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 2019

Program: B.Tech.- Electronics and Communication Engineering

Regulations: SVEC-19

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-19 revised syllabus, SVEC-16 (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.	19BT30402	Electronic Devices and Circuits	20	04
2.	19BT30431	Electromagnetic Fields and Transmission Lines Lab	100	08
3.	19BT30432	Electronic Devices and Circuits Lab	50	10
4.	19BT40402	Electronic Circuit Analysis and Design	20	14
5.	19BT40403	Linear and Digital IC Applications	100	18
6.	19BT40431	Digital Design Workshop	100	20
7.	19BT40432	Electronic Circuit Analysis and Design Lab	50	22
8.	19BT40433	Linear and Digital IC Applications Lab	80	25
9.	19BT50409	Green Technologies	35	28
10.	19BT40441	Analog Electronics	20	32
11.	19BT1AC01	Spoken English	100	36
12.	19BT1BS02	Biology for Engineers	100	38
13.	19BT1HS01	Communicative English	20	40
14.	19BT1BS03	Engineering Physics	40	44
15.	19BT1BS31	Engineering Physics Lab	30	48
16.	19BT1BS04	Engineering Chemistry	50	51
17.	19BT1BS32	Engineering Chemistry Lab	25	56
18.	19BT2BS01	Transformation Techniques and Linear Algebra	20	59
19.	19BT4BS01	Material Science	100	63
20.	19BT4HS05	Gender & Environment	100	65
21.	19BT4HS09	Life Skills	100	67
22.	19BT4HS11	Professional Ethics	100	69
23.	19BT4HS12	Women Empowerment	100	71
24.	19BT40107	Sustainable Engineering	100	73
25.	19BT10201	Basic Electrical and Electronics Engineering	100	75
26.	19BT10231	Basic Electrical and Electronics Engineering Lab	100	77
27.	19BT10341	Basic Civil and Mechanical Engineering	100	79
28.	19BT10501	Programming for Problem Solving	100	81
29.	19BT10531	Programming for Problem Solving Lab	100	83
30.	19BT315AC	Design Thinking	100	85
31.	19BT50405	Fiber Optic Communications	100	87
32.	19BT50406	FPGA Architectures and Applications	100	89
33.	19BT50431	Analog and Digital Communications Lab	100	91
34.	19BT61531	Internet of Things Lab	100	93
35.	19BT50432	Socially Relevant Project-1	100	95
36.	19BT503AC	Foundations of Entrepreneurship	100	96
37.	19BT60401	Antennas and Propagation	20	98
38.	19BT60402	Microcontrollers	100	102
39.	19BT60404	ARM and AVR Microcontrollers	100	104
40.	19BT60405	Digital IC Design	100	106
41.	19BT60408	Nanostructures and Nanotechnology	100	108
42.	19BT60409	Testing and Testability	100	110

S. No.	Course Code	Name of the course	Percentage of content changed	Page Number in which Details are Highlighted
43.	19BT60410	Wireless Sensor Networks	30	112
44.	19BT50501	Machine Learning	100	116
45.	19BT60201	Power Electronics	100	118
46.	19BT51041	PLC and SCADA	100	120
47.	19BT60433	Socially Relevant Project-2	100	122
48.	19BT5MC01	Universal Human Values	100	123
49.	19BT60432	Microcontrollers Lab	100	125
50.	19BT70402	Microwave Engineering	20	127
51.	19BT70404	Cellular and Mobile communications	60	131
52.	19BT70405	Speech Processing	30	135
53.	19BT71001	Biomedical Instrumentation	100	139
54.	19BT70406	Adaptive Signal Processing	100	141
55.	19BT70407	Error Control Coding	100	143
56.	19BT70409	Real Time Systems	100	145
57.	19BT70433	Internship	100	147
58.	19BT704AC	Principles of Operating Systems	100	148
59.	19BT40107	Sustainable Engineering	100	150
60.	19BT51207	AI in Healthcare	100	153
61.	19BT60503	Cryptography and Network Security	42.2	155
62.	19BT50207	Computer Organization And Architecture	100	159
		Average %(A)	80.35	-
		Total No. of Courses in the Program(T)	119	
		No. of Courses where syllabus (more than 20%) has been changed(N)	62	
		Percentage of Syllabus content change in the courses **(C) = (AXN)/100**	49.81	
		Percentage of Syllabus content changed in the Program(P) =(C/T)X100	**41.86**	

