SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)
Sree Sainath Nagar, Tirupati

Department of Electronics and Communication Engineering

Supporting Document for 1.1.2

Syllabus Revision carried out in 2016

Program: B.Tech.- Electronics and Communication Engineering

Regulations : SVEC-16

This document details the following:

1. Courses where syllabus has been changed 20% and more.
2. Course-wise revised syllabus with changes highlighted.

Note: *For SVEC-16 revised syllabus, SVEC-14 (previous syllabus) is the reference.*

List of Courses where syllabus content has been changed (20% and more)

S. No.	Course Code	Name of the course	Percentage of content changed	Page Number in which Details are Highlighted
1.	16BT30431	Basic Electronics and Digital Design Lab	100	04
2.	16BT40401	Analog Communications	20	06
3.	16BT40433	Pulse and Digital Circuits Lab	50	10
4.	16BT50404	Electronic Measurements and Instrumentation	40	12
5.	16BT50431	Linear and Digital IC Applications Lab	100	16
6.	16BT60403	Analog IC Design	60	17
7.	16BT60405	Radar Engineering	90	20
8.	16BT60407	Digital CMOS IC Design	40	24
9.	16BT60408	Information Theory and Coding	100	27
10.	16BT60410	Nanoelectronics	100	29
11.	16BT60431	Digital Communications Lab	100	31
12.	16BT70401	Cellular and Mobile Communications	40	32
13.	16BT70402	Embedded Systems	80	36
14.	16BT70403	Microwave Engineering	30	39
15.	16BT70404	Advanced Digital Signal Processing	20	43
16.	16BT70405	Mixed Signal Design	20	46
17.	16BT70407	Wireless Communication and Networks	100	49
18.	16BT70409	RF Engineering	100	51
19.	16BT70431	Antennas and Microwave Engineering Lab	50	53
20.	16BT70432	Embedded Systems Lab	100	56
21.	16BT70413	Introduction to Nanoscience and Nanotechnology	100	58
22.	16BT1HS01	Technical English	20	60
23.	16BT1HS31	English Language Lab	20	64
24.	16BT1BS02	Engineering Physics	20	68
25.	16BT2BS01	Transformation Techniques and Partial Differential Equations	100	72
26.	16BT4HS31	Soft Skills Lab	100	74
27.	16BT6HS05	French Language	100	76

S. No.	Course Code	Name of the course	Percentage of content changed	Page Number in which Details are Highlighted
28.	16BT6HS06	German Language	100	78
29.	16BT6HS07	Indian Constitution	100	80
30.	16BT6HS08	Indian Economy	100	82
31.	16BT6HS09	Indian Heritage and Culture	100	84
32.	16BT6HS10	Indian History	100	86
33.	16BT6HS11	Personality Development	100	88
34.	16BT6HS13	Philosophy of Education	100	90
35.	16BT6HS13	Public Administration	100	92
36.	16BT60112	Building Maintenance and Repair	100	94
37.	16BT60115	Environmental Pollution and Control	40	96
38.	16BT10232	Electrical and Electronics Workshop Practice	100	99
39.	16BT30251	Electrical Technology Lab	36	101
40.	16BT20541	Foundations of Data Structures	100	104
41.	16BT20551	Foundations of Data structures Lab	100	106
42.	16BT60310	Managing Innovation and Entrepreneurship	50	107
		Average %**(A)**	74.43	-
		Total No. of Courses in the Program **(T)**	112	
		No. of Courses where syllabus (more than 20% content) has been changed **(N)**	42	
		Percentage of syllabus content change in the courses **(C)=(A x N)/100**	31.26	
		Percentage of Syllabus Content changed in the Program (P)= C/T	**27.91**	

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II B.Tech. - I semester

(16BT30431) BASIC ELECTRONICS AND DIGITAL DESIGN LAB

(Common to ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Electronic Devices and Circuits & Switching Theory andLogic Design.

COURSE DESCRIPTION: Diode characteristics; Rectifiers; BJT and FET characteristics; UJT and SCR characteristics; BJT Amplifiers; Combinational Circuits; Realization of Flip-flops; Sequential Circuits; Demonstration on VHDL Programme.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in different electronic devices, analog and digital circuits

CO2. Analyze the characteristics of different electronic devices and circuits like
- Diodes-PN Junction Diodes, Zener Diodes, SCR
- Transistors-BJT,FET,UJT
- Combinational Circuits-HA, FA
- Flip Flops-JK FF, D FF
- Sequential Circuits -Counters

CO3. Design electronic circuits like FET Amplifiers, Combinational Circuits and Sequential Circuits.

CO4. Solve engineering problems with better Electronic circuits.

CO5. Work individually and also in a group in the area of Analog and Digital circuits**.**

CO6. Communicate verbally and in written form in the area of Electronic Devices and circuits.

LIST OF EXERCISES:

PART A

ANALOG DEVICES AND CIRCUITS (Minimum SIX experiments to be conducted)

1. PN Junction and Zener diodes characteristics
2. Ripple Factor and Load Regulations of Rectifier with and without filters (Full wave or Half wave)
3. Input and Output characteristics of Transistor in CE configuration
4. Drain and Transfer Characteristics of JFET
5. Design an Common Source Amplifier Stage and Plot its Frequency response
6. UJT Characteristics
7. SCR characteristics

PART B

DIGITAL CIRCUITS (Minimum FOUR experiments to be conducted)

Design and Realization of

1. Basic gates using universal gates
2. Half Adder and Full Adder using logic gates
3. Multiplexer and Demultiplexer using logic gates
4. Flip Flops using logic gates
5. Asynchronous Counter using ICs
6. Synchronous Counter using ICs

Demonstration of

7. VHDL Programme

II B.Tech. - II semester

(16BT40401) ANALOG COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Electronic Devices and circuits, Signals and Systems.

COURSE DESCRIPTION:
Continuous wave modulations; Modulators and De-Modulators; Transmitters; Receivers; Noise performance; Pulse modulations; Multiplexing.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in
- Elements of communication systems.
- Amplitude, Frequency, and Phase Modulations andDe-Modulations.
- Noise
- Multiplexing.

CO2. Analyze Noise Performance in different modulation systems, calculation of total power and bandwidth.

CO3. Design Transmitters and Receivers with high signal to noise ratio.

CO4. Solve problems pertaining to modulation schemes, transmitters and receivers considering noise effects.

CO5. Select, and apply appropriate techniques for different modulation schemes understanding power and bandwidth limitations.

CO6. Follow standards while designing transmitters and receivers.

DETAILED SYLLABUS :

UNIT-I: AMPLITUDE MODULATION AND DEMODULATION (12 Periods)
Elements of Communication Systems, Modulation, Modulation Methods, Need for Modulation, Amplitude Modulation (AM), Generation of AM waves - Square law modulator, switching modulators; Demodulation of AM waves – Square law detector, Envelope detector; Double sideband suppressed carrier (DSBSC), Generation of DSBSC waves - Balanced modulator, Ring modulator; Coherent detection of DSBSC waves - Costas receiver, squaring loop; Single sideband modulation (SSB), Generation of SSB waves - Frequency Discrimination Method, Phase Discrimination Method; Demodulation of SSB waves, Vestigial sideband (VSB) modulation & demodulation, Frequency division multiplexing.

UNIT-II: ANGLE MODULATION AND DEMODULATION (09 Periods)
Basic Definitions Phase modulation (PM) and frequency modulation (FM), Single-Tone FM, Bandwidth of angle modulated waves - Narrow band frequency modulation (NBFM) and Wide band frequency modulation (WBFM); Transmission Bandwidth of FM Waves, Generation of FM waves – Indirect FM, Direct FM; Demodulation of FM Waves- Frequency Discrimination, PLL Demodulator.

UNIT-III: NOISE **(09 Periods)**

Noise in Analog communication System, Signal to Noise ratio in AM, DSB & SSB System, Signal to Noise ratio in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & De-emphasis, FM Capture Effect.

UNIT-VI: TRANSMITTERS AND RECEIVERS **(10 Periods)**

Radio Transmitter - Classification of Transmitters, AM Transmitter, FM Transmitter; Radio Receivers - Receiver Types, Tuned radio frequency receiver, Super heterodyne receiver, Intermediate frequency, AGC, FM Receiver, Amplitude limiting; Comparison FM with AM Receiver, Radio Receiver measurements - Sensitivity, Selectivity, and fidelity.

UNIT-V: PULSE MODULATION **(05 Periods)**

Analog pulse modulation schemes, Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes; Time division multiplexing.

Total Periods: 45

TEXT BOOKS:

1. Simon Haykin, *Communication Systems,* Wiley-India edition, 3rd Edition, 2010.
2. R.P. Singh, S. P. Sapre, *Communication Systems*, TMH, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Herbert Taub & Donald L Schilling, *Principles of Communication Systems*, Tata McGraw-Hill, 3rd Edition, 2009.
2. B. P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford Univ. press, 3rd Edition, 2006.
3. Sham Shanmugam, *Digital and Analog Communication Systems*, Wiley-India Edition, 2006.

II B.Tech. II Semester
14BT40401: ANALOG COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Courses on Semiconductor Devices and circuits, Signals and Systems and Probability & Stochastic Processes.

COURSE DESCRIPTION:
Continuous Wave Analog Modulations; Pulse Analog Modulations; Modulators and De-Modulators; AM and FM Transmitters and Receivers; Noise performance of AM and FM Systems; TDM and FDM systems; Applications of AM and FM Systems.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to

CO7. Demonstrate fundamental knowledge in
- Elements of Analog Communication systems.
- Generation and Detection of AM, PM, FM and Pulse modulated signals
- Effect of noise on AM and FM transmission
- TDM and FDM systems.

CO8. Analyze different types of analog modulation systems and calculate total power, bandwidth of AM, PM and FM.

CO9. Design an efficient Transmitter and Receiver based on SNR, bandwidth and equipment complexities.

CO10. Formulate and solve specific problems in analog communication systems.

DETAILED SYLLABUS

UNIT-I : AMPLITUDE MODULATION – I (10 Periods)
Introduction to communication system, Need for modulation, Amplitude Modulation: Time domain and frequency domain description - single tone modulation - Power relations in AM waves, Generation of AM waves: Square law modulator - Switching modulator, Detection of AM waves: Square law detector - Envelope detector, Double Side Band Suppressed Carrier Modulation: Time domain and frequency domain description, Generation of DSB-SC Waves: Balanced Modulators - Ring Modulator, Detection of DSB-SC modulated waves-Coherent detector, COSTAS Loop

UNIT-II : AMPLITUDE MODULATION – II (8 Periods)
AM-SSB modulation: Frequency domain description, Frequency discrimination method for generation of AM-SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM-SSB Modulated waves, Demodulation of AM-SSB Waves, Signal to Noise ratio in coherent detection of AM-SSB wave, Vestigial Side Band Modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave plus Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT-III : ANGLE MODULATION (8 Periods)
Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves –Indirect method, Direct generation; Demodulation of FM, Bandpass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM receiver, FM Capture Effect.

UNIT-IV : ANALOG COMMUNICATION SYSTEMS (13 Periods)
TRANSMITTERS: Radio Transmitter, Classification of radio transmitters, AM Transmitter, Collector Modulator, Balanced modulator using transistors, FM Transmitter, Reactance FET modulator, Varactor diode modulator, frequency stability in FM Transmitter.

RECEVERS: Radio Receiver, Classification of radio receivers, Tuned radio frequency receiver, Superheterodyne receiver, Choice of IF, Receiver Characteristics, AGC, FM Receiver, Amplitude limiting, Comparison between AM and AM Receivers.
NOISE: Band-Pass systems, Signal to Noise ratio in coherent detection of DSBSC, SSB, Signal to Noise ratio in envelop detection of AM, Signal to Noise ratio in Angle Modulation System- Narrowband & wideband, Threshold in Angle Modulation System, Pre-emphasis & De-emphasis.

UNIT-V : PULSE ANALOG MODULATION **(6 Periods)**
Pulse modulation, Pulse Amplitude modulation, Generation & demodulation of PAM, Pulse Width Modulation, Generation & demodulation of PWM, Pulse Position Modulation, Generation and demodulation of PPM. Multiplexing, Time Division Multiplexing, Frequency Division Multiplexing.

Total Periods: 45

TEXT BOOKS:

1. Simon Haykin, *Communication Systems*, John Wiley, 2nd Edition, 1978.
2. B. P. Lathi, Modern Digital and Analog Communication Systems, Oxford Univ. press, 3rd Edition, 2006

REFERENCE BOOKS:

1. Sam Shanmugam, *Digital and Analog Communication Systems*, John Wiley, 2006.
2. R. P. Singh, S.P. Sapre, *Communication Systems - Analog and Digital*, TMH, 2nd Edition, 2007.
3. George Kennedy and Bernard Davis, *Electronics & Communication System*, TMH, 2004.

II B.Tech. - II semester

(16BT40433) PULSE AND DIGITAL CIRCUITS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES:A course on Pulse and Digital Circuits

COURSE DESCRIPTION:
Linear and non-linear Wave shaping circuits; Transistor switching times; UJT relaxation oscillator; sampling and logic gates; Design of Multivibrator circuits.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Apply the knowledge in different Pulse and digital circuits.
CO2. Analyze the characteristics of different Circuits like
- RC Low Pass and High pass Circuits
- Clipping and Clamping Circuits
- Sampling and Logic Gates

CO3. Design the circuits like Multi-vibrators, Sampling Gates, UJT Relaxation Oscillator,Bootstrap sweep circuit, Constant Current Sweep Generator using BJT.
CO4. Provide valid conclusions through the design and conduct of experiments, analysis and synthesis.
CO5. Apply conversion techniques for design of multivibrators.
CO6. Function effectively as an individual and as a member in a group in the area of pulseand digital circuits.
CO7. Communicate effectively to write report and design documentation in the area of pulse and digital circuits.

LIST OF EXERCISES:

(Minimum of **twelve experiments** to be conducted)

PART – A

1. Linear wave shaping - High Pass and Low Pass RC Circuits.
2. Non Linear wave shaping – Clippers and Clampers.
3. Transistor as a switch.
4. Schmitt Trigger.
5. UJT Relaxation Oscillator
6. Constant Current Sweep Generator using BJT.
7. Bootstrap sweep circuit.
8. Sampling Gates.
9. Study of Logic Gates & Some applications.
10. Characterization of CMOS Inverter.

PART – B (Design aspects included)

1. Bistable Multivibrator.

2. Monostable Multivibrator.
3. Astable Multivibrator.

III B. Tech. – I Semester
14BT50422: PDC & IC Lab

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	--	--	3	2

PRE-REQUISITES: Courses on Pulse and Digital Circuits and Linear IC Applications.

COURSE DESCRIPTION: Linear and non-linear Wave shaping circuits; generation of sweep signal; sampling and logic gates; design of multivibrator circuits and filters, verification of Op-Amp applications; Timers; Voltage regulator; ADC and DAC;

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:
CO1. Analyze Linear, non-linear Wave shaping circuits and applications of Op-Amp.
CO2. Design different multivibrator circuits and filters.
CO3. Conduct of experiments, analysis and interpretation of data, and synthesis of the information to provide valid solutions.

List of experiments
Minimum Twelve Experiments to be conducted

PART A: **Pulse and Digital Circuits Lab**: (Minimum of six experiments to be conducted)

1. Linear wave shaping - High Pass and Low Pass RC Circuits.
2. Non-Linear wave shaping – Clippers and Clampers.
3. Bistable Multivibrator.
4. Astable Multivibrator.
5. Schmitt Trigger.
6. Bootstrap sweep circuit.
7. Sampling Gates.
8. Study of Logic Gates & Some applications.

PART B: **IC Lab:** (Minimum of six experiments to be conducted)

1. Op-Amp Applications-Adder, Subtractor and Comparator circuits.
2. Active Filter Applications-LPF, HPF (first and second order).
3. Function Generator using Op-Amps.
4. IC 555 Timer-Monostable and Astable Multivibrators.
5. IC 566-VCO Applications.
6. Voltage Regulator using IC 723.
7. 4 Bit ADC and DAC.
8. Precision Rectifier using Op-Amp.

III B.Tech. - I semester

(16BT50404) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES:
Courses on Electronic Devices and circuits, Network Analysis, Linear IC Applications and Digital IC Applications.

COURSE DESCRIPTION:
Measurements and Measuring Systems; Signal Analyzers and Oscilloscopes; Transducers; Display Devices and Recorders; Data Acquisition Systems and Telemetry.

COURSE OBJECTIVES:

CEO1: To impart knowledge in electronic instruments.
CEO2: To develop skills in analysis, design, problem solving and apply of techniques in measuring electrical and non electrical quantities to solve engineering problems.
CEO3. To inculcate attitude for providing instrumentation solutions for societal needs.

COURSE OUTCOMES:

On successful completion of this course the students will be able to

CO1: Demonstrate knowledge in

- Working of measuring instruments
- Operating principles of various display and recording devices
- Various measurement techniques
- Errors in measurements and their rectification
- Transmitting techniques of various electrical and non electrical quantities
- Application of digital techniques in development of instrumentation systems

CO2: Analyse and compare the performance of various measuring systems based on the response to the given inputs.

CO3: Design of basic electronic instruments according the required specifications.

CO4: Solve engineering problems using different transducers for measurement of an electrical or non-electrical quantity and establish the drawbacks of instruments.

CO5: Create effective and suitable techniques to overcome limitations of the instruments and display devices in measuring systems.

CO6: Apply the instrumentation technology to provide wide range of solutions for the problems of Societal, Health and Safety issues in real time world.

DETAILED SYLLABUS:

UNIT-I: MEASUREMENTS AND MEASURING SYSTEMS **(10 Periods)**

Static characteristics – Accuracy, Precision, Resolution, Sensitivity, measurement Errors; Dynamic Characteristics - Speed of response, fidelity, Lag, Dynamic error and Statistical Analysis; Basic meter movement; Ammeters – Multirange, Universal Shunt, Extending Ranges; DC voltmeters – Multirange, Range extension, Loading, Transistorized Voltmeter; AC voltmeters – Rectifier type, Thermocouple Type; Ohmmeters - Series type and Shunt type; Calibration of DC Instrument & Ohmmeter, Multimeter for Voltage, Current & Resistance measurements.

UNIT-II: TRANSDUCERS AND BRIDGES (10 Periods)

Transducers: Classification of Transducers; Measurement of Displacement (Resistance, Capacitance, Inductance, LVDT), Force (Strain Gauges), Pressure (Piezoelectric Transducers), Temperature (Resistance Thermometers, Thermocouples, Thermistors); Measurement of Velocity, Acceleration, Vibration, Moisture and pH value.

Bridges: Wheatstone bridge, Kelvin Bridge, Practical Kelvin's double bridge, Maxwell's bridge, Hay's bridge, Schering bridge, Wien Bridge, Anderson Bridge, Errors and precautions in using bridges, Q-meter.

UNIT-III: SIGNAL ANALYZERS AND OSCILLOSCOPES (12 Periods)

Signal Analyzers: Wave analyzers - Frequency Selective Wave Analyzer, Heterodyne Wave Analyzer, Application of Wave Analyzers, Harmonic Distortion Analyzers, Total Harmonic Distortion; Spectrum Analyzers – Basic Spectrum Analyzer, Spectral Displays, Spectra of Different Spectrum Analyzers.

Oscilloscopes: Oscilloscope Block diagram, Cathode Ray Tube, Vertical Deflection System, Delay Line, Horizontal Deflection System - Triggered Sweep, Delayed sweep; CRO Probes, Dual Beam & Trace CROs, Measurement of Amplitude, Frequency and Phase (Lissajous method), Sampling Oscilloscope, Analog Storage Oscilloscope, Digital Storage Oscilloscope.

UNIT-IV: DISPLAY DEVICES AND RECORDERS (7 Periods)

Display Devices: Segment Displays – Seven Segment Display, Dot Matrix Display; LCD Display, BCD to 7 Segment Converter, BCD to Dot Matrix Converter.

Recorders: Strip Chart Recorder and X-Y Recorder.

UNIT-V: DATA ACQUISITION SYSTEMS AND TELEMETRY (6 Periods)

Data Acquisition System: Generalized Data Acquisition System, Single and Multi Channel DAS.

