling
3. Design and develop the combinational and sequential circuits using Data flow modeling
4. Design and develop the combinational and sequential circuits using Structural modeling
5. Analyze the process of synthesizing the combinational and sequential descriptions

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC206PPC10	-	-	2	2Hours	30	20	1

DATA COMMUNICATION & COMPUTER NETWORK Lab

COURSE OBJECTIVE

Students will learn

1. Channel capacity theorem and its analysis.
2. Details of Ethernet and network topologies.
3. Details of different network protocols.

LIST OF EXPERIMENTS

1. Study of channel capacity theorems.
2. Study of Shannon- Feno code.
3. Study of Differential manchester code.
4. Program to calculate channel capacity and its plot.
5. Program to calculate received SINR from given channel capacity and bandwidth and also its plot.
6. Design of Ethernet.
7. Study of network topologies.
8. Study of flow control protocols.
9. Study of Selective repeat protocol.
10. Study of pure Aloha protocol.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Understand channel capacity and its analysis.
2. Understand different types of Ethernet and its design.
3. Understand different types of network topologies and its working.
4. Understand different types of flow control methods and its working
5. Understand different other network protocols.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC206PES06	-	-	2	2Hours	30	20	1

ELECTRONIC MEASUREMENT AND SENSORS Lab

COURSE OBJECTIVES:

1. To introduce students to monitor, analyze and control any physical system.
2. To understand students how different types of meters wwork and their construction.
3. To introduce students a knowledge to use modern tools necessary for electrical projects.

Name of Experiments:

1. Measurement of unknown self-inductance using Maxwell inductance bridge.
2. Measurement of unknown self-inductance of high quality factor using Hay's bridge.
3. Measurement of unknown self-inductance using Anderson bridge.
4. Measurement of unknown capacitance using De-Saunty's bridge.
5. Measurement of unknown capacitance using Wein's series resistance bridge.
6. Measurement of unknown capacitance using Schering's bridge.
7. To determine the sensitivity of LVDT and hence to show linear range of operation of LVDT.
8. To study the input/output characteristics of LVDT.
9. To study the characteristics of the thermocouple.
10. To study Galvanometer.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to:

1. To use the techniques and skills for electrical projects.
2. Design a system, component or process to meet desired needs in electrical engineering.
3. Ability to balance bridges to find unknown values.
4. Ability to measure frequency, phase with oscilloscope.
5. Ability to use digital voltmeters.

PROGRAM ELECTIVE-1

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC206TPE01	3	-	-	3hours	30	70	100	3

INFORMATION THEORY & CODING

COURSE OBJECTIVES:

1. To Study the concept of information and entropy
2. To Study Shannon"s theorem for coding
3. To analyze channel capacity
4. To study various channel coding techniques for error correction and detection

Unit-I:SourceCoding:Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and entropy, Information Measures for continuous Random Variables, Source Coding Theorem, Huffman coding.

Unit-II: Channel Capacity Coding: Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem, Shannon Limit, Markov sources.

Unit-III: Error Control Coding (Channel Coding) Linear Block Codes for Error Correction & Cyclic Codes: Introduction to Error Correcting Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Hamming Codes. Cyclic Codes: Polynomials, The Division algorithm for Polynomials, A Method for Generating Cyclic codes, Matrix Description of cyclic codes, Burst Error Correction.

Unit-V: Convolution Codes: Introduction to Convolution Codes, Tree codes and Trellis Codes, Polynomial Description of Convolution Codes (analytical Representation), distance Notions for Convolution Codes, The Generating Function, Matrix Description of Convolution Codes, Viterbi Decoding, Distance Bounds for Convolution Codes.

Unit-V: Turbo Codes: Turbo codes, Turbo decoding, Distance properties of turbo codes, Convergence of turbo codes

Text/Reference Books:

1. Information Theory, Coding and Cryptography by Ranjan Bose,Tata McGraw-Hill Education, 2008
2. Simon Haykin, Digital Communications, Wiley India Edition, 2009
3. N. Abramson, Information and Coding, McGraw Hill, 1963.
4. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
5. R.B. Ash, Information Theory, Prentice Hall, 1970.
6. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC206TPE02	3	-	-	3 hours	30	70	100	3

ADVANCE SIGNAL PROCESSING

Course Objectives:

The objectives of the course are to make the students:

1. To develop basic idea of multi rate filter bank design
2. To develop the understanding the concept of prediction of future signals
3. To introduce the fundamental concepts for adaptive filter designs.
4. To analyze the concept of estimation theory for signal analysis
5. To explore the concept of multi-resolution transformation.

Unit-1 Multirate Digital Signal Processing:

Decimation and Interpolation, Multistage implementation of sampling rate conversion, Applications of multirate signal processing, Digital filter banks, two channel quadrature mirror filter banks, .