DEAN (Academics)

DEAN (Academic)
SREE VIDYANIKETHAN ENGINEERING COLLEGE
Sree Sainath Nagar, A. RANGAMPET
CHITTOOR (DT.)-517 102, A.P.

PRINCIPAL

PRINCIPAL
SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)
Sree Sainath Nagar, A. RANGAMPET
Chittoor (Dist.) - 517 102, A.P., INDIA.

II B. Tech. – I Semester

(19BT30402) ELECTRONIC DEVICES AND CIRCUITS

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Basic Electrical and Electronics Engineering, Differential Equations and Multivariable Calculus & Engineering Physics.

COURSE DESCRIPTION:

Linear and Non-Linear Wave shaping, Biasing and small signal analysis of BJT & FET, Operation and characteristics of Special Purpose electronic devices.

COURSE OUTCOMES:

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

CO1. Analyze the response of High pass circuits, Low pass RC circuits for various signals and performance of clippers and clampers.

CO2. Design transistor biasing circuits and stabilize the operating point using appropriate techniques.

CO3. Develop mathematical model of BJT for CE, CB and CC configurations using h-parameters.

CO4. Analyze various configurations and biasing techniques for FET.

CO5. Demonstrate the operation and characteristics of special purpose semiconductor devices for real time applications.

DETAILED SYLLABUS:

UNIT-I: LINEAR & NONLINEAR WAVE SHAPING **(Periods: 09)**

High-pass, Low-pass RC circuits, their response for Sinusoidal, Step, Pulse, Square and Ramp inputs. High pass RC network as a Differentiator, Low pass RC network as an Integrator, Diode clippers and Clampers.

UNIT-II: TRANSISTOR BIASING & STABILISATION **(Periods: 10)**

DC Load Line analysis and Selection of Q point, Biasing Circuits-Fixed(Base) Bias, Collector-to-Base Bias, Base Bias and collector-to-Base Bias with Emitter Resistor,Voltage Divider Bias Circuit, Thermal stability of Bias circuits, compensation techniques using Thermistor, Sensistor and Diode.

UNIT-III: SMALL SIGNAL ANALYSISOF BJT **(Periods: 09)**

Transistor modeling using h-Parameters, CE, CB and CC circuit analysis using h-parameters, Simplified hybrid model, Comparison of CB, CE and CC circuits,Analysis of CE amplifier with emitter resistance.

UNIT-IV: FIELD EFFECT TRANSISTOR (Periods:10)

Construction, Operation and characteristics of JFET, Enhancement MOSFET & Depletion MOSFET, FET Biasing-Gate bias, Self bias, voltage divider bias, FET equivalent circuit, CS,CD and CG amplifiers, comparison of BJT & FET.

UNIT-V: SPECIAL PURPOSE ELECTRONIC DEVICES (Periods: 07)

Tunnel Diode, Varactor Diode, Unijunction Transistor (UJT),UJT as Relaxation Oscillator, DIAC, TRIAC, Silicon Controlled Rectifier

Total periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Jacob Millman, Herbert Taub and SuryaprakashRaoMothiki, *Pulse Digital and Switching Waveforms,* TMH, 3rd edition,2011.
2. J. Millman, Christos C. Halkias and SatyabrataJit, *Electronic Devices and Circuits*, TMH, 3rd Edition, 2010.

REFERENCE BOOKS:

1. David A. Bell, *Electronic Devices and Circuits*, Oxford University press, 5th Edition, 2014
2. S. Salivahanan, N. Suresh Kumar, *Electronic Devices and Circuits*,TMH, 3rd Edition 2013.
3. R.L. Boylestad and Louis Nashelky, *Electronic Devices andCircuits*, PHI, 10thEdition, 2009.