Telemetry: General Telemetry System, Types of Telemetry Systems, Land Line Telemetry Systems – Voltage, Current and Position Telemetering Systems; Introduction to Radio Frequency Telemetry.

Total Periods: 45

TEXT BOOKS:

1. A.D. Helfrick and W.D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI, 5th Edition, 2006.
2. A.K. Sawhney, *A Course in Electrical & Electronic Measurement and Instrumentation*, DhanpatRai& Company Private Limited, New Delhi, 18th Edition, 2007.

REFERENCE BOOKS:

1. David A. Bell *Electronic Instrumentation & Measurements*, PHI, 2nd Edition, 2003.
2. H.S.Kalsi, *Electronic instrumentation*, TMH, 3rd Edition, 2015.

IV B. Tech. – I Semester
14BT70401: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES:
Courses on Semiconductor Devices and circuits, Linear IC Applications.

COURSE DESCRIPTION:
Performance characteristics of Instruments; Indicators; Signal Generators; Analyzers; Oscilloscopes; AC and DC Bridges; Sensors and Transducers; Data Acquisition System.

COURSE OUTCOMES:
On successful completion of the course, the student will be able to:

1. Demonstrate knowledge in
    - Working of Instruments.
    - Various measurement techniques available
    - Errors in measurements and their rectification
2. Analyze parameters measuring methods and evaluate errors involved in measurement.
3. Solve engineering problems by proposing potential solutions leading to better instruments designs.

UNIT-I **(10 Periods)**
PERFORMANCE CHARACTERISTICS OF INSTRUMENTS
Static characteristics, Accuracy, Precision, Resolution, Sensitivity, Errors in measurement, Dynamic Characteristics-speed of response, fidelity, lag and dynamic error, Statistical Analysis.
DISPLAY DEVICES: Basic meter movement, DC voltmeters-multirange, range extension, Loading, Transistor Voltmeter, Solid State Voltmeter, AC voltmeters –using rectifiers, Multirange, range extension, Ammeters- Multirange, Universal Shunt, Extending Ranges, ohmmeters, series type and shunt type, Calibration of DC Instrument & Ohmmeter, Multimeter for Voltage, Current and Resistance measurements.

UNIT-II: **(08 Periods)**
SIGNAL GENERATORS
Fixed and Variable AF oscillators, Standard Signal Generator, AF Sine & Square wave Generator, Function Generators-Square & Pulse, Random noise, Sweep, and arbitrary waveform generators specifications and principles of working (Block diagram approach).
ANALYZERS: Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, Digital Fourier analyzers, and Logic analyzers.

UNIT-III: OSCILLOSCOPES **(10 Periods)**
Block diagramof CRO, CRT features, Vertical and Horizontal amplifiers, Horizontal and Vertical deflection systems, Triggered Sweep CRO, and Delayed sweep, sync selector circuits, probes for CRO – active, passive, and attenuator type, Dual Beam & Trace CRO,Measurement of amplitude, frequency and phase (Lissajous method).Standard specifications of CRO.
Sampling oscilloscope, Storage oscilloscope, Digital readout Oscilloscope, Digital storage oscilloscope, Digital frequency counter, time and phase measurement.

UNIT-IV:BRIDGESAND RECORDERS **(08 Periods)**
DC BRIDGES: Wheatstone bridge, Kelvin Bridge, Practical Kelvin's double bridge.
ACBRIDGES: Maxwell's bridge, Hay's bridge,Schering bridge, Wien Bridge,Anderson Bridge, Errors and precautions in using bridges, Q-meter.
RECORDERS: Strip chart recorder and X-Y recorder.

UNIT-V: **(09 Periods)**
SENSORS AND TRANSDUCERS
Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT), Force (strain gauges), Pressure (piezoelectric transducers), Temperature (resistance thermometers, thermocouples, and Thermistors), Velocity, Acceleration, Vibration.

DATA ACQUISITION SYSTEM: Generalized Data Acquisition System, Signal Conditioning, Single & Multi Channel DAS.

Total Periods: 45

TEXT BOOKS:

3. H.S.Kalsi, *Electronic instrumentation*, TMH, 3rd Edition, 2015.
4. A.D. Helfrick and W.D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI, 5th Edition, 2006.

REFERENCE BOOKS:

1. Sawhney.A.K., *A Course in Electrical & Electronic Measurement and Instrumentation*,DhanpatRai& Company Private Limited, New Delhi, 18th Edition,2007.
2. David A. Bell,*Electronic Instrumentation & Measurements*, PHI, 2nd Edition, 2003.

III B.Tech. - I semester

(16BT50431) LINEAR AND DIGITAL IC APPLICATIONS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Linear IC Applications and Digital IC Applications.

COURSE DESCRIPTION: Design and verification of Op-Amp applications; Timers; Voltage regulator; ADC and DAC; Simulation and synthesis of combinational and sequential circuits; XILINX tools.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in different Linear and Digital integrated circuits applications and XILINX tools.
CO2. Analyzedifferentcircuits built with linear and digital ICs.
CO3. Design different multivibrator circuits, filters and digital circuits.
CO4. Conduct of experiments, analysis and interpretation of data, and synthesis of the information to provide valid solutions.
CO5. Model a Linear and Digital integrated circuits using HDL tools.
CO6. Function effectively as an individual and as a member in a group in the area of IC applications.
CO7. Communicate in verbal and written form in the area of IC applications.

LIST OF EXERCISES:

PART A: Linear IC Applications: (Minimum of **six experiments** to be conducted)

9. Op-Amp Applications-Adder, Subtractor and Comparator circuits.
10. Active Filter Applications-LPF, HPF (first and second order).
11. Function Generator using Op-Amps.
12. IC 555 Timer-Monostable and Astable Multivibrators.
13. IC 566-VCO Applications.
14. Voltage Regulator using IC 723.
15. 4 Bit ADC and DAC.
16. Precision Rectifier using Op-Amp.

PART B: **Digital IC Applications:** (Minimum of **six experiments** to be conducted)

Simulate the internal structure of the following Digital IC's using HDL and verify the operations of the Digital IC's (Hardware) in the Laboratory.

1. Half Adder, Full Adder, Half Subtractor & Full Subtractor.
2. 8-3 Encoder-74x148.
3. 3-8 Decoders -74x138.
4. 8x1 Multiplexer -74x151 and 2x4 Demultiplexer -74x155.
5. 4 Bit Comparator-74x85.
6. Decade counter-74x90.
7. Universal shift Register – 74X194/195

III B.Tech. - II semester

(16BT60403) ANALOG IC DESIGN

(Program Elective – 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:A Course on Electronic Circuits analysis and design.

COURSE DESCRIPTION:
MOS & CMOS Devices and Modeling; Current mirrors and biasing techniques; Single stage amplifiers; Sample and Hold Circuits; Bandgap Reference Circuits and Comparators.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in
- MOS device modeling
- Current Mirrors
- Single stage amplifiers
- Bandgap Reference Circuits.
- Sample and hold circuits
- Comparators.

CO2. Analyze analog integrated circuits suitable for real time applications.
CO3. Design and Develop Analog Integrated Circuits using MOS Transistor.
CO4. Use different styles of CMOS Circuit modelling to synthesize analog ICs.
CO5. Apply appropriate biasing techniques to improve performance of analog circuits.
CO6. Assess the performance of sample and hold circuits and Bandgap reference circuits in analog ICs suitable for societal use.

DETAILED SYLLABUS:

UNIT - I: MOS DEVICE MODELING **(10 Periods)**
MOSFET Capacitances, Latch up in CMOS Technology, Short Channel Effects in MOS Transistors, Weak Inversion in MOS Transistors, Small Signal Modeling of MOS Transistors, Large Signal Modeling of MOS Transistors.

UNIT - II: CURRENT MIRRORS AND BIASING TECHNIQUES **(10 Periods)**
Current Mirrors - Simple Current Mirrors, Simple Current Mirror with Source Degeneration, Cascode Current Mirror and Wilson Current Mirror.
Biasing Techniques: CS Biasing, CG Biasing, Source Follower Biasing, Differential Pair Biasing.

UNIT - III: SINGLE STAGE AMPLIFIERS **(07 Periods)**
Common Source Stage with resistive load, Source follower, Common Gate Stage, Cascode Stage.

UNIT - IV: SAMPLE AND HOLD CIRCUITS, BANDGAP REFERENCE CIRCUITS **(10 Periods)**
Performance of Sample and Hold Circuits, MOS Sample and Hold Basics, Examples of CMOS S/H circuits, Bipolar and BICMOS Sample and Hold circuits,Band gap Voltage Reference Basics, Circuits for Band gap References.

UNIT - V: COMPARATORS **(08 Periods)**

Using an Opamp for a Comparator, Charge-Injection Errors, Latched Comparators, Examples of CMOS and BiCMOS Comparators.

Total Periods: 45

TEXT BOOKS:

1. David A. Johns, Ken Martin,*Analog Integrated Circuit Design*, Wiley Student Edition, 1997.
2. Behzad Razavi, *Design of Analog CMOS Integrated Circuits,* Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, *Analysis and Design of Analog Integrated Circuits,* Wiley India, 5th Edition, 2013.
2. Philip E. Allen and Douglas R. Holberg, *CMOS Analog Circuit Design*, Oxford University Press, International 2nd Edition/Indian Edition, 2010.

III B. Tech. II Semester
14BT60404: Analog IC Design
(PE-I)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES:
Courses on Semiconductor Devices and Circuits and Electronic Circuits Analysis and Design.

COURSE DESCRIPTION:
MOS & CMOS Devices and Modeling, Current mirrors, Band gap References, Differential Amplifiers, Design of Two-Stage Op Amps. Open Loop Comparators, Ring Oscillators. Voltage Controlled Oscillators, Non-Ideal Effects in PLLs and Delay Locked Loops.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:

CO1. Demonstrate knowledge in
- MOS devices and modeling
- Current Mirrors
- Output Amplifiers
- Two stage operational Amplifiers
- Open loop comparators
- Oscillators and Phase locked loop

CO2. Analyze complex engineering problems in any analog circuits in real time applications.

CO3. Design and Develop Analog ICs subsystems and systems.

CO4. Solve engineering problems for feasible and optimal solutions in the core area of analog ICs.

DETAILED SYLLABUS

UNIT - I: MOS & CMOS Devices and Modeling (08 Periods)
The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Sub-threshold MOS Model.

UNIT - II: Analog CMOS Sub-Circuits (09 Periods)
MOS Switch, MOS Diode/Active Resistor, Current Sinks and Sources, Current Mirrors-basic current mirrors, Source degenerated current mirrors, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT - III: CMOS Amplifiers (09 Periods)
Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers.

UNIT - IV: CMOS Operational Amplifiers (09 Periods)
Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps.

UNIT -V: Comparators and Oscillators (10 Periods)
Comparators: Characterization of Comparator, Two-Stage Comparator, Open-Loop Comparator, Discrete-Time Comparators.
Oscillators: General Considerations, Ring Oscillators, Voltage Controlled Oscillators.

Total Periods: 45

TEXT BOOKS:
3. Philip E. Allen and Douglas R. Holberg, *CMOS Analog Circuit Design,* Oxford University Press, International Second Edition/Indian Edition, 2010.

4. Behzad Razavi, *Design of Analog CMOS Integrated Circuits*, Tata-Mc GrawHill, 2008.

REFERENCE BOOKS:

3. Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, *Analysis and Design of Analog Integrated Circuits*, Wiley India, Fifth Edition, 2013.
4. David A.Johns, Ken Martin *Analog Integrated Circuit Design*, Wiley Student Edn, 1997.

III B.Tech. - II semester

(16BT60405) RADAR ENGINEERING

(Program Elective – 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:

Courses on Antennas and Wave propagation &Microwave Engineering.

COURSE DESCRIPTION:

Radar equation; Targets; classification of radars; MTI and pulsed radar;Tracking with radar; radar receivers; Echo signal detection in the presence of noise; Navigational Aids.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in
- Principle of working of radars
- MTI and Pulse Doppler radars
- Tracking and detection of radar signals
- Radar displays and duplexers
- Radar receivers.
- Navigational Aids.

CO2. Analyze to detect radar echo signals, range and Doppler measurement.

CO3. Design and develop optimum matched filters, radar receivers and radar system components.

CO4. Solve engineering problems to detect radar signals for range prediction anddetectable signal in the presence of noise

CO5. Apply appropriate techniques for signal detection, tracking and global positioning in the field of radar systems and navigational aids.

CO6. Provide wide range of feasible solutions for accurate echo detection and study of Navigational aids useful in real time applications.

DETAILED SYLLABUS :

UNIT I: RADAR EQUATION **(10 Periods)**

Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT II: DOPPLER RADAR **(12 Periods)**

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems. FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar, MTI-Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation,

Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

UNIT III: RADAR TRACKING (06 Periods)

Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT IV: RADAR TRANSMITTERS AND RECEIVERS (11 Periods)

Noise Figure and Noise Temperature, Display types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations. Detection of Radar Signals in Noise - Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

UNIT V: FUNDAMENTALS OF NAVIGATIONAL AIDS (06 Periods)

Introduction and Types of Navigational Aids, VHF Omni Directional Range (VOR) navigation system- salient features-principle of operation- advantages and limitations, Salient features of LORAN and DECCA navigation system.

Total Periods: 45

TEXT BOOKS:

1. Merrill I. Skolnik, *Introduction to Radar Systems*, TMH Special Indian Edition, 2nd Edition, 2007.
2. G S N Raju,*Radar Engineering and Fundamentals of Navigational Aids*, I.K. International Pvt. Ltd, 1st Edition, 2010.

REFERENCE BOOKS:

1. Merrill I. Skolnik, *Introduction to Radar Systems*, TMH, 3rd Edition, 2001.
2. Byron Edde, *Radar Principles, Technology, Applications*, Pearson Education, 2004.

III B. Tech. II Sem.
14BT60406: TV AND RADAR ENGINEERING
(PE-I)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES:
Courses on Pulse and Digital Circuits, Analog and Digital Communications.

COURSE DESCRIPTION:
Introduction to Television systems, Transmission and reception of video signals, Composite Video Signal, Color TV, Digital TV, Advanced Television systems.
Radar equation, classification of radars, MTI and pulsed radar, radar receivers, Echo signal detection in the presence of noise.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:
CO1. Demonstrate fundamental knowledge in
- Sound and picture transmission
- Composite Video signals & TV picture tubes
- Digital TV technology & Advanced television systems
- CW and MTI Radars
- Radar receivers

CO2. Analyze NTSC, SECAM, PAL coder and decoders and Radar signals in the presence of noise.
CO3. Design Matched filter for radar receiver.
CO4. Solve engineering problems with feasible and economical solutions in television and Radar systems.

DETAILED SYLLABUS:
UNIT-I: BASIC TELEVISION SYSTEM AND SCANNING PRINCIPLES (11 Periods)
Elements of Television system, Sound and picture transmission, scanning process, video signal, transmission & reception of video signals, brightness perception & photometric quantities, aspect ratio & rectangular scanning, persistence of vision & flicker, Kell factor, vertical and horizontal resolution, interlaced scanning, Composite Video Signal: Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system. Standard channel characteristics, reception of the vestigial side band signal, television broadcast channels, television camera pick-ups: Vidicon, Plumbicon.

UNIT-II: COLOR TELEVISION SIGNALS AND SYSTEMS (07 Periods)
Colour fundamentals, mixing of colours and colour perception, chromaticity diagram, colour television camera, Principle and working of of colour television, colour TV signals and transmission, Principles of NTSC, SECAM and PAL coder and decoder.

UNIT-III: DIGITAL TELEVISION TECHNOLOGY (09 Periods)
Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers. Advanced Television systems : Multiplexed Analog Component encoding Television system (MAC TV), High definition television system (HDTV), LCD and LED Displays.

UNIT IV: RADAR (12 Periods)
Radar Range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, SNR, False Alarm Time and Probability, Integration of Radar Pulses, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative

treatment). Doppler Effect, CW Radar – Block Diagram, Applications of CW radar, FM-CW Radar, Multiple Frequency CW Radar. MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers.

UNIT V: RADAR RECEIVERS (06 Periods)

Noise Figure and Noise Temperature, Display types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Detection of Radar Signals in Noise - Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Total Periods: 45

TEXT BOOKS:

1. A.M. Dhake, *Television and Video Engineering*, TMH, 2nd Edition, 2008
2. Merrill I. Skolnik, *Introduction to Radar Systems*, TMH Special Indian Edition, 2nd Edition, 2007.

REFERENCE BOOKS:

1. R.R. Gulati, *Monochrome and color TV*, New Age International publication, 2nd Edition, 2005.
2. Merrill I. Skolnik, *Introduction to Radar Systems*, TMH, 3rd Edition, 2008.
3. Jiun-Haw Lee, david N.Liu, Shin-Tson Wu, *Introduction to Flat Panel Displays*, John Wiley & Sons, 2008.

III B.Tech. - II semester

(16BT60407) DIGITAL CMOS IC DESIGN

(Program Elective – 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:ACourses on VLSI Design.

COURSE DESCRIPTION:
Design styles and characteristics of CMOS digital circuits; Layout design rules; Memory design; Interconnect strategies; Design Methodologies.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:

CO1. Apply knowledge in
- CMOS Circuits
- MOS Layouts
- Memories
- Interconnects
- Methodologies

CO2. Analyze Problems in Interconnect Design.
CO3. Design optimized CMOS Circuits and develop the corresponding Stick Diagrams and Layouts.
CO4. Provide valid solutions to critical problems in CMOS Design.
CO5. Understand the limitations of techniques applied in CMOS design.
CO6. Create Solutions to reduce the power dissipation in CMOS devices for societal needs.

DETAILED SYLLABUS:

UNIT - I: CMOS CIRCUIT AND LOGIC DESIGN (08 Periods)
CMOS Logic Gate Design, CMOS Logic Structures, Clocking Strategies – 2 phase clocking, 4 phase clocking.

UNIT - II:LAYOUT DESIGN RULES (10 Periods)
Need for Design Rules, Stick diagrams, Physical Design of Logic Gates, Design Capture Tools, Design Verification Tools.

UNIT - III: SEMICONDUCTOR MEMORIES (10 Periods)
Classification of Memories, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation; SRAM - operation, Leakage currents in SRAM cells; Flash Memory- NOR Flash and NAND Flash.

UNIT - IV: INTERCONNECT AND CLOCKING STRATEGIES (09 Periods)
Interconnect Parameters – Capacitance, Resistance and Inductance; Electrical Wire Models, Timing classification of Digital Systems, Synchronous Design, Self-Timed Circuit Design.

UNIT - V:CMOSDESIGN METHODS (08 Periods)
Introduction, Design Flows, Design Strategies, Design Methods, Design Options, Design Economics, Data Sheets and Documentation.

Total Periods: 45

TEXT BOOKS:

1. Kamran Eshranghian, Douglas A.Pucknell and Sholeh Eshranghian, *Essential of VLSI Circuits and Systems*, PHI, 1st Edition, 2005.
2. Jan M Rabaey, *Digital Integrated Circuits-A Design Perspective*, Prentice Hall, 1stEdition, 1997.
3. Neil H. E. Weste, David Harris, Ayan Banerjee, *CMOS VLSI Design-A Circuit and Systems Perspective,* Pearson Education India, 3rd Edition, 2005.

REFERENCE BOOK:

1. Jacob Baker, *CMOS: Circuit Design, Layout, and Simulation*, Wiley IEEE Press, 3rd Edition, 2010.

IV B. Tech. – I Semester
14BT70405: DIGITAL CMOS IC DESIGN
(PE-II)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES:
Courses on Digital IC Applications and VLSI Design.

COURSE DESCRIPTION:
Design styles and characteristics of CMOS digital circuits; Transistor sizing and memory design; Design strategies; Layout design rules; Design of sub-systems.

COURSE OUTCOMES: On successful completion of the course, the students will be able to:
CO1. Demonstrate advanced knowledge in
- Static and dynamic characteristics of CMOS.
- Alternative CMOS Logics
- Transistor sizing
- Adders Design
- Design rules to develop layouts
- Estimation of Delay and Power

CO2. Analyze complex engineering problems critically in the domain of CMOS Digital Integrated Circuits for conducting research.
CO3. Solve engineering problems for feasible and optimal solutions in the core area of CMOS Digital ICs.