Unit-2 Linear prediction and Optimum Linear Filters:

Random signals, Correlation Functions and Power Spectra, Innovations Representation of a Stationary Random Process. Forward and Backward Linear Prediction. Solution of the Normal Equations. The Levinson-Durbin Algorithm. Properties of the Linear Prediction-Error Filters..

Unit-3 Adaptive filters:

Applications of Adaptive Filters-Adaptive Channel Equalization, Adaptive noise cancellation, Linear Predictive coding of Speech Signals, Adaptive direct form FIR filters-The LMS algorithm, Properties of LMS algorithm. Adaptive direct form filters- RLS algorithm..

Unit-4 Power Spectrum Estimation:

Parametric and Non parametric Methods for Power Spectrum Estimation, Methods for the AR Model Parameters, ARMA Model for Power Spectrum Estimation.

Unit-5 Wavelet Transform

Origin of Wavelets, Wavelets and other reality transforms History and future of wavelets, Short Time Fourier Transform, Continuous Wavelet, and Discrete Wavelet Transform

Text/Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson, Fourth edition, 2007.
2. S. Haykin, "Adaptive Filter Theory" Prentice Hall, Englewood Cliffs, NJ, 1991.
3. K P Soman, Ramachandran, Resmi, "Insight into Wavelets- from Theory to Practice", PHI, Third Edition, 2010.
4. P.P.Vaidyanathan, "Multi rate systems and filter banks", Prentice Hall, 1993.
5. S.Mallet,"A Wavelet tour of Signal Processing", Academic Press, 1998.

MOOCs:

1. https://nptel.ac.in/courses/117/105/117105075/

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC206TPE03	3	-	-	3 hours	30	70	100	3

RENEWABLE ENERGY SOURCES

COURSE OBJECTIVE:

To impart knowledge on the following

1. Awareness about renewable Energy Sources and technologies.
2. Adequate inputs on wind power plants
3. To learn basics of solar energy and its extraction
4. To learn power generation process using biomass and hydroelectric system
5. To know details of other renewable energy sources and their storage.

UNIT I RENEWABLE ENERGY (RE) SOURCES: Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources

UNIT II WIND ENERGY: Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs- Siting of WPPs-Grid integration issues of WPPs

UNIT III SOLAR PV AND THERMAL SYSTEMS: Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY: Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT 5: OTHER ENERGY SOURCES: Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TEXT/ REFERENCE BOOKS:

1. Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016.
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education, 2015

Sub Code	L	T	P	Duration	IA	ESE	Total	Credits
EC206TPE04	3	-	-	3 hours	30	70	100	3

INTRODUCTION TO MEMS

Course Objectives:

1. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
2. To educate on the rudiments of Micro fabrication techniques.
3. To introduce various sensors and actuators.
4. To introduce different materials used for MEMS.
5. To educate on the applications of MEMS to disciplines beyond electrical and mechanical engineering.

Syllabus Content:

Unit-I: Introduction: Intrinsic characteristics of MEMS- Energy domains and Transducers-Sensors and Actuators- Introduction to Micro-fabrication – Silicon based MEMS processes – New materials – Review of electrical and mechanical concepts of MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending – Torsional deflection.

Unit-II: Sensors and Actuators-I : Electrostatic sensors – Pparallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro grippers – Micro motors – Thermal sensing and actuation – Thermal expansion – Thermocouples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators – Actuation using Shape memory alloys.

Unit-III: Sensors and Actuators-II : Piezoresistive sensors - Piezoresistive sensor materials – Stress analysis of mechanical elements – Applications to inertia, pressure, tactile and flow sensors – Piezoelectric sensors and actuators – Piezoelectric effects - Piezoelectric materials – Applications to inertia, acoustic, tactile and flow sensors.

Unit-IV: Micromachining: Silicon Anisotropic etching – Anisotropic Wet etching – Dry etching of Silicon – Plasma etching – Deep reaction Ion etching (DRIE) – Isotropic Wet etching – Gas phase etchants – Case studies – Basic surface micro machining processes – Structural and Sacrificial materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA process - Assembly of 3D MEMS – Foundry process.

Unit-V: Polymer and Optical MEMS: Polymer in MEMS – Polimide – SU-8 – Liquid crystal polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon – Applications to Acceleration, pressure, flow and tactile sensors – Optical MEMS – Lenses and Mirrors – Actuators for Active optical MEMS.

TEXT BOOKS:

1. Chang Liu, Foundations of MEMS, Pearson Education Inc., 2012.

2. Stephen D Senturia, Microsystem Design, Springer publication, 2000.

3. Tai Ran Hsu, MEMS & Micro systems design and Manufacture, Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS:

1. N Premchand Mahalik, MEMS, The McGraw-Hill Companies, 2011.
2. Nadim Maluf, An Introduction to Micro Electro Mechanical System Design, Artech House,