ADDITIONAL LEARNING RESOURCES:

1. http://www.nptelvideos.in/2012/11/basic-electronics-prof-tsnatarajan.html
2. https://kupdf.net/download/n-n-bhargava-basic-electronics-and-linear-circuits_5912b54adc0d60a324959ea5_pdf
3. http://www.talkingelectronics.com/Download%20eBooks/Principles%20of%20electronics/CH-21.pdf

I B. Tech. – II Semester
(16BT20401) ELECTRONIC DEVICES AND CIRCUITS
(Common to ECE, EIE & EEE)

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

PRE-REQUISITES: A Course on Engineering Physics.

COURSE DESCRIPTION: Characteristics of general and special purpose electronic devices; Rectifiers; filters and regulators; Biasing and small signal analysis of BJT and FET.

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

CO1: Demonstrate knowledge in
- p-n junction diode and its characteristics
- Zener diode and its characteristics
- Rectifiers, Filters and Regulators
- Characteristics of BJT, FET, MOSFET and special purpose electronic devices.

CO2: Analyze numerical and analytical problems in
- Rectifiers using Filters
- Regulated Power Supplies
- Transistor biasing circuits and stabilization
- Transistor amplifiers
- FET biasing circuits and amplifiers

CO3: Design electronic circuits such as
- Rectifiers with and without filters
- Voltage regulators
- BJT and FET biasing circuits
- BJT and FET amplifiers

CO4: Solve engineering problems and arrive at solutions pertaining to electronic circuits.
CO5: Select appropriate technique for transistor modeling.

DETAILED SYLLABUS:

UNIT-I: *PN JUNCTION DIODE, RECTIFIERS AND REGULATORS* (11 Periods)

PN-Junction Diode:
p-n Junction as a diode, *p-n* Junction diode equation, Volt-Ampere (V-I) characteristics, temperature dependence of *p-n* characteristics, diode resistance-static and dynamic resistances, transition and diffusion capacitances, break down mechanisms in semiconductor diodes, Zener diode characteristics.

Rectifiers and Regulators:
Half-Wave rectifier and Full-Wave rectifiers (Qualitative and quantitative analysis), Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L - section filter, π- section filter, comparison of various filter circuits in terms of ripple factors. Simple circuit of a regulator using Zener diode. Problems on rectifier circuits.

UNIT-II: *BIPOLAR JUNCTION TRANSISTOR, BIASING AND STABILIZATION*
(10 Periods)

Transistor construction, BJT Operation, Transistor currents and their relations, Input and Output Characteristics of a Transistor in Common Emitter, Common Base and Common Collector Configurations, BJT specifications, Transistor Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Emitter Feedback Bias, Collector to Base Feedback Bias, Voltage Divider Bias, Bias Stability, Transistor as an amplifier, Thermal Runaway, Problems on biasing circuits.

UNIT - III: *SMALL SIGNAL ANALYSIS OF BJT AMPLIFIERS* **(8 Periods)**

BJT Modeling, Hybrid Modeling, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Millers Theorem, Analysis of CE, CB and CC configurations using simplified Hybrid Model, Comparison of CB, CE and CC configurations.

UNIT - IV: *FIELD EFFECT TRANSISTORS* **(10 Periods)**

Construction, Principle of operation and characteristics of JFET and MOSFET (Enhancement & Depletion), Biasing of FET, Small Signal Model of JFET, Common Source and Common Drain Amplifiers using JFET, Generalized FET Amplifier, FET as Voltage Variable Resistor, Comparison of BJT and FET.

UNIT - V: *SPECIAL PURPOSE ELECTRONIC DEVICES* **(6 Periods)**

Principle of Operation and Characteristics of Tunnel Diode, Uni-Junction Transistor (UJT), Varactor Diode, Silicon Control Rectifier (SCR). Principle of operation of Schottky, Barrier Diode.