DETAILED SYLLABUS:
UNIT I: CMOS INVERTERS CHARACTERSTICS and DESIGN STYLES (Periods: 08)
Static and Dynamic characteristics, Static and Dynamic CMOS design- Domino and NORA logic - Combinational and Sequential circuits.

UNIT II: **HIGH SPEED NETWORK AND MEMORY DESIGN (Periods: 09)**
Methods of Logical Effort for transistor sizing -Power consumption in CMOS Gates, Low power CMOS design. CMOS Memory design – SRAM, DRAM.

UNIT III: **DESIGN METHODOLOGY AND TOOLS (Periods: 10)**
Introduction, Structured Design Strategies, Design Methods, Design Flows, Design Economics, Data Sheets and Documentation.

UNIT IV: **LAYOUT DESIGN RULES (Periods: 10)**
Need for Design Rules, Mead Conway Design Rules for the Silicon Gate NMOS Process, CMOS Based Design Rules, Simple Layout Examples, Sheet Resistance, Area Capacitance, Wire Capacitance, Drive Large Capacitive Load**.**

UNIT V: **SUBSYSTEM DESIGN PROCESS (Periods: 08)**
General arrangement of 4-bit Arithmetic Processor, Design of 4-bit shifter, Design of ALU sub-system, Implementing ALU functions with an adder, Multipliers, modified Booth's algorithm.

Total Periods: 45

TEXT BOOKS:

4. Eugene D Fabricus, *Introduction to VLSI Design*, McGraw Hill International Edition. 1990
5. Kamran Eshranghian, Douglas A.Puknell and Sholh Eshranghian, *Essential of VLSI Circuits and Systems*, PHI, 1st edition,2005.
6. Neil H. E. Weste, David Money Harris, *CMOS VLSI Design-A Circuit and Systems Perspective*, Pearson 4th Edition,2011.

REFERENCE BOOKS:

2. John P.Uyemura, *Introduction to VLSI Circuits and Systems*, Wiley Edition, 2002.
3. Sung-Mo Kang & Yusuf Leblebici, *CMOS Digital Integrated Circuits - Analysis & Design*, McGraw Hill, 2nd edition, 1999.
4. Jan M Rabaey, *Digital Integrated Circuits-A Design Perspective*, Prentice Hall, 1st edition, 1997.

III B.Tech. - II semester

(16BT60408)INFORMATION THEORY AND CODING

(Program Elective - 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:A Course on Digital Communications.

COURSE DESCRIPTION:

Information theory; Channel capacity; Linear block codes; Cyclic codes; Convolutional codes; Read-Solomon and Turbo codes.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in Information Theory, Channel Capacity and various error control coding technique.
CO2. Analyze complex engineering problems critically in the domain of information theory, source encoding techniques, channel capacity and error control coding.
CO3. Design various types of channel encoders, syndrome circuits and channel decoders.
CO4. Solve problems pertaining to entropy, source coding and channel coding.
CO5. Use appropriate source and channel coding techniques.
CO6. Apply source and channel coding techniques for providing optimal communication systems for societal use.

DETAILED SYLLABUS

UNIT I: INTRODUCTION (09 Periods)

Entropy: Discrete stationarysources, Markov sources, Entropy of a discrete Random variable-Joint, conditional, relative entropy, Mutual Information and conditional mutual information. Chain rules for entropy, relative entropy and mutual information, Differential Entropy - Joint, relative, conditional differential entropy and Mutual information.

Loss less Source coding: Uniquely decodable codes, Instantaneous codes, Kraft's inequality, optimal codes, Huffman code, Shannon's Source Coding Theorem.

UNIT II: CHANNEL CAPACITY (08 Periods)

Capacity computation for some simple channels, Channel Coding Theorem,Fano's inequality and the converse to the Coding Theorem, Equality in the converse to the coding theorem,The joint source Channel Coding Theorem, The Gaussian channels- Capacity calculation for Band limited Gaussian channels, Parallel Gaussian Channels, Capacity of channels with colored Gaussian noise.

UNIT III: CHANNEL CODING-1 (07 periods)

LinearBlockCodes: IntroductiontoLinearblockcodes,GeneratorMatrix,SystematicLinearBlockcodes, EncoderImplementationofLinearBlockCodes,ParityCheckMatrix,Syndrometesting,Errorcorrection, Decoder Implementation of Linear Block Codes,Error Detecting and Correcting capability of Linear Block codes.

UNITIV: CHANNEL CODING-2 (11 Periods)

CyclicCodes: Algebraic Structure of Cyclic Codes, Binary Cyclic Code Properties, Encoding in Systematic Form, Systematic Encoding with an (n - k)-Stage Shift Register, Error Detection with an (n - k)-Stage Shift Register, Well-Known Block Codes-Hamming Codes, Extended Golay Code, BCH Codes.

ConvolutionalCodes: Convolution Encoding, Convolutional Encoder Representation, Formulation of the Convolutional Decoding Problem, Properties of Convolutional Codes, Sequential Decoding, Application of Viterbi and sequential decoding.

UNIT V: CHANNEL CODING-3 (11 Periods)

Reed-Solomon Codes- Reed-Solomon Error Probability, Finite Fields, Reed-Solomon Encoding, Reed-Solomon Decoding, Interleaving and Concatenated Codes- Block Interleaving, Convolutional Interleaving, Concatenated Codes. Coding and Interleaving Applied to the Compact Disc Digital Audio System- CIRC Encoding, CIRC Decoding. Turbo Codes-Turbo Code Concepts, Encoding with Recursive Systematic Codes, Feedback Decoder, The MAP Decoding Algorithm.

Total Periods: 46

TEXT BOOKS:

1. Thomas M. Cover and Joy A. Thomas, *Elements of Information Theory*, John Wiley & Sons,1st Edition, 1999.
2. Bernard Sklar, *Digital Communications – Fundamental and Application*, PearsonEducation, 2nd Edition, 2009.

REFERENCE BOOKS:

1. John G. Proakis, *Digital Communications*, McGraw Hill Publication, 5th Edition, 2008.
2. SHU LIN and Daniel J. Costello, Jr.,*Error Control Coding – Fundamentals and Applications*, Prentice Hall, 2nd Edition, 2002.

III B.Tech. - II semester

(16BT60410) NANOELECTRONICS

(Program Elective - 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:
Courses on Basic Engineering Physics, Basic Engineering Chemistry and Electronic Devices.

COURSE DESCRIPTION:
Basics of Nanoelectronics; Crystal structure of materials; Fabrication techniques and measurement of nanostructures; Nanoelectronic devices.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:

CO1. Demonstrate the basic knowledge in
- Nanoelectronics,
- Crystal structure of semiconducting material
- Various techniques for fabrication and measurement of nanostructure,
- Semiconducting nano electronic devices.

CO2. Analyze
- Crystal lattices and energy band diagram of semiconducting heterostructures of nanomaterials
- Energy states in nanomaterials.

CO3. Design and develop new semiconducting nano structures with the knowledge of density of states and electron transport.

CO4. Solve the problems related to fabrication of nanoelectronic devices.

CO5. Apply techniques of fabrication and measurement to create nanostructures.

CO6. Apply the ethical standards and legal issues while using chemical substances in fabricating nano device structures.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO NANOELECTRONICS (08 Periods)
The "Top-Down" Approach, Lithography, The "Bottom-Up" Approach; Importance of Nanoelectronics Nanotechnology Potential. The Schr'odinger wave equation, Wave mechanics of particles, Atoms and atomic orbitals.

UNIT – II: MATERIALS FOR NANOELECTRONICS (09 Periods)
Semiconductors, Crystal lattices: bonding in crystals, Electron energy bands, Semiconductor heterostructures, Lattice-matched and pseudomorphic heterostructures; Organic semiconductors, Carbon nanomaterials: nanotubes and fullerenes.

UNIT – III: FABRICATION AND MEASUREMENT TECHNIQUES FOR NANOSTRUCTURES (10 Periods)

Bulk crystal and heterostructure growth: Nanolithography, etching, physical and chemical deposition for fabrication of nanostructures and nanodevices; Techniques for characterization of nanostructures, Spontaneous formation and ordering of nanostructures; Clusters and nanocrystals, Methods of nanotube growth, Chemical and biological methods for nanoscale fabrication, Fabrication of nanoelectromechanical systems.

UNIT – IV: SEMICONDUCTING NANO STRUCTURES (09 Periods)

Time and length scales of the electrons in solids, Statistics of the electrons in solids and nanostructures; The density of states of electrons in nanostructures, Electron transport in nanostructures, Electrons in Quantum well, Quantum wire and Quantum dots.

UNIT – V: NANOELECTRONIC DEVICES (09 Periods)

Resonant tunneling diodes, Field effect transistors, Single electron transfer devices, Potential effect transistors, Light emitting diodes and lasers; Nanoelectromechanical system devices, Quantum dot cellular automata.

Total Periods:45

TEXT BOOKS:

1. Vladimir V. Mitin, Viatcheslav A. Kochelap, Michael A. Stroscio, *Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications,* Cambridge University Press, 2012.
2. George W. Hanson, *Fundamentals of Nanoelectronics*, Prentice Hall, 2007.

REFERENCE BOOKS:

1. Mitin.V, Kochelap.V and Stroscio.M, *Introduction to Nanoelectronics*, Cambridge University Press, 2008.
2. Karl Goserl, Peter Glosekotter and Jan Dienstuhl, *Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum devices*, Springer, 2005.

III B.Tech. - II semester

(16BT60431) DIGITAL COMMUNICATIONS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Signal and Systems &Digital Communications .

COURSE DESCRIPTION:
Simulation and study of various Digital modulation and Demodulation schemes.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in different Digital Communications.
CO2. Compare the characteristics of various Digital modulation schemes and analyze their performance.
CO3. Design various digital modulation and demodulation circuits and study their characteristics.
CO4. Solve problems pertaining to development of modulation schemes.
CO5. Use MATLAB tools for simulation of modulation schemes.
CO6. Function effectively as an individual and as a member in a group in the area of digital communications.
CO7. Communicate in verbal and written form in the area of digital communications.

LIST OF EXERCISES :

1. Verification of Sampling Theorem
2. Pulse code modulation and demodulation
3. Delta modulation and demodulation
4. FSK Modulation and demodulation
5. PSK Modulation and demodulation
6. DPSK Modulation and demodulation
7. QPSK Modulation and demodulation
8. Generation and Detection of PSK & DPSK signals using MATLAB
9. Generation and Detection of QPSK signal using MATLAB
10. Generation and Detection of DM and FSK signals using MATLAB
11. Generation of PCM and DPCM signals using MATLAB
12. Generation of TDM signal using MATLAB

IV B.Tech. - I semester

(16BT70401) CELLULAR AND MOBILE COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Analog and Digital Communications &Antennasand waveguides.

COURSE DESCRIPTION: Concepts of cellular systems; Lee-model for cellular coverage; Desired C/I; Interference and reduction techniques; Frequency management in cellular systems; Handoff techniques; Various modulation techniques and Multiple Access techniques; 2G Systems - GSM - IS-95; 3G systems - WCDMA - CDMA 2000.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate fundamental knowledge in
- Cellular systems
- Interference and cell coverage in Cellular systems
- Handoffs and Dropped calls
- Modulation techniques for cellular systems
- 2G and 3G Wireless communication systems
- Introduction to 4G

CO2. Analyze low interference cellular systems.

CO3. Design omni-directional and directional antenna systems.

CO4. Provide appropriate solution for various scenarios to overcome interference problems.

CO5. Select appropriate antennas to suit the requirements of advanced communication systems.

CO6. Assess and propose cost effective solutions for societal use and minimize the radiation hazards caused by wireless links.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO CELLULAR MOBILE SYSTEMS (10 Periods)

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems.

Elements Of Cellular Radio Systems Design:

General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

UNIT-II: COCHANNEL AND NONCOCHANNEL INTERFERENCE (10 Periods)

Introduction to co-channel interference, Exploring co-channel interference areas in a system, Real time cochannel interference measurement, Design of different antenna systems, Lowering the antenna height, antenna parameters and their effects, Diversity Receiver, Types of Noncochannel Interference.

UNIT-III: CELL COVERAGE FOR SIGNAL AND ANTENNA STRUCTURES (08 Periods)

General introduction, obtaining the mobile point to point model, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics; Cell site antenna heights and signal coverage cells, mobile to mobile propagation, Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

UNIT- IV: FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT, HAND OFF AND DROPPED CALLS (06 Periods)

Frequency Management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

UNIT-V: DIGITAL CELLULAR SYSTEMS (2G AND 3G SYSTEMS) (12 Periods)

Advantages of Digital systems, GSM: , North American TDMA - Architecture, Transmission and modulation, Time alignment and Limitation of Emission, Error corrections, Interleaving and coding, Channels, Enhanced NA-TDMA; CDMA - Output power limits and control-modulation characteristics, Joint detection, call processing; Introduction to 3G, WCDMA-UMTS Physical layer, WCDMA TDD Physical Layer; Overview of CDMA 2000 - Physical layer; Introduction to 4G.

Total Periods: 46

TEXT BOOKS:

1. William C. Y. Lee*, Mobile Cellular Telecommunications*, McGraw Hill, 2nd Edition, 1990.
2. William C. Y. Lee, *Wireless & Cellular Telecommunications*, McGraw Hill, 3rd Edition, 2006.

REFERENCE BOOKS:

1. Theodore S Rappaport, *Wireless Communication Principles and Practice*, Pearson Education, 2nd Edition, 2002.
2. Lawrence Harte*, 3G Wireless Demystified*, McGraw Hill Publications, 2001.

IV B.Tech - II Semester
14BT80401: CELLULAR AND MOBILE COMMUNICATIONS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Analog and Digital Communications and Antennas.

COURSE DESCRIPTION:
Concepts of cellular systems; Lee-model for cellular coverage; desired C/I; Interference and reduction techniques; Frequency management in cellular systems, Handoff techniques; various modulation techniques and Multiple Access techniques, 2G Systems-GSM, IS-95.

COURSE OUTCOMES: On successful completion of the course, the students will be able to:
CO1. Demonstrate knowledge in
- Cellular systems
- Interference and cell coverage in Cellular systems
- Handoffs and Dropped calls
- Modulation techniques for cellular systems
- 2G and 3G Wireless communication system,

CO2. Analyze low interference cellular systems.
CO3. Design omni-directional and directional antenna systems.
CO4. Solve engineering problems with wide range of solutions in cellular communications.

DETAILED SYLLABUS:
UNITI: INTRODUCTION TO CELLULAR MOBILE SYSTEMS (10 Periods)
A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems.
ELEMENTS OF CELLULAR RADIO SYSTEMS DESIGN AND INTERFERENCE
General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems, Introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

UNITII: CELL COVERAGE FOR SIGNAL & ANTENNA STRUCTURES (09 Periods)
General introduction, obtaining the mobile point to point model, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation, Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

UNIT III: FREQUENCY MANAGEMENT & CHANNEL ASSIGNMENT, HAND OFF & DROPPED CALLS (05 Periods)
Frequency Management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

UNIT IV: MODULATION METHODS AND CODING FOR ERROR DETECTION AND CORRECTION (08 Periods)
Modulation methods in cellular wireless systems, OFDM, Block Coding, convolution coding and Turbo coding.

UNIT V:
MULTIPLE ACCESS TECHNIQUES (13 Periods)
FDMA, TDMA, CDMA: Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, probability of bit error considerations, CDMA compared with TDMA.
SECOND GENERATION DIGITAL WIRELESS SYSTEMS

GSM, IS-136 (D-AMPS), IS-95, mobile management, voice signal processing and coding, Introduction to 3G.

Total Periods: 45

TEXT BOOKS:

1. William, C. Y. Lee, *Mobile Cellular Telecommunications*, 2nd Edition, McGraw Hill, 1990.
2. Mischa Schwartz, *Mobile Wireless Communications*, Cambridge University Press, UK, 2005.

REFERENCE BOOKS:

1. *Mobile Communication Hand Books*, 2nd Edition, IEEE Press.
2. Theodore S Rappaport, *Wireless Communication Principles and Practice*, 2nd Edition, Pearson Education, 2002.
3. Lawrence Harte, *3G Wireless Demystified*, McGraw Hill Publications, 2001.

IV B.Tech. - I semester

(16BT70402) EMBEDDED SYSTEMS

(Common to EEE, ECE & CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:
Courses on Switching Theory and Logic Design, Microprocessors and Microcontrollers.

COURSE DESCRIPTION:
Embedded system design approaches; MSP430 Architecture; Instruction Set; On-Chip Resources; Programming; Communication with peripherals; Internet of Things related Issues.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Apply knowledge in
- MSP430 Architecture, Pin out, Instruction set
- High level programming
- Usage of On-chip resources like ADC, DAC, Timers
- Internet of Things related issues

CO2. Analyze various design issues regarding
- Usage of on chip resources
- Low power modes
- Communication support

CO3. Design embedded systems using MSP430 series microcontrollers to suit market requirements.

CO4. Solve engineering problems and arrive at solutions in designing embedded systems to support interconnectivity.

CO5. Apply techniques, program skills, On-Chip resources to design networked embedded systems with an understanding of limitations.

CO6. Reason out and practice professional engineering to deliver efficient and costeffective embedded based products to society.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO EMBEDDED SYSTEMS (09 Periods)
Embedded Systems - Definition, Approaches, Applications, Anatomy of microcontroller, Memory, Software; MSP430 Introduction- Pin out, Functional Block diagram, Memory, CPU, Memory mapped input and output, Clock generator; Exceptions- Interrupts and Resets.

UNIT - II: ARCHITECTURE OF MSP430 (09 Periods)
CPU, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Example programs, Reflections on CPU and Instruction set, Resets, Clock System.

UNIT - III: FUNDAMENTALS FOR PROGRAMMING (09 Periods)
Development Environment, C Programming Language, Assembly Language, Programming and Debugging, Sample programs- Light LEDs in C, Read input from a switch; Automatic Control-

Flashing light by delay, use of subroutines, using Timer_A; Header files and issues, Functions, Interrupts and Low power modes.

UNIT - IV: TIMERS, MIXED SIGNAL SYSTEMS AND COMMUNICATION

(09 Periods)

Timers - Watchdog Timer, RTC, Measurement in capture mode; Mixed-Signal Systems- Comparator_A, ADC10 Architecture & operation, ADC12, Sigma-Delta ADC Architecture & operation, DAC; Communication- Communication Peripherals in MSP430, SPI, Inter-integrated Circuit Bus, Asynchronous communication with the USCI_A.

UNIT - V: HARDWARE SOFTWARE CO-DESIGN AND INTERNET OF THINGS

(09 Periods)

CO- Design Issues: Co-design Models, Architectures, Languages, a Generic Co-design Methodology

IOT: Introduction, Origins, Drivers and Applications, IOT Communication Models - Device to Device, Device to Cloud, Device to Gateway, Back end Data Sharing Model; IPV6 and IOTs', IOT Issues, Security Issues-challenges; Privacy Considerations, Interoperability/Standards.

Total Periods: 45

TEXT BOOKS:

1. John H. Davies, *MSP430 Microcontroller Basics*, Newnes Publications, 2008.
2. Karen Rose, Scott Eldridge, Lyman Chapin, *The Internet of Things: An Overview: Understanding the Issues and Challenges of a More Connected World, Internet Society*, Oct. 2015.
3. Jorgen Staunstrup, Wayne Wolf, *Hardware/software co-design Principles and Practice*, Springer, 2009.

REFERENCE BOOK:

1. Chris Nagy, *Embedded Systems Design using the TI MSP30 Series*, Newnes Publications, 2003.

IV B.Tech - I Semester
14BT70402: EMBEDDED SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: A course on Microprocessors and Microcontrollers.

COURSE DESCRIPTION:
Introduction to Embedded System; State Machines and Concurrent Process Models; Various Communication interfacing Models; RTOS Concepts; Target Architectures.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:
CO1. Demonstrate knowledge on Communication Interfacing Models, Processor Technology, State Machines, Kernel Objects, ARM and SHARC Controllers.
CO2. Analyze Various problems in Optimization of Single Purpose Processor, Synchronization among the Processes, Clock Driven and Event Driven Scheduling and Debugging Techniques
CO3. Design and develop embedded system to suit a particular Application.
CO4. Choose suitable Hardware and software components of a system that Work together to solve engineering problems to exhibit a specific behavior.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (12 Periods)
Embedded systems overview, classification, applications, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors, Basic architecture, operation, Pipelining, Programmer's view, development environment.