Total Periods: *45*

TEXT BOOK:

1. J. Millman, Christos C. Halkias and SatyabrataJit, *Electronic Devices and Circuits,* TMH, 3rd Edition, 2010.

REFERENCE BOOKS:

1. R.L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits,* PHI, 10thEdition, 2009.
2. David A. Bell, *Electronic Devices and Circuits,* Oxford University press, 5thEdition, 2014.
3. S. Salivahanan, N. Suresh Kumar, *Electronic Devices and Circuits*, Mc-Graw Hill, 3rd Edition 2013.
4. Ben G. Streetman, Sanjay Banerjee , Solid State Electronic Devices, Pearson Prentice Hall, 2006.

II B.Tech. - I Semester

(19BT30431) **ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PREREQUISITES: Courses on Transformation Techniques and Linear Algebra & Engineering Physics

COURSE DESCRIPTION:

Design and Simulation of electric and magnetic fields (Time variant an Time-in variant) due to Charged particles, finite lines. Simulation of Maxwell's equation and wave equation, primary and secondary constants of Transmission lines.

COURSE OUTCOMES:

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

CO1. Analyze the vector field, vector product, Coulomb law,Electric flux lines, Electric Potential and Bio-Savart's Law.

CO2. Solve Uniform Plane Wave equation for Electromagnetic Wave Propagation.

CO3. Design and verify the conditions for loss less and distortion less transmission Lines

CO4. Analyze the time-variant and time-invariant electromagnetic fields in different media.

CO5. Work independently and in teams to solve problems with effective Communication.

List of Exercises/List of Experiments:

(Minimum **Ten** experiments are to be conducted)

Simulate the following analytically using MATLAB

1. Plot the following three different graphs in MATLAB
   a) Plot a Circle
   b) Quiver plot or Electric line in 2D
   c) Quiver plot or Electric line in 3D
2. a) Find the Slope of the differential equation given below:

$$\frac{dy}{dt} = t + \sin(y)$$

   b) Plot the Vector field and Volume Visualization.

   c) For the given two vectors, find the Dot product, the projection and the angle between the vectors.
3. Plot fields due to discrete charge distributions using Coulomb Law.
4. Plot the Electric Flux lines in 3D due to a point charge located at the origin.
5. Calculate and plot Potential and Electric Field in 2D due to two charges of different magnitudes and same sign that are placed along x-axis.
6. Plot and visualize Variable EM Fields and Potentials.
7. Calculate the electric energy stored due the electric field in cylindrical co-ordinates.

8. Find the energy stored in a Parallel-Plate Capacitor.
9. Verify Bio-Savart's Law and plot magnetic field due to a current carrying finite wire.
10. Determine and Verify Electric field across dielectric-dielectric media.
11. Plot $\nabla \times E = -\partial B/\partial t$ in full 3D, using the proper term for the electric and magnetic counterparts and visualize Maxwell's equations using MATLAB.
12. Plot E-Field and H-Field.
13. For the given Primary Constants.
    a) Find the secondary Constants Z_o, α, β, γ, ω and Velocity of propagation
    b) Find the Propagation Constant for Lossless Transmission Line
    c) Verify the Condition for Distortion less Transmission line.

REFERENCE BOOKS/LABORATORY MANUALS:

1. LonnngrenSavov, "Fundamentals of Electromagnetics with MATLAB", Sitech Publications, 2007.
2. Matthew N. O. Sadiku, Ph.D, "Numerical Techniques in Electromagnetics", third edition, CRC Press, New York, Washington,2009.

SOFTWARE/Tools used:

MATLAB

II B.Tech. – I Semester

(19BT30432) ELECTRONIC DEVICES AND CIRCUITS LAB

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES:ACourse on Basic Electrical and Electronics Engineering.

COURSE DESCRIPTION: Integrator and Differentiator, Clippers and Clampers, Transistor switch, h-parameter calculation, Drain and Transfer characteristics of FET, Frequency response of CE and CS amplifiers, UJT Relaxation oscillator, Characteristics of DIAC and SCR

COURSE OUTCOMES:

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

CO1. Analyze the response of RC circuits for square input.