UNIT-II: STATE MACHINE AND CONCURRENT PROCESS MODELS (08 Periods)
Introduction, models versus languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model.

UNIT-III: COMMUNICATION INTERFACE (07 Periods)
Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Fire wire, Ethernet, I^2C bus and CAN.

UNIT-IV: RTOS CONCEPTS (10 Periods)
CONCEPTS 1: Architecture of the Kernel, Tasks and Task scheduler, Types of real-time tasks, Task periodicity, Task scheduling, Classification of scheduling algorithms, Clock driven Scheduling, Event driven Scheduling, resource sharing, Commercial RTOs.
CONCEPTS 2: Interrupt service routines, Semaphores, Mutex, Mailboxes, Message Queues, Event Registers, Pipes, Signals, Timers, Memory Management, Priority inversion problem.

UNIT-V: TARGET ARCHITECUTERS (08 Periods)
Host and target machines, linkers, loading software into target machine, debugging techniques,ARM microcontroller, ARM pipeline, Instruction set architecture, THUMB instructions, Exceptions in ARM, salient features of SHARC microcontroller and comparison with ARM microcontroller.

Total Periods: 45

TEXT BOOKS:

1. Frank Vahid, Tony D. Givargis, *Embedded System Design – A Unified Hardware/Software Introduction,* John Wiley, 2002.
2. KVKK Prasad, *Embedded/Real Time Systems,* Dramatic Press, 2005.

REFERENCE BOOKS:

1. Raj Kamal, *Embedded System Architectures Programming & Design*, Tata MC Graw-Hill Publising, 2003.
2. David E.Simons, *An Embedded Software Premier*, Pearson Educational, 2004.

IV B.Tech. - I semester

(16BT70403) MICROWAVE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: A course on Electromagnetic Theory and Transmission Lines.

COURSE DESCRIPTION: Wave Propagation; Waveguide components; Microwave tubes; Microwave solid state devices; and Microwave measurements.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in
- Wave Propagation
- Microwave Components
- Microwave Tubes
- Microwave Measurements

CO2. Analyze the Performance of Microwave components and Microwave Tubes.

CO3. Design microwave components such as hybrid junctions, ferrite devices, and phase shifters.

CO4. Solve problems pertaining to microwave junctions and waveguide components.

CO5. Use appropriate resources to solve the problems related to microwave communication systems.

CO6. Use various microwave components like phase shifters, attenuators and tubes to model a communication system for societal needs.

DETAILED SYLLABUS:

UNIT-I: MICROWAVE COMPONENTS (10 Periods)

Introduction, Microwave spectrum and bands, applications of Microwaves, Scattering Matrix-Significance, Formulation and properties. S Matrix calculations for 2-port junction, Waveguide multiport junctions-E plane and H plane Tees, Magic Tee, Directional coupler; Ferrites-composition and characteristics, Faraday rotation, ferrite components –Isolator and Circulator. Waveguide discontinuities – waveguide Windows, tuning screws and posts, matched loads; Coupling mechanisms- probe, loop. Waveguide attenuators- resistive card, rotary vane Attenuators, waveguide phase shifters - dielectric, rotary vane phase shifters; Illustrative problems.

UNIT-II: MICROWAVE SOURCES (10 Periods)

Limitations and losses of conventional tubes at microwave frequencies.Classification of Microwave tubes.Two cavity klystron (Only Qualitative Treatment). Reflex Klystrons - structure, Velocity Modulation, Applegate diagram, mathematical theory of bunching, power output, efficiency, oscillating modes and O/P characteristics. Slow wave structures; structure of Helix TWT and amplification process. Magnetrons - different types, cylindrical travelling wave magnetron – Hull cutoff and Hartree conditions, Illustrative Problems.

UNIT-III: MICROWAVE SOLID STATE DEVICES (08 Periods)

Introduction, classification, applications, Transfer Electronic Devices, Gunn diode- principles, RWH theory, characteristics, basic modes of operation – Gunn oscillation modes, LSA Mode; Transit-Time Devices – IMPATT, TRAPATT and BARITT.

UNIT-IV: MICROWAVE MEASUREMENTS (08 Periods)

Description of Microwave bench –different blocks and their features, errors and precaution; Microwave power measurement- Bolometer method, Measurement of attenuation, frequency, low and high VSWR, Q of the cavity and impedance measurements.

UNIT-V: WAVE PROPAGATION (09 Periods)

Introduction, Modes of wave propagation, Ground wave propagation, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, absorption; Super refraction, M-curves and duct propagation, scattering phenomena, troposphere propagation, fading. Sky wave propagation-Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-Hop propagation.

Total Periods: 45

TEXT BOOKS:

1. Samuel Y. Liao, *Microwave devices and circuits*, Pearson Education, 3rd Edition, 2003.
2. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, *Antennas and wave propagation*, 4th Edition (special Indian Edition), TMH, New Delhi, 2010.

REFERENCE BOOKS:

1. F.E. Terman, *Electronic and Radio Engineering*, McGraw-Hill, 4th Edition, 1955.
2. Annapurna Das and Sisir K Das, *Microwave Engineering, McGraw-Hill*, 2nd Edition, 2009.
3. M.Kulkarni, *Microwave and Radar Engineering*, Umesh Publications, 3rd Edition, 2008.

III B.Tech - II Semester
14BT60402: MICROWAVE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PREREQUISITES: A course on Electromagnetic Theory and Transmission Lines.

COURSE DESCRIPTION: Rectangular waveguides and its characteristics; Strip lines and Microstrip lines; Waveguide components; Microwave tubes; Microwave solid state devices; and Microwave measurements.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:

CO1. Demonstrate knowledge in
- Waveguides
- Microwave Components
- Microwave Tubes
- Microwave Measurements

CO2. Perform analysis mathematically the operation and working of the various tubes. Quantify the signal and noise characteristics of microwave systems such as communication networks, Radars, and Radiometers and relate this to the design process.

C03. Design microwave components such as power dividers, hybrid junctions, microwave filters, ferrite devices, and single stage microwave transistor amplifier.

C04. Solve problems in effects of noise on microwave systems.

DETAILED SYLLABUS:

UNIT-I: MICROWAVE TRANSMISSION LINES (12 Periods)

Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides-solution of wave Equation in Rectangular Coordinates, TE and TM mode analysis, Expressions for fields, Characteristic equation and cutoff frequencies, filter characteristics, dominant and degenerate modes, sketches of TE and TM mode fields in the cross section. Mode characteristics – phase and Group velocities, wavelengths and impedance relations. Power Transmission and Power Losses. Introduction to Circular Waveguides, Cavity resonators- introduction, rectangular cavities, dominant modes and resonant frequencies, Q-factor and coupling coefficients. Micro strip lines-introduction, Z_O relations, effective dielectric constant, losses, Q-factor, Illustrative Problems.

UNIT-II: WAVEGUIDE COMPONENTS AND APPLICATIONS (10 Periods)

Waveguide multiport junctions-E plane and H plane Tees, Magic Tee, Directional coupler; Waveguide discontinuities – waveguide Windows, tuning screws and posts, matched loads; Coupling mechanisms-probe, loop, aperture types. Ferrites-composition and characteristics, faraday rotation, ferrite components – Gyrator, Isolator and Circulator. Waveguide attenuators- resistive card, rotary vane Attenuators, waveguide phase shifters - dielectric, rotary vane phase shifters; Scattering Matrix-Significance, Formulation and properties. S Matrix calculations for 2-port junction, E plane and H plane Tees, Magic Tee, Directional coupler, circulator and Isolator, Illustrative problems.

UNIT-III: MICROWAVE TUBES- I (08 Periods)

Limitations and losses of conventional tubes at microwave frequencies. Microwave tubes-O type and M type classifications.

O TYPE TUBES: 2 cavity klystrons-structure, Reentrant cavities, velocity modulation process and Applegate diagram, bunching process and small signal theory- Expressions for O/P power and efficiency. Reflex Klystrons-structure, Velocity Modulation, Applegate diagram, mathematical theory of bunching, power

output, efficiency, oscillating modes and O/P characteristics, Effect of Repeller Voltage on Power O/P, Illustrative problems.

UNIT- IV: MICROWAVE TUBES –II (08 Periods)

HELIX TWTS: Significance, types and characteristics of slow wave structures; structure of TWT and amplification process (qualitative treatment), suppression of oscillations, gain considerations.

M- TYPE TUBES: Introduction, cross field effects, Magnetrons-different types, cylindrical travelling wave magnetron – Hull cutoff and Hartree conditions, modes of resonance and PI- mode operation, separation of PI-mode, O/P characteristics, Illustrative Problems.

UNIT-V: MICROWAVE SOLID STATE DEVICES & MEASUREMENTS (08 Periods)

Introduction, classification, applications, Transfer Electronic Devices, Gunn diode- principles, RWH theory, characteristics, basic modes of operation – Gunn oscillation modes. LSA Mode, Varactor Diode, parametric Amplifier, Introduction to Avalanche Transit time devices (brief treatment only).

MEASUREMENTS: Description of Microwave bench –different blocks and their features, errors and precaution; Microwave power measurement- Bolometer method, Measurement of attenuation, frequency, low and high VSWR, Q of the cavity and impedance measurements.

Total Periods: 46

TEXT BOOKS:

3. Samuel Y. Liao, *Microwave devices and circuits*, Pearson Education, 3rd Edition, 2003.
4. Matthew N.O.Sadiku, *Elements of Electromagneticcs,* Oxford University Press, 4th Edition, 2007.

REFERENCE BOOKS:

4. Sushrut Das, *Microwave Engineering*, Oxford University Press, 2014
5. R.E.Collin, *Foundations for Microwave Engineering*, IEEE Press, john wiley,2nd Edition, 2002
6. F.E. Terman, *Electronic and Radio Engineering*, McGraw-Hill, 4th Edition, 1955.
7. Peter A. Rizzi, *Microwave Engineering Passive Circuits*, PHI, 1999.

IV B.Tech. - I semester

(16BT70404) ADVANCED DIGITAL SIGNAL PROCESSING

(Program Elective - 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:ACourse on Digital Signal Processing

COURSE DESCRIPTION:
Digital filter banks; Parametric and Non-Parametric Power Spectrum Estimation methods; Computationally efficient algorithms; Applications of DSP.

COURSE OUTCOMES: On successful completion of the course, students will be able to :

CO1. Apply knowledge in
- Filter banks and Wavelets
- Linear Prediction
- Efficient power Spectral Estimation Techniques.
- Applications of Multirate signal processing

CO2. Analyze complex engineering problems in the Power Spectrum Estimation,Sampling rate conversion and Linear Prediction.

CO3. Design optimum filters, multirate DSP systems and computationally efficient DSP algorithms.

CO4. Solve Engineering problems pertaining to Digital Signal Processing.

CO5. Apply DSP Algorithms, and algorithms related to Forward and Backward Prediction in digital system design with an understanding of the limitations.

CO6. Apply computationally efficient DSP Algorithms, Optimum Filters and perfect reconstruction filters to address societal issues in multirate signal processing andcommunications.

DETAILED SYLLABUS:

UNIT-I: MULTIRATE FILTER BANKS (10 Periods)

Decimation, Interpolation, Sampling rate conversion by a rational factor I/D, Multistage Implementation of sampling rate conversion.

Digital Filter Banks: Two-Channel Quadrature-Mirror Filter Bank, Elimination of aliasing, condition for Perfect Reconstruction, Polyphase form of QMF bank, Linear phase FIR QMF bank, IIR QMF bank, Perfect Reconstruction Two-Channel FIR QMF Bank .

UNIT-II: POWERSPECTRALESTIMATIONS (09 Periods)

Estimation of spectra from finite duration observation of signals.

Non-ParametricMethods: Bartlett, Welch, Blackman &Tukey methods. Performance Characteristics of Non parametric Power Spectrum Estimators, Computational Requirements of Non parametric Power Spectrum Estimates.

Parametric Methods of Power Spectral Estimation:
Autocorrelation & Its Properties, Relationship between autocorrelation &model parameters, Yule-walker &Burg Methods, MA &ARMA models for power spectrum estimation.

UNIT-III: LINEAR PREDICTION (09 Periods)
Forward and Backward Linear Prediction – Forward Linear Prediction, Backward Linear Prediction, Optimum reflection coefficients for the Lattice Forward and Backward Predictors. Solution of the Normal Equations: Levinson Durbin Algorithm, Schur Algorithm. Properties of Linear Prediction Filters.

UNIT-IV: DSP ALGORITHMS (08 Periods)
Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNIT-V: APPLICATIONS OF DIGITAL SIGNAL PROCESSING (09 Periods)
Digital cellular mobile telephony, Adaptive telephone echo cancellation, High quality A/D conversion for digital Audio, Efficient D/A conversion in compact hi-fi systems, Acquisition of high quality data, Multirate narrow band digital filtering, High resolution narrowband spectral analysis.

Total Periods: 45

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, *Digital signal processing, principles, Algorithms and applications*, Prentice Hall, 4th Edition, 2007.
2. Sanjit K Mitra, *Digital signal processing, A computer base approach*, McGraw-Hill Higher Education, 4th Edition, 2011.

REFERENCE BOOKS:

1. Emmanuel C Ifeachor Barrie. W. Jervis, *DSP-A Practical Approach*, Pearson Education, 2nd Edition, 2002.
2. A.V. Oppenheim and R.W. Schaffer, *Discrete Time Signal Processing*, PHI, 2nd Edition, 2006.

IV B. Tech – I Semester
14BT70404: ADVANCED DIGITAL SIGNAL PROCESSING
(Program Elective - 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: Course on Digital Signal Processing.
COURSE DESCRIPTION:
Design of digital filter banks; Power spectral estimation; Digital signal processing algorithms; DSP applications.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:

CO1. Demonstrate knowledge in
- Filter banks and Wavelets
- Efficient power Spectral Estimation Techniques.
- Adaptive filters.
- Applications of Multirate signal processing

CO2. Analyze complex engineering problems critically for conducting research in Adaptive filter design.
CO3. Design and develop digital filters and multirate systems to optimize system performance and their realization.
CO4. Solve engineering problems by designing computationally efficient DSP algorithms for feasible and optimal solutions in digital signal processing field.

DETAILED SYLLABUS:
UNIT I: MULTIRATE FILTER BANKS (10 Periods)
Decimation, Interpolation, Sampling rate conversion by a rational factor I/D, Multistage Implementation of sampling rate conversion.
Digital Filter Banks: Two-Channel Quadrature-Mirror Filter Bank, Elimination of aliasing, condition for Perfect Reconstruction, Polyphase form of QMF bank, Linear phase FIR QMF bank, IIR QMF bank, Perfect Reconstruction Two-Channel FIR QMF Bank .

UNIT II: POWER SPECTRAL ESTIMATIONS (08 Periods)
Estimation of spectra from finite duration observation of signals.
Non-Parametric Methods: Bartlett, Welch, Blackmann & Tukey methods. Performance Characteristics of Nonparametric Power Spectrum Estimators, Computational Requirements of Nonparametric Power Spectrum Estimates.

UNIT III: PARAMETRIC METHODS OF POWER SPECTRAL ESTIMATION (09 Periods)
Autocorrelation & Its Properties, Relation between auto correlation & model parameters, Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation.

UNIT IV: DSP ALGORITHMS (09 Periods)
Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

UNITV: APPLICATIONS OF DIGITAL SIGNAL PROCESSING (09 Periods)
Digital cellular mobile telephony, Adaptive telephone echo cancellation, High quality A/D conversion for digital Audio, Efficient D/A conversion in compact hi-fi systems, Acquisition of high quality data, Multirate narrow band digital filtering, High resolution narrowband spectral analysis.

Total Periods: 45

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, *Digital signal processing, principles, Algorithms and applications,* Prentice Hall, 4th Edition, 2007.
2. Sanjit K Mitra, *Digital signal processing, A computer base approach,* McGraw-Hill Higher Education, 4th Edition, 2011.

REFERENCE BOOKS:

1. Emmanuel C Ifeacher Barrie. W. Jervis, *DSP-A Practical Approach*, Pearson Education, 2nd Edition, 2002.
2. A.V. Oppenheim and R.W. Schaffer, *Discrete Time Signal Processing,* PHI, 2nd Edition, 2006.

IV B.Tech. - I semester

(16BT70405) MIXED SIGNAL DESIGN

(Program Elective - 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:A course on VLSI Design.

COURSE DESCRIPTION:
Switched Capacitor Circuits; PLLs; Nyquist Rate Data Converters.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in
- Switched Capacitor Circuits
- PLL
- Data Converters – ADC and DAC.

CO2. Analyze non-ideal effects of switched capacitor circuits and PLLs.
CO3. Design and Develop Switched Capacitor Circuits, PLLs and Data Converters.
CO4. Solve problems by using alternate data converters to compensate performance limitations.
CO5. Apply appropriate techniques to improve the performance of data converters.
CO6. Understand the impact of mixed signal design for societal needs.

DETAILED SYLLABUS:

UNIT - I: SWITCHED CAPACITOR CIRCUITS (07 Periods)
Introduction to Switched Capacitor circuits- basic building blocks, Basic Operation and Analysis - Resistor equivalance of switched capacitor, Parasitic sensitive integrator, parasitic insensitive integrator, signal flow graph analysis; Non-ideal effects in switched capacitor circuits.

UNIT - II: PHASED LOCK LOOP (08 Periods)
Simple PLL - Phase detector, Basic PLL topology, Dynamics of simple PLL; Charge pump PLLs - Problem of Lock acquisition, Phase/Frequency detector and charge pump; Non-ideal effects in PLLs.

UNIT - III: DATA CONVERTER FUNDAMENTALS (07 Periods)
Introduction to data converters, Ideal D/A converter, Ideal A/D converter, Quantization noise, Signed codes, performance limitations.

UNIT - IV: NYQUIST RATE D/A CONVERTERS (11 Periods)
Decoder based Converters - resistor string converters, folded resistor string converters, multiple R-string converters, signed outputs; Binary-Scaled converters - binary weighted resistor converters, reduced resistance ratio ladders, R-2R Based converters, charge- redistribution switched capacitor converters,current mode converters; Thermometer-code converters, Hybrid converters.

UNIT - V: NYQUIST RATE A/D CONVERTERS (12 Periods)

Successive approximation converters, Flash converter, Two-step A/D converters, Folding A/D converters, Pipelined A/D converters, Time-Interleaved Converters

Total Periods: 45

TEXT BOOKS:

1. David A. Johns, Ken Martin, *Analog Integrated Circuit Design,* Wiley Student Edition, 1997.
2. Behzad Razavi, *Design of Analog CMOS Integrated Circuits*, Tata McGraw Hill, 2008.

REFERENCE BOOKS:

1. Rudy Van De Plassche, *CMOS Integrated Analog-to-Digital and Digital-to-Analog converters*, Kluwer Academic Publishers, 2007.
2. R. Jacob Baker, *CMOS Mixed-Signal Circuit Design*, Wiley Interscience, 2014.

IV B. Tech - II Semester
14BT80402: MIXED SIGNAL DESIGN
(Program Elective - 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: A Course on Analog IC Design.

COURSE DESCRIPTION:
Switched Capacitor Integrated Circuits, Biquad filters, charge pump PLL, Delay locked loops, Nyquist rate D/A & A/D converters, Oversampling Converters.

COURSE OUTCOMES:
On successful completion of the course, the students will be able to:
CO1: Demonstrate in-depth knowledge in
- Switched Capacitor Circuits
- PLL
- Data Converters – ADC and DAC

CO2: Analyze complex engineering problems critically for conducting research in Data Converters for Communication Systems.
CO3: Design and Develop Switched Capacitor Circuits and PLL.
CO4: Solve engineering problems with wide range of solutions to increase Data Rate of ADC and DAC.

DETAILED SYLLABUS:
UNIT -I: Switched Capacitor Circuits (10 Periods)
Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, Biquad filters.

UNIT -II: Phased Lock Loop (PLL) (08 Periods)
Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT -III: Data Converter Fundamentals (10 Periods)
DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based Converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

UNIT -IV: Nyquist Rate A/D Converters (08 Periods)
Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D Converters, Folding A/D converters, Pipelined A/D converters, Time-Interleaved Converters.

UNIT -V: Oversampling Converters (09 Periods)
Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A.