CO2. Analyze the characteristics of BJT, FET, DIAC and SCR.

CO3. Design BJT and FET Amplifiersand evaluate the performance parametersfrom the frequency response.

CO4. Develop the basic applications of diode, transistor and UJT for desired specifications.

CO5. Work independently and in teams to solve problems with effective Communication.

List of Exercises/List of Experiments:

(Minimum **Ten** Experiments are to be conducted)

1. Design RC integrator and differentiator and determine their response to the square input.
2. Develop clipper circuit to clip positive and negative portions of the input waveform with two reference voltages.
3. Develop clamping circuits to clamp different positive and negative dc levels of the input signal.
4. Verify the switching action of a BJT with suitable circuit.
5. Verify input and output characteristics of BJT in Common Base configuration experimentally and find required h – parameters from the graphs
6. Verify the frequency response of Common Emitter Amplifier.
7. Study and draw the Drain and Transfer Characteristics of a JFET experimentally.
8. Verify the Frequency Response of Common Source Amplifier using JFET.
9. Study and draw the V-I Characteristics of DIAC experimentally.
10. Study and draw the V-I Characteristics of SCR experimentally.
11. Design a Relaxation Oscillator using UJT.
12. Design and analyze any biasing circuit using BJT.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Navas K.A, Electronics Lab Manual (Volume 2), PHI Learning Private Ltd. 6th Edition, 2018.

SOFTWARE/Tools used: --

ADDITIONAL LEARNING RESOURCES:

1. www.vlab.co.in, Basic Electronics Lab, An initiative of MHRD under NMEICT.

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

(19BT40402) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN

(Common to ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: Courses on Basic Electrical and Electronic Engineering & Electronic Devices and circuits.

COURSE DESCRIPTION:
Demonstrate Single Stage Amplifiers;Multi Stage amplifiers; Frequency Response; Negative Feedback Amplifiers; Oscillators; Large Signal Amplifiers; Tuned Amplifiers.

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

CO1. Design multistage amplifiers using voltage divider bias todetermine the Gain, Bandwidth, Input and Output Impedances.
CO2. Analyzetransistors athigh frequencies using Hybrid-π Model to determine the gain and bandwidth.
CO3. Design negative Feedback Amplifiers with high stability and positive feedback amplifiers to generate sustained oscillations.
CO4. Analyze different classes of Power Amplifiers to improve power efficiency and understand frequency response of single stage tuned amplifiers.

DETAILED SYLLABUS:

UNITI- DESIGN OF LOW FREQUENCY AMPLIFIERS (10 periods)

BJT Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Design and analysis of RC coupled amplifier, effect of coupling and bypass capacitors, Multistage Frequency Effects, Cascode amplifier, Darlington pair, Bootstrapped Darlington circuit.

MOSFET Amplifiers: MOS Small signal model, Common source amplifier, Common Gate Amplifier, Source follower-simple problems.

UNIT II-TRANSISTOR AT HIGH FREQUENCY (10 periods)

The Hybrid- pi (π) – Common Emitter transistor model, Hybrid-π conductance, Hybrid-π capacitances, validity of Hybrid-π model,CE short circuit current gain, current gain with resistive load, single stage CE transistoramplifier response, Gain-bandwidth product,Emitter Follower at Higher Frequencies-problems.

UNIT III-NEGATIVE FEEDBACK AMPLIFIERS (9 periods)

Concepts offeedback – Classification of feedback amplifiers – General characteristics of negativefeedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series,Voltage shunt, Current series and Current shunt Feedback configurations –Method of analysis of Feedback amplifiers- Voltage series,Voltage shunt, Current series and Current shunt amplifiers-simple problems.

UNIT IV- OSCILLATORS (7 periods)

Conditions for oscillations, Classification, RC phase shift oscillator, Wien bridge oscillator, generalized analysis of LC oscillators, Quartz, Hartley and Colpitts Oscillators, Frequency stability-simple problems.