Total Periods: 45

TEXT BOOKS:
3. Behzad Razavi, *Design of Analog CMOS Integrated Circuits*, TMH Edition, 2008.

4. Philip E. Allen and Douglas R. Holberg, *CMOS Analog Circuit Design*, Oxford University Press, International 2nd Edition/Indian Edition, 2010.
5. David A. Johns,Ken Martin, *Analog Integrated Circuit Design*, Wiley Student Edition, 1997.

REFERENCE BOOKS:

3. Rudy Van De Plassche, *CMOS Integrated Analog-to-Digital and Digital-to-Analog converters*, Kluwer Academic Publishers, 2007.
4. Richard Schreier, *Understanding Delta-Sigma Data converters*, Wiley Interscience, 2005.
5. R. Jacob Baker, *CMOS Mixed-Signal Circuit Design*, Wiley Interscience, 2014.

IV B.Tech. - I semester

(16BT70407) WIRELESS COMMUNICATIONS AND NETWORKS

(Program Elective - 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:A Course on Computer Networks.

COURSE DESCRIPTION:

Multiple Access techniques; Concepts of Wired and Wireless networks; operation of Mobile IP; Wireless Application Protocol; Architecture of Wireless LAN; Layered architecture of Bluetooth; High speed data networks.

COURSE OUTCOMES:

On successful completion of the course, students will be able to:

CO1. Apply knowledge to understand
- Routing in wireless networks.
- Various protocols for Wireless networks.
- Various wireless LAN technologies.
- Bluetooth
- Architectures of various Wireless Data Networks.

CO2. Analyze various protocols related to wireless networks.

CO3. Design and Develop innovative techniques for implementation of high performance networking.

CO4. Provide valid solutions to overcome challenges in wireless networks.

CO5. Apply appropriate techniques to solve complex engineering problems in wireless networking domain.

CO6. Apply standards in area of wireless networking.

DETAILED SYLLABUS:

UNIT-I: WIRELESS NETWORKING AND DATA SERVICES (15 Periods)

Introduction, Difference between Wireless and Fixed Telephone Networks, Development of Wireless Networks, FDMA, TDMA, Spread Spectrum Multiple Access techniques, Capture Effect in Packet Radio, Traffic Routing in Wireless Networks. CDPD, ARDIS, RMD, Common Channel Signaling, ISDN, Broadband ISDN and ATM, SS7.

UNIT-II: MOBILE IP AND WIRELESS APPLICATION PROTOCOL (11 Periods)

Operation of mobile IP, Discovery, Co-located address, Registration, Tunneling, WAP Architecture, overview, WML, WML scripts.

WAPprotocol stack: Wireless Application Environment, Wireless session Protocol, Wireless Transaction Protocol, Wireless Transport Layer Security Protocol and Wireless Datagram Protocol.

UNIT-III: WIRELESS LAN TECHNOLOGY (11 Periods)

Overview, WLAN Requirements, Infrared LANs, Spread Spectrum LANs, Narrow Band Microwave LANs, IEEE 802 Protocol Architecture, IEEE802.11 Architecture and Services, 802.11 Medium Access Control, 802.11 Physical Layer. Wi-Fi and Introduction to WiMAX.

UNIT-IV: BLUETOOTH (08 Periods)

Overview, Radio Specification, Base band Specification, Links Manager Specification, Logical Link Control and Adaptation Protocol.WLL Technology.

UNIT-V: MOBILE DATA NETWORKS (10 Periods)

Introduction, Data oriented CDPD Network, GPRS and higher Data Rates, Short Messaging Service in GSM, Mobile Application Protocol. Wireless ATM, HIPER LAN - Architecture, Physical Model, Layers and Security.

(Total Periods: 45)

TEXT BOOKS:

1. Theodore S. Rappaport, *Wireless Communications,* 2nd Edition, PHI, 2008.
2. William Stallings, *Wireless Communications and Networks,* 2nd Edition, Pearson Education, 2007.
3. Kaveh Pahlavan and Prashant Krishna Murthy, *Principles of Wireless Networks,* PHI, 2005.

REFERENCE BOOKS:

1. Kamilo Feher, *Wireless Digital Communications,* PHI, 2001.
2. Andreaws F. Molisch, *Wideband Wireless Digital Communications,* Pearson Education, 2002.
3. Dharma Prakash Agarwal, Qing-An Zeng, *Introduction to Wireless and Mobile Systems,* 2nd Edition, Thomson, 2006.
4. Gordon L. Stuber, *Principles of Mobile Communications,* 2nd Edition, Springer International, 2007.

IV B.Tech. - I semester

(16BT70409) RF ENGINEERING

(Program Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: Courses on Basic Electronics and Wave Theory

COURSE DESCRIPTION:
Concepts of transmission line theory; RF Electronics; high frequency circuit behavior; design of tuning and matching networks; RF Passive and active components; RF Transistor amplifier design; Oscillators and RF Mixers.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:
CO1. Understand basics of RF Electronics and transmission lines.
CO2. Analyze Transmission lines, Matching and biasing networks.
CO3. Design Matching and biasing networks, RF passive and active components, and RFtransistor amplifiers.
CO4. Solve problems in transmission lines, filters, oscillators and Mixers.
CO5. Apply appropriate Oscillators, Mixers and components to RF Circuit design.
CO6. Apply RF electronics in the field of wireless communication systems and allied areasfor societal use.

DETAILED SYLLABUS

UNIT – I: INTRODUCTION TO RF ELECTRONICS (10 Periods)
The Electromagnetic Spectrum, units and Physical Constants, Microwave bands, RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors. Voltage and Current in capacitor circuits, Tuned RF / IF Transformers.

UNIT – II: TRANSMISSION LINE ANALYSIS (10 Periods)
Examples of transmission lines, Transmission line equations and Biasing: Kirchoffs Voltage and current law representation, Traveling voltage and current waves, General Impedance definition, lossless transmission line model. Micro Strip Transmission Lines, Special Termination Conditions, sourced and Loaded Transmission Lines.
Single And Multiport Networks: The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT -III: MATCHING AND BIASING NETWORKS (10 Periods)
Impedance matching using discrete components, Micro strip line matching networks, Amplifier classes of Operation and Biasing networks.
RF Passive & Active Components: Filter Basics, Lumped filter design, Distributed Filter Design, Diplexer Filters, Crystal and Saw filters, Active Filters, Tunable filters. Power Combiners

/ Dividers: Directional Couplers, Hybrid Couplers, Isolators. RF Diodes: BJTs, FETs, HEMTs and Models.

UNIT – IV: RF TRANSISTOR AMPLIFIER DESIGN (09 Periods)

Characteristics of Amplifiers, Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT – V: OSCILLATORS and Mixers (09 Periods)

Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer.

RF Mixers: Basic characteristics of a mixer, Active mixers, Image Reject and Harmonic mixers, Frequency domain considerations.

Total Periods: 48

TEXT BOOKS:

1. Reinhold Ludwing, Pavel Bretchko, *RF Circuit design: Theory and applications*, Pearson Education Asia Publication, New Delhi 2001.
2. Joseph Carr, *Secrets of RF Design*, Tata McGraw Hill Publications, 3rd Edition, 2004.

REFERENCE BOOKS:

1. Devendra K. Misra, *Radio Frequency and Microwave Communication Circuits – Analysis and Design,* Wiley Student Edition, John Wiley & Sons, 2nd Edition, July 2004.
2. Christopher Bowick, Cheryl Aljuni and John Biyler,*RF Circuit Design*, Elsevier Science, 2008.
3. Mathew M.Radmangh, *Radio frequency and microwave electronics*, PE Asia Publication, 2001.

IV B.Tech. - I semester

(16BT70431) ANTENNAS AND MICROWAVE ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on EM theory, Antennas and Microwave Engineering.

COURSE DESCRIPTION:
Design and verification of various antennas; Study of Microwave components' characteristics; Power supplies.

COURSE OUTCOMES: On successful completion of the course, students will be able to:

CO1. Apply the knowledge of antennas and microwaves to understand the working of various devices.
CO2. Analyze the characteristics of different microwave components like
- Attenuators
- Directional Couplers
- Horn antennas etc.,

CO3. Design various antennas for different communication needs.
CO4. Solve problems using different antenna designs and microwave devices.
CO5. Apply appropriate tools to design and analyze various antennas.
CO6. Understand the working of various antennas and microwave components and provide engineering solutions for societal use.
CO7. Commit to ethical principles in the design of antennas and microwave components.
CO8. Work individually or in a group in the field of antennas and microwaves**.**
CO9. Communicate effectively in verbal and written form in the area of antennas and microwaves.

List of Exercises:

PART – A: (Antennas)
(Minimum of **six experiments** to be conducted)

1. Design of Monopole and Half Wave Dipole antenna
2. Design of Folded dipole antenna
3. Design of End fire and Broadside antenna array
4. Design of Yagi-Uda (minimum of 5 elements) antenna

5. Design of Helical antenna
6. Design of Horn antenna
7. Design of Microstrip patch antenna (strip and probe feeding)
8. Design of Parabolic antenna

Note: Verification for couple of antennas may be demonstrated.

PART – B: (Microwave Engineering)

(Minimum of **six experiments** to be conducted)

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Attenuation Measurement
4. Directional Coupler Characteristics
5. VSWR Measurement
6. Impedance Measurement
7. Waveguide parameters measurement
8. Scattering parameters of circulator.

IV B. Tech - I Semester
14BT70422: MICROWAVE AND LIGHT WAVE COMMUNICATIONS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PREREQUISITES: Courses on Microwave Engineering and Light wave communications.

COURSE DESCRIPTION:
Design and study of various Microwave and Light wave communication circuits, characteristics of Microwave power supplies and components, optical fibers and sources.

COURSE OUTCOMES: On successful completion of the course, the students will be able to:
CO 1. Analyze the characteristics and working of various microwave components like attenuators, directional couplers, Horn antennas etc.
CO 2. Simulate and design various Lightwave communication circuits and study their characteristics.
CO 3. Solve problems given in Lightwave and microwave communication systems.

LIST OF EXPERIMENTS:

Minimum Twelve Experiments to be conducted:

Part – A (Any 6 Experiments):
1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Attenuation Measurement
4. Directional Coupler Characteristics
5. VSWR Measurement
6. Impedance Measurement
7. Waveguide parameters measurement
8. Scattering parameters of circulator.

Part – B (Any 6 Experiments):
1. Characterization of LED
2. Characterization of Laser diode
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital optical link.
5. Measurement of Numerical aperture.
6. Measurement of losses for Analog optical link
7. Demonstration of Optical simulator.

IV B.Tech. - I semester

(16BT70432) EMBEDDED SYSTEMS LAB

(Common to EEE, ECE & CSSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Embedded systems, C Programming.

COURSE DESCRIPTION:
IDE for Embedded System Design using MSP430; Interfacing Switch & LED; Timers-WDT, Configuring, Programming; ADC-usage; Power down modes; DAC; PWM Generator; Networking – SPI, Wi-Fi.

COURSE OUTCOMES:
On successful completion of the course,students will be able to:

CO1. Demonstrate knowledge in designing complex energy efficient embedded systems.
CO2. Analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC,Comparator, SPI.
CO3. Design embedded systems to suit market requirements.
CO4. Solve engineering problems by proposing potential solutions using industry choice advanced Microcontrollers.
CO5. Apply appropriate techniques, resources, and CCSV6 based IDE for modeling embedded systems with understanding of limitations.
CO6. Provide embedded system solutions for societal needs.
CO7. Work individually and in a group to develop embedded systems.
CO8. Communicate effectively in oral and written form in the field of embedded systems.

LIST OF EXCERSISES:

1. Introduction to MSP430 launch pad and Programming Environment.
2. Read input from switch and Automatic control/flash LED (software delay).
3. Interrupts programming example using GPIO.
4. Configure watchdog timer in watchdog & interval mode.
5. Configure timer block for signal generation (with given frequency).
6. Read Temperature of MSP430 with the help of ADC.
7. Test various Power Down modes in MSP430.
8. PWM Generator.
9. Use Comparator to compare the signal threshold level.

10. Speed Control of DC Motor

11. Master slave communication between MSPs using SPI.

12. Networking MSPs using Wi-Fi.

Tool Requirement:

Code Composer Studio Version 6, MSP430 based launch pads, Wi-Fi booster pack.

REFERENCE BOOKS:

1. John H Davies, *MSP430 Microcontrollers Basics*, Newnes Publishers, 1st Edition, 2008.
2. C P Ravikumar, *MSP430 Microcontrollers in Embedded System Projects*, Elite Publishing House, 1st Edition, 2012.

IV B.Tech. - I Semester

(16BT70413)INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES:--

COURSE DESCRIPTION:
Introduction to the concept ofnano;Description of nanomaterial;Nanostructure characterization tools;Classification of nanomaterials;Fabrication of nanomaterial;Different applications of nanostructures and nanomaterials.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. Demonstrate knowledge in
- Nanoscale technology.
- Difference between micro and nanotechnology
- Classification of Nanostructure and Nanomaterial
- Fabrication of various nanomaterials and nanostructures.

CO2. Analyze numerical and analytical problems in
- Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction

CO3. Design and fabricate devices based on nanostructures like
- Nano solar cell
- Nano cantilever
- Nano bio-sensor

CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.

CO5. Select appropriate technique for fabrication ofnanostructures and Nano composites.

CO6. Apply ethical standards and legal issues while using chemical substances infabrication of new nanostructures.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF NANOTECHNOLOGY(08 Periods)
Introduction – Scientific revolutions, Time and length scale in structures, Definition of a nanosystem; Dimensionality and size dependent phenomena - Surface to volume ratio Fraction of surface atoms, Surface energy and surface stress, surface defects, Properties at nanoscale (optical, mechanical, electronic, and magnetic).

UNIT-II:IDENTIFICATION AND CHARACTERIZATION TOOLS FOR NANOMATERIALS AND NANOSTRUCTURE(10 Periods)
Field Emission Scanning Electron Microscopy (FESEM), Environmental Scanning ElectronMicroscopy (ESEM) High Resolution, Transmission Electron Microscope (HRTEM), Scanning Tunneling Microscope(STM), Surface enhanced Raman spectroscopy (SERS), Secondary

Ion Mass Spectroscopy, Focused Ion Beam Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy (XPS), Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), X-Ray Diffraction, Intensities in X-Ray Scattering Particle Size Effect.

UNIT-III:CLASSIFICATION OF NANOMATERIALS(10 Periods)

Classification based on dimensionality, Quantum Dots,Wells and Wires-III-V Nanoparticles, Electronic Structure of Nanosemiconductor, Carbon based nanomaterials (buckyballs, nanotubes, graphene), Metal based nano materials (nanogold, nanosilver and metal oxides), Nanocomposites,Nanopolymers,Nanoglasses, Nano ceramics, Biological nanomaterials, Fulrene-discovery and early years,.

UNIT-IV: SOME FABRICATION TECHNIQUES OF NANOMATERIALS AND NANOSTRUCTURES(09 Periods)

Chemical Methods: Metal Nanocrystals by Reduction, Solvothermal Synthesis, Photochemical Synthesis,Sonochemical Routes, Chemical Vapor Deposition (CVD), Metal Oxide Chemical Vapor Deposition (MOCVD), Plasma Enhanced Chemical Vapour Deposition Technique(PECVD), Hydrothermal Method, Sol-Gel.

PhysicalMethods: Ball Milling, Electrodeposition, Spray Pyrolysis, Flame Pyrolysis, DC/RF Magnetron Sputtering, Molecular Beam Epitaxy (MBE) Thermal Evaporation Method.

UNIT-V:APPLICATIONS (08 Periods)

Solar energy harvesting, Catalysis,Molecular electronics and printed electronics Nanoelectronics, Polymers with aspecial architecture, Liquid crystalline systems, Linear and nonlinear optical and electro-optical properties, Applications in displays and other devices, Nanomaterials for data storage, Photonics, Plasmonics, Chemical and biosensors, Nanomedicine and Nanobiotechnology, MESFET.

Total Periods: 45

TEXT BOOKS:

1. Pradeep T., *A Textbook of Nanoscience and Nanotechnology*, Tata McGraw Hill Education Pvt. Ltd., 2012.
2. Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*,Academic Press, 2002.

REFERENCE BOOKS:

1. Nabok A., *Organic and Inorganic Nanostructures*, Artech House, 2005.
2. Dupas C., Houdy P., Lahmani M*, Nanoscience: Nanotechnologies and Nanophysics*, Springer - Verlag Berlin Heidelberg, 2007.
3. S.M. Sze, Physics of Semiconductor Devices, 2nd Edition, 2001.

I B. Tech. – I Semester [CSE, CSSE, IT, CE & ME]

I B. Tech. – II Semester [ECE, EEE & EIE]

(16BT1HS01) TECHNICAL ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: ***English at Intermediate level***

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading; and Writing.

COURSE OBJECTIVES:

CEO1. To impart knowledge of the nuances of communication.
CEO2. To develop Listening, Speaking, Reading and Writing skills in order to use language effectively in distinct situations.
CEO3. To imbibe an attitude of assimilating language skills in the sequence of locating, retrieving, reporting, evaluating, integrating, and accurately citing in the required context.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Demonstrate knowledge in

- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2: Analyze the possibilities and limitations of language, understanding
- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3: Design and develop functional skills for professional practice**.**

CO4: Apply writing skills in preparing and presenting documents

CO5: Function effectively as an individual and as a member in diverse teams.

CO6*:* Communicate effectively with the engineering community and society in formal and informal situations**.**

DETAILED SYLLABUS:

UNIT I - **INTRODUCTION TO COMMUNICATION: (9 periods)**

Introduction –Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication – Barriers to Communication (classification)

UNIT II - **ACTIVE LISTENING:** **(9 periods)**

Introduction – Reasons for poor Listening – Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information

UNIT III - **EFFECTIVE SPEAKING:** **(9 periods)**

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Persuasive Speaking

UNIT IV - **READING**: **(9 periods)**

Introduction and Reading Rates – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – Reading for Different Purposes – SQ3R Reading Technique –Study Skills

UNIT V – **WRITING**: **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Referencing and Styling – Right Words and Phrases – Sentences

Total Periods: *45*

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt.Ltd., New Delhi, 2015.
2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.
3. Teri Kwal Gamble and Michael Gamble, *Communication Works*, Tata Mc Graw-Hill, New Delhi, 2010.
4. Rajendra Pal and J.S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

14BT1HS01: **TECHNICAL ENGLISH**

I -Year B.Tech.

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	-	-	4

COURSE OBJECTIVES:

1. To lay basic foundation and impart knowledge of English language, grammar and communication skills.
2. To develop listening, speaking, reading and writing skills among students needed in their personal, academic and professional pursuits.
3. To train students apply the nuances of English for various communication needs.
4. To build confidence in effective usage of English language.

COURSE OUTCOMES : After completion of the course the students will be able to

1. Acquire fundamental and functional knowledge of English language, grammar and communication skills.
2. Identify and analyze productive skills (speaking and writing) and receptive skills (listening and reading) of English language proficiency for effective communication and practice.
3. Design and develop functional skills for professional practice through English.
4. Communicate effectively with the engineering community and society to comprehend and deliver effective solutions.
5. Inculcate an attitude to upgrade competence of English knowledge and communication to engage in independent and life-long learning.

DETAILED SYLLABUS:

UNIT – I : (10 periods)

My Early Days, **A. P. J. Abdul Kalam** from **Technical English for Engineer**s by Cambridge University Press for India Pvt Ltd. (2014).

Communication: Importance of communication-- Language as a tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Verbal and Non-verbal Communication

UNIT – II : (10 periods)

A Speech by N. R. Narayana Murthy from **Technical English for Engineer**s by Cambridge University Press for India Pvt Ltd. (2014).

Listening: Meaning and Art of Listening – Importance of Listening– Traits of a Good Listener - Reasons for poor Listening –Types of Listening – Barriers to Effective Listening

UNIT – III : (10 periods)

The Town by the Sea by Amitav Ghosh from **Technical English for Engineer**s by Cambridge University Press for India Pvt Ltd. (2014).

Speaking: Achieving Confidence, Clarity, and Fluency – Paralinguistic Features – Types of Speaking – Barriers to Speaking.

UNIT – IV : (10 periods)

Dr. C. V. Raman: The Celebrated Genius from **Technical English for Engineer**s by Cambridge University Press for India Pvt. Ltd., (2014).

Reading: Reading and Interpretation—Intensive and Extensive Reading—Critical Reading--Reading Comprehension-– Techniques for Good Comprehension – SQ3R Reading Technique

UNIT – V : (10 periods)

Lesson Entitled **The Model Millionaire** from **Technical English for Engineer**s by Cambridge University Press for India Pvt. Ltd. (2014).

Writing: Characteristics –– Language –Elements of Style – Techniques for Good Technical Writing – Avoiding Plagiarism and Referencing and Styling.

Total periods: 50

TEXT BOOKS:

1. **Technical English for Engineers***,* Cambridge University Press for India Pvt. Ltd., First Edition, (2014),
2. Meenakshi Raman & Sangeetha Sharma, **Technical Communication**, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. M. Ashraf Rizvi, **Effective Technical Communication**, Tata McGraw–Hill, Publishing Company Limited, First Edition, 2005.
2. Martin Hewings, **Advanced English Grammar: A Self Study Reference and Practice Book for Advanced South Asian Students,** Cambridge University press, First South Asian Edition, 1999, New Delhi.

I B. Tech. – I Semester (CSE, CSSE, IT, CE & ME)

I B. Tech. – II Semester (ECE, EEE & EIE)

(16BT1HS31) ENGLISH LANGUAGE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	0	0	3	2

PRE-REQUISITES: English at intermediate or equivalent level.

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OBJECTIVES:

CEO1: To impart the knowledge of native pronunciation through Phonetics.

CEO2: To enhance Listening, Speaking, Reading and Writing skills for effective usage of language in formal and informal situations.

CEO3: To imbibe a positive attitude of learning the language through computer-aided multimedia instructions.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Demonstrate knowledge in
- Phonetics
- Information Transfer

CO2: Analyze the situations in professional context by using
- Vocabulary
- Grammar

CO3: Design and develop functional skills for professional practice.

CO4: Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.

CO5: Function effectively as an individual and as a member in diverse teams through
- Extempore talk and
- Role Play

CO6: Communicate effectively in public speaking in formal and informal situations.

CO7: Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

LIST OF EXERCISES:

1. Phonetics
2. Vocabulary Building
3. Functional Grammar
4. Just a Minute
5. Elocution/Impromptu
6. Giving Directions/Conversation Starters
7. Role Play
8. Public Speaking
9. Describing People, Places, Objects and Events.
10. Reading Comprehension
11. Listening Comprehension
12. Information Transfer

Total Lab Slots: 10

TEXT BOOK:

1. Department Lab Manual

REFERENCE BOOKS:

1. D. Sudha Rani, *A Manual for English Language Laboratories*, Pearson, Noida, 2010.
2. D. Sudha Rani, *Advanced Communication Skills Laboratory Manual*, Pearson, Noida, 2012.
3. R. Manivannan and G. Immanuel, *Communication Skills Laboratory*, VK Publications, Sivakasi, 2013
4. Nira Kumar*, English Language Laboratories*, PHI Learning Pvt. Ltd., New Delhi, 2011.

(14BT1HS02) ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

B. Tech. – I year

(Common to All branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	3

COURSE OBJECTIVES:

1. To impart practical knowledge in segmental features, supra-segmental features and Para-linguistic features.
2. To develop language skills for effective communication with clarity and precision in academic, professional and personal situations.
3. To apply the practical knowledge of functional grammar and vocabulary enrichment in effective writing.
4. To develop interest in English language so that the students use it effectively in various formal, informal and neutral situations.

COURSE OUTCOMES:

On the successful completion of the course, the students will / should be able to

1. Gain practical knowledge in
   - English Speech Sounds
   - Stress Patterns in word and sentence
   - Intonation Patterns
   - Paralinguistic Features
   - Vocabulary Enrichment
2. Analyse the functional part of the grammatical elements for writing grammatically correct English in various academic and personal practices.
3. Develop various language functions to fulfil the purpose of speaking and writing in academic, professional and personal contexts
4. Apply the knowledge of the usage of various language software for enhancing the language skills more and more thereby acquiring unconsciously the language functions and elements that are commonly used in various contexts
5. Communicate effectively with engineering community and society in various formal, informal and neutral situations.
6. Demonstrate various language functions by participating in
   - Just A Minute
   - Impromptu Speech
   - Elocution
   - Role Plays
   - Presentations
7. Engage in lifelong learning for the development of the communicative competence for meeting the global challenges.

DETAILED LIST OF EXPERIMENTS / LAB PRACTICE SESSIONS:

1. English Speech Sounds and Phonemic Transcription
2. Word Stress & Sentence Stress
3. Accent, Rhythm and Intonation
4. Paralinguistic Features.
5. Vocabulary Building
    a. Importance of Vocabulary Enrichment in Speaking: Spelling
    b. Synonyms – Antonyms – prefix – Suffixes – One Word Substitutes
    c. Idioms and Phrases – Homophones – Homonyms – Homographs.
6. Functional Grammar
    a. Parts of Speech
    b. Tenses
    c. Change of Speech
    d. Change of Voice
    e. Word Order& Error Correction
    f. Essay Writing
7. Just a Minute, Impromptu Speech & Elocution
8. Role Plays
9. Telephonic Etiquette
10. Listening Skills
11. Describing People, Places and Objects
12. Presentation Skills
13. Information Transfer

REFERENCES :

1. Departmental Lab Manual

I B. Tech. – I/II Semester

(16BT1BS02) ENGINEERING PHYSICS

(Common to all branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES: Intermediate / senior secondary Physics

COURSE DESCRIPTION:

Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nano materials.

COURSE OBJECTIVES:

CEO1 : To provide the basic knowledge of architectural acoustics, quantum mechanics, lasers, superconductors, optical fibers, semiconductors and nanotechnology.

CEO2 : To develop skills in using semiconductor devices, lasers, and optical fibers.

COURSE OUTCOMES: After completion of the course, a successful student will be able to:

CO1: Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nano materials.

CO2: Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.

CO3: Gain skills in designing of lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.

CO4: Develop problem solving skills in engineering context.

CO5: Use relevant techniques for assessing ball milling, pulsed laser deposition, pn-junction, Laser

DETAILED SYLLABUS:

UNIT I – LASERS AND FIBER OPTICS (11 periods)

Lasers: Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients – condition for amplification, population inversion, Nd:YAG laser, Helium-Neon laser, semiconductor laser and applications of lasers.

Fiber optics: Introduction, principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, classification of optical fibers optical fiber communication system and applications of optical fibers.

UNIT II – PRINCIPLES OF QUANTUM MECHANICS AND BAND THEORY OF SOLIDS (07 periods)

Principles of Quantum Mechanics: Introduction, de-Broglie's hypothesis, Schrödinger's one dimensional wave equation (time independent), significance of wave function, particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment).

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment), origin of energy bands formation in solids, distinction between conductors, semiconductors and insulators based on band theory.

UNIT III – SEMICONDUCTORS AND DIELECTRIC PROPERTIES OF MATERIALS (13 periods)

Semiconductors: Introduction, types of semiconductors, intrinsic carrier concentration, electrical conductivity in semiconductors, drift and diffusion currents, Einstein's relation, Hall effect and its applications, direct and indirect band gap semiconductors, p-n junction, energy band diagram of p-n diode, LED, photo diode and Solar cell.

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, frequency dependence of polarizability (qualitative treatment), ferroelectricity.

UNIT IV – ACOUSTICS OF BUILDINGS AND SUPERCONDUCTIVITY (07 periods)

Acoustics of Buildings: Introduction, basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment), absorption coefficient of sound and its measurement, factors affecting the architectural acoustics and their remedies.

Superconductivity: Introduction, General properties - Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory (qualitative treatment), applications of superconductors.

UNIT V – CRYSTALLOGRAPHY AND NANOMATERIALS (07 periods)

Crystallography: Introduction, crystal planes, crystal directions and Miller indices, separation between successive (hkl) planes, X-ray diffraction by crystal planes, Bragg's law- powder method.

Nanomaterials: Introduction, principles of nanomaterials, properties of nanomaterials, synthesis of nanomaterials by ball milling and pulsed laser deposition and applications of nanomaterials.

Total Periods: 45

TEXT BOOKS:

1. P. K. Palaniswamy, ***Engineering Physics***, Scitech Publications India Private Limited, 2nd Edition, 2009

REFERENCE BOOKS:

1. Dr. S. Mani Naidu, ***Engineering Physics***, Pearson Education, 1st Edition, 2013.
2. M.N. Avadhanulu, P.G.Kshirsagar, ***A textbook of Engineering Physics***, S.Chand & Company Ltd. Revised edition 2014.
3. K. Thyagarajan, ***Engineering Physics-I***, McGraw-Hill Education (India) Pvt.Ltd. 2015

(14BT1BS01) ENGINEERING PHYSICS

(Common to All Branches of Engineering)

I Year B. Tech.

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	1	--	4

Pre requisite: --

COURSE OBJECTIVES:

1. To provide the basic knowledge of space & time, acoustics principles, quantum mechanics, laser concepts, nanotechnology, superconductors, principles of optical fibers and its communication systems, p-n Junction based devices and zero resistance concepts.
2. To develop skills in using semiconductor devices, lasers, magnetic field intensity and fiber optics.
3. To apply laser techniques and optical fibers in communication technology.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

1. Apply the knowledge of lasers and optical fiber technology in communication systems.
2. Analyze and provide basic information to design acoustically good halls, theatres, sound recording rooms, etc.
3. Gain knowledge of crystal directions and planes and for analyzing the complex crystal structure behavior for engineering and medical applications.
4. Use magnetic materials, lasers and superconductors for the benefit of society.
5. Recognize the importance of lasers, optical fibers and superconductors for effective use in engineering applications.

DETAILED SYLLABI:

UNIT-I: LASERS, FIBER OPTICS AND HOLOGRAPHY (18 periods)

Lasers: Introduction, characteristics of laser, principles of lasing action, spontaneous and stimulated emission of radiation, Einstein's coefficients, population inversion, ruby laser, Helium-Neon laser, semiconductor laser, applications of lasers.

Fiber optics: Introduction, construction and working principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, types of optical fibers and refractive index profiles, Attenuation and losses in fibers, optical fiber communication system, applications of optical fibers in sensors and medicine.

Holography: Introduction, construction of a hologram, reconstruction of image from hologram, applications.

UNIT-II: SPECIAL THEORY OF RELATIVITY, ACOUSTICS OF BUILDINGS AND CRYSTALLOGRAPHY (16 periods)

Special Theory of Relativity: Introduction, absolute frame of reference, time dilation, length contraction, addition of velocities, mass-energy equivalence, energy-momentum relation.

Acoustics of Buildings: Introduction, basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment),

absorption coefficient of Sound and its measurement, factors affecting the architectural acoustics and their remedies.

Crystallography: Introduction, crystal planes, crystal directions and Miller indices, separation between successive (hkl) planes, X-ray diffraction by crystal planes, Bragg's law, Laue and powder methods.

UNIT-III :PRINCIPLES OF QUANTUM MECHANICAS AND BAND THEORY OF SOLIDS (17 periods)

Principles of Quantum Mechanics: Black body radiation – Wien's law, Rayleigh-Jeans law and Planck's law (qualitative), waves and particles, matter waves, de-Broglie's hypothesis, G.P. Thomson experiment, Heisenberg's uncertainty principle, Schrödinger's one dimensional wave equation (time independent), significance of wave function, particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment only), scattering-source of electrical resistance.

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment), origin of energy band formation in solids, effective mass of electron, distinction between metals, semiconductors and insulators based on band theory.

UNIT-IV: DIELECTRIC PROPERTIES OF MATERIALS AND SEMICONDUCTORS (17 periods)

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, Clausius-Mossotti equation, frequency dependence of polarisability (qualitative treatment), ferro and piezo electricity.

Semiconductors: Introduction, intrinsic and extrinsic semiconductors, carrier concentration, electrical conductivity in semiconductors, drift and diffusion, Einstein's relation, Hall effect, direct and indirect band gap semiconductors, p-n junction, energy diagram of p-n diode, diode equation (qualitative), LED, photo diode and solar cell.

UNIT-V :MAGNETIC PROPERTIES OF MATERIALS, SUPERCONDUCTIVITY AND NANOMATERIALS (17 periods)

Magnetic Properties of Materials: Introduction, origin of magnetic moment, classification of magnetic materials into dia, para, ferro, anti-ferro and ferri magnetism, hysteresis, soft and hard magnetic materials.

Superconductivity: General properties, Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory, applications of superconductors.

Nanomaterials: Introduction, surface area to volume ratio, quantum confinement, properties of nanomaterials, synthesis of nanomaterials by ball milling, plasma arcing, pulsed laser deposition and sol-gel methods, carbon nanotubes-properties and applications, applications of nanomaterials.

Total : 85 periods

TEXT BOOKS :

1. S. Mani Naidu,*Engineering Physics*, Pearson Education, 2013.
2. P. K. Palaniswamy, *Engineering Physics*, Scitech Publications India Private Limited, 2009

REFERENCE BOOKS:

1. R. K. Gaur and S. L. Gupta , *Engineering Physics*, , Dhanpat Rai Publications (P) Ltd., 8th Edition, 2001.
2. M. R. Srinivasan ,*Engineering Physics* , New Age International (P) Limited, Publishers, 1st Edition,2010.

I B. Tech. – II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OBJECTIVES:

CEO 1: To impart basic knowledge on Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations.

CEO 2: To develop skills in analyzing the problems, designing mathematical models, Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations for the problems in engineering.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO 1 :Acquire basic knowledge in
- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations
- (f) Heat transfer and wave motion

CO 2 : Develop skills in analyzing the
- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO 3 :Develop skills in designing mathematical models for
- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO 4 :Develop analytical skills in solving the problems involving
- (a) Fourier series and Fourier transforms
- (b) Laplace transforms
- (c) Z-transforms and difference equations
- (d) Heat transfer and wave motion

CO 5 : Use relevant transformation techniques for
- (a) Obtaining Fourier transforms for different types of functions
- (b) Laplace transforms
- (c) Z- transforms
- (d) Partial differential equations

DETAILED SYLLABUS:

UNIT- I : FOURIER SERIES (7 periods)

Fourier series:Determination of Fourier coefficients, convergence of Fourier series (Dirichlet's conditions),Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT- II: FOURIER INTEGRALS AND FOURIER TRANSFORMS (8 periods)

Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III:LAPLACE TRANSFORMS (12 periods)

Laplace transforms of standard functions. Properties of Laplace transforms. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem (without proof), inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV : Z- TRANSFORMS (9 periods)

Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem(without proof), solution of difference equations by Z–transforms.

UNIT – V : PARTIAL DIFFERENTIAL EQUATIONS (9 periods)

Formation of Partial differential equations – Solutions of first order linear equations by method of grouping. First and second order equations by method of separation of variables – Solutions of one dimensional Wave equation, Heat equation.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, ***Engineering Mathematics, vol-1***, S. Chand & Company 13/e,2014.
2. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad, ***Mathematical Methods***, S.Chand and Company, 8/e,2013

REFERENCE BOOKS:

1. Grewal, B.S., ***Higher Engineering Mathematics***, Khanna publishers, Delhi, 42/e,2012
2. Kreyszig, E., ***Advanced Engineering Mathematics***, John Wiley and Sons, Inc., 9/e,2013.

II B. Tech. – II Semester/ III B.Tech – I Semester

(16BT4HS31) SOFT SKILLS LABORATORY

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	0	0	3	2

PRE-REQUISITES:

English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION:

Body Language; Creative Thinking; Stress Management; Goal Setting; Interpersonal Skills; Leadership Skills; Team Work; Assertiveness; Etiquette; Conflict Management; Report Writing; Group Discussions.

COURSE OBJECTIVES:

CEO1: To impart knowledge of Body Language in order to appreciate non-verbal forms of understanding and expression.

CEO2: To develop the principles in understanding the elements of team, anticipating the problem situation and adopt appropriate steps to remedy.

CEO3: To imbibe an attitude of planning & organizing to set and meet goals.

COURSE OUTCOMES:
On successful completion of this course the students will be able to
CO1: Acquire knowledge in

- Goal Setting
- Creative Thinking
- Leadership Skills
- Team Work

CO2: Analyse the functional knowledge in

- Body Language
- Interpersonal Skills
- Stress Management

CO3: Apply the techniques of soft skills in a problem situation enhanced through multimedia software.
CO4: Function effectively as an individual and as a member in diverse teams.
CO5: Communicate effectively in public speaking in formal and informal situations.

LIST OF EXERCISES:

1. Body Language
2. Creative Thinking
3. Stress Management
4. Goal Setting
5. Interpersonal Skills

6. Leadership Skills
7. Team Work
8. Assertiveness
9. Etiquette
10. Conflict Management
11. Report Writing
12. Group Discussions

Total Lab Slots: 10

TEXT BOOKS:

1. Department Lab Manual.

REFERENCE BOOKS:

1. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw-Hill Publishing Company Limited, Third Edition, New Delhi, 2012.
2. Gopalswamy Ramesh and Mahadevan Ramesh, *The Ace of Soft Skills*, Pearson, Noida, 2010.
3. Jeff Butterfeild, *Soft Skills for Everyone*, Cengage learning, Delhi, 2011.
4. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, Noida, 2012.

SUGGESTED SOFTWARE:

1. English Language Communication Skills Laboratory Software – SOFTX Technologies Pvt. Ltd., Hyderabad.
2. GEMS – Globarena E- Mentoring System.
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learning to Speak English 8.1, The Learning Company – 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series of Grammar.
9. Language in Use 1, 2 & 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix – Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. The Ultimate English Tutor.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES

COURSE DESCRIPTION: Oral communications; Basic grmmar; ;advancedgrammar;basic writing; Business French (La Francais Commercial)

COURSE OBJECTIVES:

CEO1. To impart knowledge of the nuances of communication.

CEO2. To develop Speaking and Writing skills in order to use French language effectively in distinct situations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Demonstrate knowledge in

- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2: Analyze the possibilities and limitations of language, understanding

- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3: Design and develop language skills for professional practice**.**

CO4: Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5: Understand French culture and civilization.

CO6*:* Communicate effectively with the native French in day to day situation**.**

DETAILED SYLLABUS

UNIT I –ORAL COMMUNICATION: (9 periods)

Introduction - Language as a Tool of Communication, French alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT II –BASIC GRAMMAR: (9 periods)

Introduction –Articles, -Er ending Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT III –ADVANCED GRAMMAR: (9 periods)

Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice.

UNIT IV –BASIC WRITING: (9 periods)

Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT V –BUSINESS FRENCH (La Francais Commercial) (9 periods)

Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.

Case study of influential French companies, Learning computer/desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment

Total Periods: 45

TEXT BOOKS:

1. Annie Berther, ***Alter Ego*** , Hachette Publications, 2012

REFERENCE BOOKS:

1 Regine Merieux, Yves Loiseau, ***Connexions*** , Goyall Publishers, 2011
2 Delphine Ripaud, ***Saison***, French and Euroean Inc., 2015

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS06) GERMAN LANGUAGE

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	--	3

PRE-REQUISITES

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Business German

COURSE OBJECTIVES:

CEO3. To impart knowledge of the nuances of communication.

CEO4. To develop Speaking and Writing skills in order to use German language effectively in distinct situations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Demonstrate knowledge in

- Process of communication
- Modes of listening
- Paralinguistic features
- Skimming and Scanning
- Elements of style in writing

CO2: Analyze the possibilities and limitations of language, understanding

- Barriers to Communication
- Barriers to Effective Listening
- Barriers to Speaking
- Formal and metaphorical language

CO3: Design and develop language skills for professional practice**.**

CO4: Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5: Understand German culture and civilization.

CO6: Communicate effectively with the native German in day to day situation**.**

DETAILED SYLLABUS

UNIT I –ORAL COMMUNICATION: (9 periods)

Introduction - Language as a Tool of Communication, German alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT II –BASIC GRAMMAR: (9 periods)

Introduction –Articles, Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT III –ADVANCED GRAMMAR: (9 periods)

Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice, Introduction to Case- Akkusativ, Nominativ, Dativ&Genetiv Case.

UNIT IV –BASIC WRITING: (9 periods)

Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT V –BERUFSDEUTCSCH (BUSINESS GERMAN): (9 periods)

Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.

Case studies of influential German companies, Learning computer/desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment.

Total Periods: 45

TEXT BOOKS:

1. Heuber, ***Tangram Aktuelleins***, Heuber Verlag Publications , 2011.

REFERENCE BOOKS:

1. Anta Kursisa, Gerhard Newner, Sara vicenta, ***Fir fuer Deutsch 1 und Deutsch 2,*** Heuber Verlag Publications, 2005
2. Herman Funk, ***Studio D A1***, Cornelsen GOYAL SAAB Publication, 2011.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS07) INDIAN CONSTITUTION

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ---

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, understanding for better professional practice and good citizenry

COURSE OBJECTIVES:

CEO1: To familiarize the students with parliamentary proceedings, legislature, and administration federal system and judiciary of India, civil services, Indian and international politics

CEO 2: To imbibe attitude for ethical behavior and attitude within provision of Constitution

COURSE OUTCOMES: After successful completion of the course the students will be able to

CO1: Gain knowledge in

- parliamentary proceedings, laws, legislature, administration and its philosophy
- federal system and judiciary of India
- socials problems and public services like central civil services and state civil services
- Indian and international political aspects and dynamics

CO2 : Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen

DETAILED SYLLABUS :

UNIT- I : PREAMBLE AND ITS PHILOSOPHY (8 periods)

Introduction and Evolution of Indian Constitution, preamble and its Philosophy.

UNIT- II :UNION GOVERNMENT (8 periods)

Powers, Functions and Position of President, Vice-President and Council of Ministers, Composition of parliament, Constitution Amendment Procedure, Financial Legislation in Parliament.

UNIT-III :FEDERAL SYSTEM (14 periods)

Centre-State relations, Directive Principles of State Policy, Fundamental Rights and Duties, Centre-State Relations, Features of Federal System, Administrative Relationship between Union and States, Powers, Functions and Position of Governors, Function of Chief Ministers, Council of Ministers, Composition and powers of the State Legislature.

UNIT-IV :JUDICIARY AND PUBLIC SERVICES (10 periods)

The Union Judiciary - Supreme Court and High Court, All India Services, Central Civil Services, State Services, Local Services and Training of Civil Services.

UNIT-V : INTERNATIONAL POLITICS (5 periods)

Foreign Policy of India, International Institutions like UNO, WTO, SAARC and Environmentalism.

Total periods : 45

TEXT BOOK:

1. Briji Kishore Sharma, ***Introduction to the Constitution of India***, Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Mahendra Pal Singh,V. N. Shukla's ***Constitution of India***, Eastern Book Company, 2011.
2. Pandey J. N., ***Constitutional Law of India*** - Central Law Agency, 1998

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS08) INDIAN ECONOMY

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: --

COURSE DESCRIPTION:
Introduction; Time Value of Money; Elementary Economic Analysis; Value Analysis/Value Engineering; Economic Planning.

COURSE OBJECTIVES:

CEO1: To familiarize the students with the concept of elementary principles of Indian economy and their operational significance from engineering perspective.
CEO2: To develop skills for effective use of principles of economy in firm/industry/corporation in public or private sector.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Acquire the knowledge in
- Micro and Macro Economics.
- Traditional and Modern methods of Capital Budgeting.
- Five year plans and NITI Aayog.

CO2: Analyze
- Capital Budgeting.
- Value Analysis and Value Engineering.
- Economic analysis
- Law of supply and demand

CO3 : Ability to understand the nuances of project management and finance

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION (9 Periods)
Economics- Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology, and Economic Development; Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

UNIT – II: TIME VALUE OF MONEY (12 Periods)
Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects – Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

UNIT – III: ELEMENTARY ECONOMIC ANALYSIS (9 Periods)
Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product; Material Selection-Process Planning, Process Modification.

UNIT - IV: VALUE ANALYSIS/VALUE ENGINEERING (6 Periods)

Introduction- Value Analysis, Value Engineering, Functions, Aims; Value Analysis vs. Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

UNIT- V: ECONOMIC PLANNING (9 Periods)

Introduction- Need For Planning in India, Five year plans(1951-2012), NITI Aayog (from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

Total Periods: 45

TEXT BOOKS

1. Panneerselvam R. ,***Engineering Economics*** , PHI Learning Private Limited, Delhi , 2/e,2013.
2. Jain T.R., V. K.Ohri, O. P. Khanna. ***Economics for Engineers***. VK Publication, 1/e, 2015.

REFERENCE BOOKS

1. Dutt Rudar & Sundhram K. P. M.***Indian Economy***.S. Chand, New Delhi, 62 revised edition 2010.
2. Misra, S.K. & V. K. Puri. ***Indian Economy*****: Its Development Experience.** Himalaya Publishing House, Mumbai 32/e ,2010.

III - B. Tech. II -Semester./ IV - B. Tech. I - Semester

(16BT6HS09) INDIAN HERITAGE AND CULTURE

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ---

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OBJECTIVES:

CEO5. To impart the knowledge on history of India and process of evaluation of Indian Culture and its importance.

CEO6. To develop analytical mind on the administrative hierarchies through the study of ancestral administration and study its relevance to the existing administrative set up

CEO7. To imbibe an attitude of having harmonious relations within society.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

CO1: Acquaint knowledge in

(a) human aspirations and values in Vedic culture.
(b) cultural aspects of Buddhism and Jainism
(c) unification of our country under Mourya's and Gupta's administrations
(d) socio Religious aspects of Indian culture
(e) reform movements and harmonious relations.

CO2 : Apply ethical principles and reforms as models for the upliftment of the societal \ status in the present cultural contexts

DETAILED SYLLABUS:

UNIT I - : BASIC TRAITS OF INDIAN CULTURE (9 periods)

Meaning and definition and various interpretations of culture. Culture and its features. The Vedic and Upanishadic culture and society. Human aspirations and values in these societies. Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

UNIT II - : HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (9 periods)

Salient features of Jainism - contributions of Jainism to Indian culture. Contributions of Aachaarya and Mahaapragya. Buddhism as a humanistic culture. The four noble truths of Buddhism. Contributions of Buddhism to Indian culture.

Unit- III : CULTURE IN THE MEDIEVAL PERIOD (9 periods)

Unifications of India under Mouryas and Guptas and their cultural achievements. Cultural conditions under satavahanas. Contributions to pallavas and cholas to art and cultural achievements of vijayanagara rulers.

Unit- IV : SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE (9 periods)

Western impact on India, Introductin of western education, social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi- Anne Besant. (theosophical society)

Unit- V : REFORM MOVEMENTS FOR HARMONIOUS RELATIONS (9 periods)

Vivekananda, Eswarchandra vidyasagar and Veeresalingam- emancipation of women and struggle against caste. Rise of Indian nationalism. Mahatma Gandhi- Non violence and satyagraha and eradication of untouchability .

Total Periods: *45*

TEXT BOOKS:

1. Valluru Prabhakaraiah, ***Indian Heritage and Culture***, Neelkamal Publications Pvt. Ltd. Delhi, 1/e , reprint 2015.

REFERENCE BOOKS:

1. L. P. Sharma, ***History of Ancient India***, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, ***History of Medieval India***, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. L. P. Sharma, ***History of Modern India***, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
4. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS10) INDIAN HISTORY

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ----

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OBJECTIVES:

CEO1: To familiarize the students with elements of Indian history by which they could correlate contemporary issues and problems in Indian society.
CEO 2: To develop analytical skills on social processes of civilizations, modernization and social change

CEO 3: To imbibe culture that will enhance them to be better citizens of the nation

COURSE OUTCOMES: After successful completion of the course the students will be able to

CO 1: Gain knowledge on evolution and history of India as a nation

CO2: Analyze social and political situations of past and current periods

CO3: Practice in career or at other social institutions morally and ethically

DETAILED SYLLABUS:

UNIT-I : INTRODUCTION (8 periods)

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

UNIT-II : ANCIENT INDIA (9 periods)

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

UNIT -III: CLASSICAL & MEDIEVAL ERA (12 periods)

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

UNIT-IV: MODERN INDIA (6 periods)

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947).

UNIT-V :INDIA AFTER INDEPENDENCE (1947 -) (10 periods)

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing Nature of work and organization.

Total periods : 45

TEXT BOOK:

1. K. Krishna Reddy, ***Indian History***, Tata McGraw-Hill, 21st reprint,2017

REFERENCE BOOKS:

1. Guha, Ramachandra, ***India after Gandhi***, Pan Macmillan,2007 Thapar, Romila, ***Early India***, Penguin, 2002

III B. Tech. – II Semester (CSE, CSSE, IT, CE & ME)

IV B. Tech. – I Semester (ECE, EEE & EIE)

(16BT6HS11) PERSONALITY DEVELOPMENT

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: Soft Skills Lab

COURSE DESCRIPTION:

Self-esteem & Self-Management; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

COURSE OBJECTIVES:

CEO1: To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.

CEO2: To impart training for positive thinking, that enables the students to be in a good stead to face the challenges,

CEO3: To imbibe an attitude of planning & organizing to set and meet goals.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Demonstrate knowledge in

- Self-Management
- Planning Career

CO2: Analyze the situations based on

- Attitudes
- Thinking strategies

CO3: Design and develop the functional skills for professional practice in

CO4: Function effectively as an individual and as a member in diverse teams.

CO5: Communicate effectively in public speaking in formal and informal situations.

DETAILED SYLLABUS:

UNIT – I: SELF-ESTEEM & SELF-IMPROVEMENT (9 Periods)

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve - Actively Working to Improve Yourself.

Case study: 1

UNIT – II: DEVELOPING POSITIVE ATTITUDES (9 Periods)

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes.

Case study: 2

UNIT – III: SELF-MOTIVATION & SELF-MANAGEMENT (9 Periods)

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies.

Case study: 3

UNIT – IV: GETTING ALONG WITH THE SUPERVISOR (9 Periods)

Know your Supervisor – Communicating with Your Supervisor – Special Communications With Your Supervisor – What Should You Expect of Your Supervisor? – What Your Supervisor Expects of You - Moving Ahead Getting Along with Your Supervisor.

Case study: 4

UNIT - V: WORKPLACE SUCCESS (9 Periods)

First Day on the Job – Keeping Your Job – Planning Your Career – Moving ahead.

Case study: 5

Total Periods: 45

TEXT BOOK:

1. Harold R. Wallace and L. Ann Masters, *Personality Development*, Cengage Learning, Delhi, Sixth Indian Reprint 2011.

REFERENCE BOOKS:

1. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, New Delhi, 2011.
2. Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, New York, 1989
3. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, Second Revised Edition 2011.
4. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th Edition 2014.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS12) PHILOSOPHY OF EDUCATION

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: ---

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

COURSE OBJECTIVES:

CEO1: To familiarize the students with the fundamentals of educational philosophical methods.

CEO2: To impart skills in applying the contextual knowledge of Engineering education and responsibilities.

CEO3: To imbibe an attitude to inculcate and implement values of engineering education.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Acquire knowledge in

- Philosophy of Engineering education.
- Philosophical Methods.
- Knowledge acquiring methods.
- Engineering education and responsibilities.

CO2: Understand the impact of Outcome Based Education for effective educational outcomes

CO3: Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

DETAILED SYLLABUS :

Unit- I:INTRODUCTION TO PHILOSOPHY ANDENGINNERING EDUCATION (9 periods)

Concept , Significance, and Scope of Philosophy in Engineering – Aims of Engineering Education – relationship between philosophy and engineering education – speculative, normative and critical approaches of philosophy in engineering.

Unit- II :PHILOSOPHICAL METHODS AND THEIR IMPLICATIONS IN ENGINEE RING (9 periods)

Introduction to Philosophical approaches: Idealism, Naturalism, Pragmatism, Realism and Existentialism; Significance and Scope in Engineering Education.

Unit: III :PHILOSOPHICAL EDUCATION IN INDIA (9 periods)

Different branches of philosophy- meaning, Epistemology: nature and scope; Knowledge acquiring methods; Kinds and instruments of knowledge; Re-shaping of educational thoughts by Indian thinkers: Rabindranath Tagore, Sri Aurobindo Gosh, Mahatma Gandhi, Jiddu Krishnamurthy and Swamy Vivekananda.

Unit- IV:VALUES AND ENGINEERING EDUCATION (9 periods)

Introduction; Engineering education and responsibilities: health, social, moral, ethics aesthetic; Value: crisis and strategies for inculcation;
Case study: Engineering Solutions given by Mokshagundam Visvesvaraya

Unit-V :OUTCOME- BASED EDUCATION (9 periods)

Institutional visioning ;educational objectives ; programme outcomes , curriculum, stakeholders, infrastructure and learning resources ; governance and management, quality in education.

Total periods: 45

TEXT BOOKS :

1. Ganta Ramesh, ***Philosophical Foundations of Education***, Neelkamal Publications, 1/e,2013
2. Carl Micham, ***Thinking through technology(The Paths between Engineering and Philosophy)***.University of Chicago Press, 1/e,1994.
3. Louis L Bucciarelli, ***Engineering Philosophy,*** Delft University Press,1/e, 2003.
4. NBA/ABET Manuals.

REFERENCE BOOKS :

1. Louis L Bucciarelli, ***Philosophy of Technology and Engineering Sciences***, North Holland, 1/e, 2009 (e-book).
2. Samuel Florman, ***Existential pleasures of education***. Martins's Griffin S.T. publication, 1/e, 1992.

III B. Tech. – II Semester / IV B. Tech. – I Semester

(16BT6HS13) PUBLIC ADMINISTRATION

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: Nil

COURSE DESCRIPTION:
Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

COURSE OBJECTIVES:

CEO1: To familiarize the students with the theories, concepts and practices of public administration from engineering perspective.

CEO2: To develop critical thinking and problem solving skills for effective practice of Good Governance and Administrative Development that are applied in the chosen domain.

CEO3: To imbibe an attitude of understanding and implementing administration policies for sustainable development in distinguished sectors.

COURSE OUTCOMES: On successful completion of this course the students will be able to

CO1: Acquireknowledge in
- Public Policy.
- Good Governance.
- E-governance.
- Development Administration.
-

CO2: Analyze the possibilities and limitations of existing policies through Good Governance perspective.

CO3: Design and develop solutions in e-governance models to find and provide opportunities in e-governance.

CO4: Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.

CO5: Understand the significance of Administrative Development in finding professional engineering solutions by probing
- Bureaucracy.
- Role of civil society.

DETAILED SYLLABUS :

UNIT – I: INTRODUCTION (9 Periods)

Public and Private Administration- Differences and Similarities, Meaning, Scope; Importance of Public Administration in Modern Era; Public Administration and its implications in the field of Engineering.

Case Study: Unique Identification Authority of India (UIDAI):Aadhaar Project: Challenges Ahead

UNIT – II: PUBLIC POLICY (9 Periods)

Meaning and Scope; Policy Formulation in India; Policy making process; Policy Implementation Engineering and Public Policy, Social, ethical, Monetary and fiscal policies; policy implications of engineering; The engineer's role in Public Policy.

Case Study: NITI Aayog: Demonetization and Aftermath of Demonetization – Cashless transactions.

UNIT – III: GOOD GOVERNANCE (9 Periods)

Significance; Objectives; Concepts; Reforms; Organization and its basic problems Administrative and Governance reforms in India; Sustainable and Inclusive growth in India; Engineering and Sustainable Environment-Role of Engineers; Right to information Act

Case Study: Strategies in Good Governance: A Case Study of Karnataka, Kerala and Orissa.

UNIT – IV: E-GOVERNANCE (9 Periods)

Meaning, Significance, Issues in E-governance; E-governance Models, Problems and Opportunities; Application of Data Warehousing and Data Mining in Governance; Engineers role in re-engineering E-governance.

Case Study: e-Housing System for Bhavana Nirman Dhanasahayam Online disbursement of housing assistance in Kerala.

UNIT - V: DEVELOPMENT ADMINISTRATION (9 Periods)

Introduction; Development Administration-Administrative Development- Sustainable Development -Significance- Objectives; Bureaucracy - Personnel administration and human resources development; Role of civil society-Citizens and administration; Development and Engineering: Issues Challenges and Opportunities.

Case Study: Neeru-Chettu (Water-Tree) of Andhra Pradesh.

Case Study: TPDDL of Delhi and Odisha.

Total Periods: 45

TEXT BOOKS

1. M.P. Sharma, B.L. Sadana, HarpreetKaur. ***Public Administration in Theory and Practice***. KitabMahal, Mumbai, 1/e,2014.
2. CSR Prabhu, ***E. Governance – concepts and case studies***.PHI, New Delhi, 2/e 2012.

REFERENCE BOOKS

1. Surendra Munshi, Bijupaul Abraham ***Good Governance, Democratic societies and Globalization***, Sage publications, New Delhi,1/e ,2004.

2. R.K.Sapru, ***Public Policy***, Sterling Publishers Pvt Ltd., New Delhi, 1/e, 2001.

(16BT60112)BUILDING MAINTENANCE AND REPAIR

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:

Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
CO2. Analyze failures, repair and rehabilitation techniques.
CO3. Solve complex building maintenance problems through proper investigations and interpretation.
CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
CO5. Provide solutions for building maintenance and repair problems considering health and safety.
CO6. Consider environmental sustainability in building maintenance and repair.
CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

DETAILED SYLLABUS:

UNIT-I: DURABILITY AND SERVICEABILITY OF BUILDINGS (10 Periods)

Life expectancy of different types of buildings; Effect of environmental elements such as heat, dampness, frost and precipitation on buildings; Effect of chemical agents on building materials, Effect of pollution on buildings, Effect of fire on building; Damage by biological agents like plants, trees, algae, fungus, moss, insects, etc.; Preventive measures on various aspects, Inspection, Assessment procedure for evaluating for damaged structures, Causes of deterioration, Testing techniques.

UNIT-II:FAILURE AND REPAIR OF BUILDINGS (10 Periods)

Building failure – Types, Methodology for investigation; Diagnostic testing methods and equipment, Repair of cracks in concrete and masonry, Materials for Repair, Methods of repair, Repair and strengthening of concrete buildings, Foundation repair and strengthening, Underpinning, Leakage of roofs and repair methods.

UNIT-III: TECHNIQUES FOR REPAIR (08 Periods)

Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete, Gunite and shotcrete, Epoxy injection, Mortar repairs for cracks, Shoring and underpinning.

UNIT-IV: MAINTENANCE OF BUILDINGS (09 Periods)

Reliability principles and its applications in selection of systems for building, Routine maintenance of building, Maintenance cost, Specifications for maintenance works, Dampness-Damp proof courses, Construction details for prevention of dampness; Termite proofing, Fire protection, Corrosion protection.

UNIT-V: CONSERVATION AND RECYCLING (08 Periods)

Performance of construction materials and components in service, Rehabilitation of constructed facilities, Conservation movement, Materials and methods for conservation work, Recycling of old buildings and its advantages, Examples.

Total Periods: 45

TEXT BOOKS:

1. Dennison Campbell, Allen and Harold Roper, *Concrete Structures – Materials, Maintenance and Repair*, Longman Scientific and Technical, UK, 1991.
2. Allen, R.T. L., Edwards, S.C. and J. D. N. Shaw, *The Repair of Concrete Structures*, Blackie Academic & Professional, UK, 1993.

REFERENCE BOOKS:

1. Peter H. Emmons, *Concrete Repair and Maintenance*, John Wiley and Sons Publications, 2002.
2. Building Construction under Seismic Conditions in the Balkan Region, UNDP/UNIDO Project Rer/79/015,Volume 5, *Repair and Strengthening of Reinforced Concrete, Stone and Brick Masonry Buildings*, United Nations Industrial Development Organisation, Vienna.
3. Shetty, M. S., *Concrete Technology*, S. Chand and Company.
4. Smith, P. and Julian, W., *Building Services*, Applied Science Publications, London, 1976.
5. SP: 25, BIS; *Causes and Prevention of Cracks in Buildings*.
6. Champion, S., *Failure and Repair of Concrete Structures*, John Wiley and Sons Publications, 1961.
7. Perkins, P. H., Repair, Protection and Water Proofing of Concrete Structures, E& FN Spon, UK, 3rdEdition, 1997.

IV B.Tech - I Semester

(16BT60115)ENVIRONMENTAL POLLUTION AND CONTROL

(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PREREQUISITES: --

COURSE DESCRIPTION:
Fundamentals ofair pollution;Dispersion of pollutants; Effects and control of air pollution; Water pollution;Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: On successful completion of the course, students will be able to

CO1. Demonstrateknowledge on air, water, soil pollution and their control and solid waste management.
CO2. Analyze causes and effects of air, water and soilpollution and their remedial measures.
CO3. Recommend suitable solutionsto complex environmental pollution problems.
CO4. Use appropriate remedial technique to solve environmental pollution problems.
CO5. Understand the effects of environmental pollutionon human health and vegetation.
CO6. Encourage sustainable development through implementation of pollution control measures.
CO7. Maintain IS Codes for environmental quality control.

DETAILED SYLLABUS:

UNIT-I: AIR AND NOISE POLLUTION (08 Periods)

Air Pollution: Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern; Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

Noise Pollution: Sound pressure, Power and intensity, Impacts of noise, permissible limits of noise pollution, measurement of noise.

UNIT-II: AIR AND NOISE POLLUTIONCONTROL (10 Periods)

Self-cleansing properties of the environment, Dilution method, Control at source, Process changes and equipment modifications, Control of particulates–Types of equipment, Design and operation –Settling chambers, Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseous pollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution.

UNIT-III: WATER POLLUTIONAND CONTROL (10 Periods)

Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, Engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment and disposal – Primary, Secondary, Tertiary; Case studies.

UNIT-IV: SOIL POLLUTION AND CONTROL (08 Periods)

Soil pollutants, Sources of soil pollution, Causes, Effects and control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Case studies.

UNIT-V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)

Types of solid waste, Composition of solid waste, Collection and transportation of solid waste, Methods of disposal – Open dumping, Sanitary landfill, Composting, Incineration, Utilization - Recovery and recycling, Energy Recovery.

Total Periods: 45

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.
2. C.S.Rao, *Environmental Pollution Control Engineering*, New Age International Pvt. Ltd., 2nd Edition, 2007.
3. Ibrahim A. Mirsa, *Soil Pollution: Origin, Monitoring & Remediation*, Springer, UK, 2nd Edition, 2008.

REFERENCE BOOKS:

1. M.N. Rao and H.V.N. Rao, *Air Pollution,* Tata McGraw–Hill Education Pvt. Ltd., 19th Edition, 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* Academic Press (Elsevier), 5th Edition, 2014.
3. S.M.Khopkar,*Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd Edition, 2007.
4. V. M. Domkundwar, Environmental Engineering, DhanpatRai& Co. Pvt. Ltd., New Delhi, 2014.

IV B.Tech - I Semester
14BT70106: ENVIRONMENTAL POLLUTION AND CONTROL
(Open Elective)

Internal Marks	External Marks	Total	L	T	P	C
30	70	100	3	1	–	3

PREREQUISITES: Environmental Sciences

COURSE DESCRIPTION: Introduction, Sources and Effects of Air Pollution – Dispersion of Pollutants and their control – Surface and Ground Water Pollution and control–Soil Pollution and remediation–Management of Municipal Solid Wastes.

COURSE OUTCOMES:
On successful completion of the courses, the students will be able to:
CO1. Explain various pollutants, characteristics and their dispersion
CO2. Analyze the major pollutants that causes environmental pollution.
CO3. Conduct research and select suitable techniques to control pollution.
CO4. Understand the effects of environmental pollutions on human beings and vegetation.
CO5. Communicate the methods of management and control of environmental pollution.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO AIR POLLUTION AND DISPERSION OF POLLUTANTS (08 Periods)
Scope – Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, Point and Non–Point, Line and Area Sources of Air Pollution – Stationary and Mobile Sources – Dispersion of Pollutants – Dispersion Models – Applications.

UNIT-II: EFFECTS AND CONTROL OF PARTICULATES (09 Periods)
Effects of Air Pollutants on Man, Material and Vegetation – Global Effects of Air Pollution – Green House Effect, Heat Island, Acid Rains, Ozone Holes – Control of Particulates – Control at Sources – Process Changes – Equipment Modifications – Design and Operation of Control Equipment – Settling Chambers – Centrifugal Separators – Bag Filters, Dry and Wet Scrubbers – Electrostatic Precipitators.

UNIT-III: WATER POLLUTION (10 Periods)
Introduction–Water Quality in Surface Waters – Nutrients – Controlling Factors in Eutrophication–Effects of Eutrophication – Ground Water Pollution – Thermal Pollution – Marine Pollution – Sewage Disposal in Ocean – Types of Marine Oil Pollution – Cleanup of Marine Oil Pollution – Control of Water Pollution – Case Study on Tanneries – Drinking Water Quality Standards.

UNIT-IV: SOIL POLLUTION (09 Periods)
Soil Pollutants – Sources of Soil Pollution – Causes of Soil Pollution and their Control – Effects of Soil Pollution–Diseases Caused by Soil Pollution – Methods to Minimize Soil Pollution – Effective Measures to Control Soil Pollution – Case Study on Fertilizer.

UNIT-V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)
Introduction – Types of Solid Wastes – Principles of Excreta Disposal – Domestic Solid Waste Production – Collection of Solid Wastes – Transport of Solid Wastes – Management of Solid Wastes – Methods of Land Disposal – Sanitary Landfill – Composting – Incineration.

Total Periods: 45

TEXT BOOKS:

1. C.S.Rao, *Environmental Pollution Control Engineering*, 2nd Edition, New Age International Pvt Ltd., 2007.
2. Y.Anjaneyulu, *Introduction to Environmental Science,* 1st Edition, BS Publications., 2009.

REFERENCE BOOKS:

1. M.N. Rao and H.V.N. Rao, *Air Pollution,* 19th Edition, Tata McGraw–Hill Education Pvt. Ltd., 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* 5th Edition, Academic Press (Elsevier), 2014.
3. S.M.Khopkar , *Environmental Pollution Monitoring and Control,* 2nd Edition, New Age International Pvt Ltd., 2007.
4. S.Deswal and K.Deswal, *Environmental Science,* 2nd Edition, Dhanpat Rai & Co, 2011.

I B. Tech. - I Semester

(16BT10232) ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	0	0	3	2

PRE-REQUISITES: NIL

COURSE DESCRIPTION: Identification and specifications of various Electric and Electronic devices; analysis of various series, parallel and series-parallel electrical circuits; develop various electrical circuits for domestic and industrial applications.

COURSE OUTCOMES: After successful completion of the course, student will be able to

CO1: Demonstrate knowledge on various Electrical and Electronic Devices.
CO2: Analyze various series and parallel electrical circuits.
CO3: Design and develop various electrical circuits for domestic and industrial applications.
CO4: Function effectively as individual and as a member in a team.
CO5: Communicate effectively both oral and written forms

DETAILED SYLLABUS:

PART A: (Demonstration)

1. Identification and Specifications of R, L, C Components (Colour Codes), Potentiometers, Switches (SPST, DPST and DPI), Gang Condensers, Relays, Bread Boards, PCBs, Fuses, MCBs, Earthing and Electrical Wiring accessories.
2. Identification and Specifications of Active Devices: Diodes, BJTs, Low-power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs, Linear and Digital ICs.
3. Study the operation of
   - Multimeter (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO.

PART-B:

1. Measurement of Electrical Quantities (AC & DC) using: Voltmeter, Ammeter and Wattmeter.
2. Measurement of Resistivity of a conducting wire.
3. Circuit with one lamp controlled by one switch and provision of 2-pin or 3-pin socket PVC surface conduit system.
4. Circuit with two lamps controlled by two switches with PVC surface conduit system.
5. Circuit for Stair case wiring and Godown wiring.
6. Circuit connection for a Fluorescent tube
7. Solder simple electronic circuits.
8. B-H curve of a Magnetic material
9. I-V and P-V characteristics of a Solar panel
10. Design and Fabrication of a single-phase transformer
11. PCB preparation and design of a circuit on a PCB

II B.Tech. - I semester

(16BT30251) ELECTRICAL TECHNOLOGY LAB

(Common to ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses onNetwork Analysis and Network Analysis lab.

COURSE DESCRIPTION:

Construction,operation,types, performance evaluation of DC& ACmachines and transformers;Necessity of starter for DC motors; Three phase power measurement.

COURSE OUTCOMES:

On successful completion of course, students will be able to:

CO1. Demonstrate knowledge on
- Construction, operation of DC& ACmachines and transformers.
- Starting and speed control of DC motors.
- Testing of DC& ACmachines and transformers.
- Characteristics of DC& ACmachines and transformers.
- Measurement of three phase power.
- Applications of DC& ACmachines and transformers.

CO2. Analyzethe operation and performance of DC& ACmachines, transformers and three phase system for various operating conditions.

CO3. Design the circuit with suitable accessories / controllers for desired operation conditions of DC & AC machines.

CO4. Interpret and synthesize the data obtained from experimentation on DC& ACmachines, transformers and three phase system and provide valid conclusions.

CO5. Select and apply appropriate technique for testing and control of DC& ACmachines and transformers useful in industry.

CO6. Apply the conceptual knowledge of electrical machines in relevance to industry and society.

CO7. Commit to ethical principles and standards while exercising the practical investigations on electrical machines.

CO8. Work individually or in a group while exercising practical investigationsin the field of electrical machines.

CO9. Communicate effectively in verbal and written form in relevance to electrical machines.

DETAILED SYLLABUS:

PART -A

1. Construction of DC machines, transformers, synchronous machines, induction motorsand DC motor starters.

PART – B

Any NINE experiments are to be conducted

1. Magnetization characteristic of a DC generator.
2. Load characteristics of DC shunt generator.
3. Swinburne's test on a DC shunt machine.
4. Brake test on a DC shunt motor.
5. Speed control of DC shunt motor by
    a. Field flux control method
    b. Armature voltage control method.
6. OC and SC tests on a singlephase transformer.
7. Load test on a single phase transformer.
8. Measurement of power using two wattmeter method
9. Brake test on a threephase induction motor.
10. Regulation of a three phase alternator by synchronous impedance method.
11. Brake test on single phase induction motor.

II B. Tech -I Semester
14BT30222: ELECTRICAL TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
25	50	75	-	-	3	2

PRE-REQUISITES:
Courses on Network Analysis and Electrical Technology.

COURSE DESCRIPTION:
Determination of Two port network parameters, verification of network theorems; Response of RLC circuits; Performance characteristics of AC and DC Machines.

COURSE OUTCOMES:
On successful completion of course, the students will be able to:
CO1. Analyze the performance of electrical machines.
CO2. Design various types of passive filters and resonant circuits.
CO3. Solve complex problems in electrical circuits and machines.

LIST OF EXPERIMENTS:

Any SIX experiments from each part to be conducted

Part-A
1. Series and parallel resonant circuits.
2. TimeresponseoffirstorderRL/RCnetworkforperiodicnon-sinusoidalinputs.
3. Determination of Z and Y parameters for a given Two-port network
4. Determination of ABCD and h-parameters for a given Two-port network
5. Verification of Superposition and Reciprocity theorems
6. Verification of maximum power transfer theorem for both DC and AC excitation.
7. Verification of Thevenin's and Norton's theorems
8. Design of low pass and high pass filters.

Part-B
1. Magnetization characteristic of a DC generator.
2. Swinburne's test on a DC shunt machine.
3. Brake test on a DC shunt motor.
4. Speed control of DC shunt motor by
    a. Field flux control method
    b. Armature voltage control method.
5. OC and SC tests on a single-phase transformer.
6. Load test on a single phase transformer.
7. Brake test on a three-phase induction motor.
8. External characteristics of DC shunt generator.

I B. Tech. – II Semester

(16BT20541) FOUNDATIONS OF DATA STRUCTURES

(Common to ECE, EEE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: A course on "Programming in C"

COURSE DESCRIPTION: Concepts of sorting: sorting by exchange, sorting by distribution, sorting by merging and data structures: stacks, queues, linked lists, trees, graphs, and hash table.

COURSE OUTCOMES: On successful completion of this course the students will be able to:

CO1. Gain knowledge in Sorting techniques, Linear and Non-linear Data Structures.

CO2: Analyze the performance of sorting techniques and their relationship to Data Structures.

CO3. Design appropriate hashing function for a given application and develop programs to implement Linear and Non-Linear data structures

CO4. Apply appropriate data structure to provide solutions for real time problems using C Language

DETAILED SYLLABUS:

UNIT - I :SORTING (9 Periods)

SORTING - Sorting by Exchange-Shell Sort, Quick sort. Sorting By Distribution-Counting Sort, Bucket Sort, Radix Sort. Sorting By Merging-Merge Sort.

UNIT – II: STACKS AND QUEUES (9 Periods)

STACKS -Introduction, Stack Operations, Applications.
QUEUES - Introduction, Operations on Queues, Circular Queues, Applications.

UNIT – III: LINKED LISTS (9 Periods)

LINKED LISTS –Introduction, Single Linked List, Circular Linked List, Doubly Linked List, Multiply Linked List, Applications.
LINKED STACKS AND LINKED QUEUES - Introduction, Operations on Linked Stack and Linked Queues, Dynamic Memory Management and Linked Stacks.

UNIT – IV: TREES AND BINARY TREES (9 Periods)

TREES– Introduction, Definition and Basic Terminologies, Representation of Trees.
BINARY TREES – Basic Terminologies and Types, Representation of Binary Trees, Binary Tree Traversals, Binary Search Trees: Definition and Operations, Applications.

UNIT – V: Graphs and Hashing (9 Periods)

Graphs – Introduction, Definitions and Basic Terminologies, Representation of Graphs, Graph Traversals, Applications.

Hashing – Introduction, Hash Table Structure, Hash Functions, Linear Open Addressing, Chaining, Applications.

Total Periods: 45

TEXT BOOK:

1. G.A.V. Pai, "Data Structures and Algorithms", Tata McGraw Hill, Second Edition, 2009.

REFERENCE BOOK:

1. DebasisSamanta, "Classic Data Structures", PHI Learning, Second Edition, 2009.

I B. Tech. – II Semester

(16BT20551) FOUNDATIONS OF DATA STRUCTURES LAB

(Common to ECE, EEE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	0	0	3	2

PRE-REQUISITES: A course on "Foundations of Data Structures"

COURSE DESCRIPTION: Hands on programming to implement data structures - Linked lists, Stacks, Queues, Trees, Search trees, Sorting, and Hashing in C Language.

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

CO1. Gain practical knowledge on stacks, queues, trees, graphs and Hashing Techniques
CO2. Identify suitable data structure to solve real world engineering problems.
CO3. Design solutions for complex engineering problems using linear and non-linear data structures.
CO4. Develop algorithms leading to multiple solutions by conducting investigations of complex problems.
CO5. Apply 'C' language as a tool for implementing linear and non linear data structures

CO6. Communicate effectively by writing Programs and document practical work.

LIST OF PRACTICAL EXERCISES:

Sl. No.	EXERCISE NUMBER	NAME OF THE EXERCISE	No. of Slots required
1.	EXERCISE 1	Implement the following sorting techniques (A) Quick Sort (b) Radix Sort (c) Merge Sort	2
2.	EXERCISE 2	Implement the following data structures using arrays (a)Stack (b) Queue (c) Circular Queue	2
3.	EXERCISE3	Implement the following operations on a single linked list. (a) Creation (b) Insertion (c) Deletion (d) Display	2
4.	EXERCISE4	Implement the following operations on a double linked list. (a) Creation (b) Insertion (c) Deletion (d) Display	1
5.	EXERCISE 5.	Implement the following operations on a circular linked list. (a) Creation (b) Insertion (c) Deletion (d) Display	1
6.	EXERCISE 6.	Implement the following data structures using linked list. (a) Stack (b) Queue (c) Circular Queue	1
7.	EXERCISE 7.	Implement the following tree traversals on a binary tree (a) Preorder (b) Inorder (c) Postorder	1
8.	EXERCISE 8.	Implement the following operation on binary search tree (a) Creation (b) Insertion (c) Deletion (d) Inorder	1
9.	EXERCISE 9.	Implement the following graph traversal techniques (a) Breadth First traversal (b) Depth First Traversal	2
10.	EXERCISE 10.	Implement the following Hashing Techniques (a) Separate Chaining (b) Open addressing methods	2

Reference Books:

1. G.A.V. Pai, *"Data Structures and Algorithms",* Tata McGraw Hill, Second Edition, 2009.
2. Debasis Samanta, "*Classic Data Structures",* PHI Learning, Second Edition, 2009.

III B. Tech. – II Semester

(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

(Common to CE, ME, CSE, IT & CSSE)
(Open Elective)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: —

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.

CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.

CO3. Develop a comprehensive and well planned business structure for a new venture.

CO4. Conduct investigation on complex problems, towards the development of Project.

CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.

CO6. Apply ethics in constructive innovation framework.

CO7. Exhibit professionalism by employing modern project management and financial tools.

DETAILED SYLLABUS:

UNIT - I: Creativity and Innovation (07 Periods)

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

UNIT - II: Paradigms of Innovation (11 Periods)

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and its application, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

UNIT - III: Sources of finance and venture capital (07 Periods)

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

UNIT - IV: Intellectual property innovation and Entrepreneurship (11 Periods)

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

UNIT - V: Open Innovation framework & Problem solving (09 Periods)

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and

Opportunities of open innovation framework, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship*, Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, *Managing Technology and Innovation for Competitive Advantage*, Pearson India, 1st Edition, 2002.

III B.Tech - II Semester
14BT60308:MANAGING INNOVATION AND ENTREPRENEURSHIP
(OPEN ELECTIVE)
(Common to CSE, IT, CSSE, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	3

PRE-REQUISITES: Nil

Course Description:

Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts Shifting Composition of the Economy Purposeful Innovation & 7 Sources of Innovative Opportunity The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

Course Outcomes:

After completion of this course, a suessful student will be able to:

CO1: Define, explain and illustrate theories of business innovation and entrepreneurship, the evolution of industries and economies, and the roles of Entrepreneurs.

CO2: Develop a comprehensive and well structured business plan for a new venture.

CO3: Present a persuasive business plan to potential investors or to internal stakeholders and effectively answer probing questions on the substance of the plan; and,

CO4: Work effectively in multidisciplinary, cross-cultural teams, towards the development of a Team Project.

Unit-I: ENTREPRENEURSHIP (7 Periods)

Introduction to Entrepreneurship: Evolution of entrepreneurship from economic theory; Managerial and entrepreneurial competencies, entrepreneurial growth and development.

UNIT II: CREATIVITY AND INNOVATION (11Periods)

Creativity and Innovation: Concepts Shifting Composition of the Economy; Purposeful Innovation & the 7 Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies: Strategies that aim at introducing an innovation, innovation & entrepreneurship, planning -incompatible with Innovation & entrepreneurship.

Unit-III: THE INDIVIDUAL ENTREPRENEUR (7 Periods)

Entrepreneurial Motivation: Need for continuous learning & relearning; AcquiringTechnological Innovation Entrepreneurial motivation (nach story); Achievement Motivation in Real life- Case Study. Entrepreneurs versus inventors

Unit-IV: INTERNATIONAL ENTREPRENEURSHIP OPPORTUNITIES (11 Periods)

International Entrepreneurship: Concepts and Nature of International Entrepreneurship. The changing International environment. Ethics and International Entrepreneurship. Entrepreneurial entry in to international business, strategic Issues in International Entrepreneurship.

Unit-V: Creative Problem Solving (9 Periods)

Problem Identification and Problem Solving: Problem Identification. Problem solving Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

1: Martin, M.J. "Managing Innovation and Entrepreneurship in Technology based Firm", John Wiley Interscience, 1994.

2: Ettlie, J.E. "Managing Technology Innovation", John Wiley & Sons, 2000.

3: Robert D Hisrich., Michael P Peters., Dean A Shepherd,"Entrepreneurship"The McGraw-Hill Companies, 6th Edition, 2011

REFERENCE BOOKS:

1: Christensen, C. M. and Raynor, M. E. The Innovators Solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press, (2003).

2: Drucker, P. F., Innovation and Entrepreneurship, New York: Harper, 1985.

3: Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press (2001).

4: Harvard Business Review on Entrepreneurship (Collection of articles), Harvard Business School Press (1999)

5: Rogers, E.M., "Diffusion of Innovations", New York: Simon and Schuster, 5th Edition, 2003.

6: Drucker, P. F. "The Discipline of Innovation," Harvard Business Review, May2000. (Originally published 1985, May-June)