UNIT V- LARGE SIGNAL AND TUNED AMPLIFIERS **(9 periods)**

Large Signal Amplifiers: Classification, Class A Power Amplifier- Power conversion Efficiency, Transformer Coupled power Amplifier, Push Pull and Complimentary SymmetryClass B power amplifier, Class AB operation, Principle of operation of class –C Amplifier, Class D Power Amplifier, Class S power Amplifier, Transistor Power Dissipation, Heat Sinks.

Tuned Amplifiers: Introduction, Q-Factor, single stage Tuned Amplifiers- frequencyresponse of tuned amplifiers.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Jacob Millman and Christos C.Halkias, *Integrated Electronics,*McGraw-Hill Education, 2nd edition, 2010.
2. Adel S.Sedra, Kenneth C.Smith ,Micro Electronic Circuits Theory and applications,OXFORD international student edition 5th edition, ,2009

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits Theory*, Pearson Education, 10th Edition, 2009.
2. David A. Bell, *Electronic Devices and Circuits,* Oxford University press, 5th Edition, 2014.
3. S. Salivahanan, N. Suresh Kumar, A Vallvaraj, Electronic Devices and Circuits, 3rd Edition, MC Graw Hill Education,2013

II B.Tech. - I semester

(16BT30401) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN

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

PREREQUISITES: A course on Electronic Devices and Circuits

COURSE DESCRIPTION:
Single Stage Amplifiers; Multi-Stage amplifiers; Frequency Response; Feedback Amplifiers; Oscillators; Large Signal Amplifiers; Tuned Amplifiers.

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

CO1. Demonstrate knowledge in
- Single Stage Amplifiers
- Multi Stage Amplifiers.
- BJT Frequency Response.
- Feedback Amplifiers.
- Power Amplifiers.
- Tuned Amplifiers.

CO2. Perform analysis of electronic circuits for meeting defined specifications.
CO3. Design and develop electronic circuits such as Feedback Amplifiers, Oscillators and Power amplifiers with given specifications.
CO4. Solve problems pertaining to electronic circuit design.
CO5. Select an Amplifier circuit for a specific electronic sub-system.
CO6. Apply course knowledge to assess societal issues and understand the consequent responsibilities relevant to the professional engineering practice using electronic circuits.

DETAILED SYLLABUS:

UNIT-I: BJT AMPLIFIERS (10 Periods)
Single Stage Amplifiers: Introduction, Classification of Amplifiers, Analysis of CE amplifier with an Emitter Resistance.
Multistage Amplifiers: Distortion in amplifiers, Cascading Transistor amplifiers, Methods of inter-stage coupling, RC Coupled Amplifier, Direct and Transformer Coupled Amplifier, Multistage Frequency Effects, Darlington Pair, Bootstrapped Darlington circuit, Cascode amplifier.

UNIT- II: HIGH FREQUENCY RESPONSE (09 Periods)
BJT: Frequency response of BJT amplifier, Analysis at low and high frequencies, Effect of coupling and bypass capacitors, Hybrid-π Common Emitter transistor model, Hybrid-π conductance, Hybrid-π capacitances, validity of Hybrid-π model, CE short circuit current gain, CE current gain with resistive load, Gain-Bandwidth Product.
FET: Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

UNIT-III: FEEDBACK AMPLIFIERS (10 Periods)
Negative feedback amplifiers: Feedback Concept, Classification, General characteristics, Effect of feedback on amplifier characteristics, Voltage series, Current series, Current shunt and Voltage shunt feedback configurations.

Oscillators: Conditions for oscillations, types of oscillators, RC-phase shift oscillators with BJT and FET with the relevant analysis, Wein bridge oscillator, Hartley oscillator, Colpitts oscillator, Piezoelectric crystal oscillator, Frequency Stability.

UNIT-IV: POWER AMPLIFIERS (08 Periods)

Classification, Class A large-signal amplifiers- Series Fed and Transformer-coupled Audio power amplifier, Efficiency**;** Second harmonic Distortions, Higher order harmonic Distortion, Class B amplifier-Transformer coupled Push-pull amplifier, Complementary symmetry Push-pull amplifier, Efficiency**;** MOSFET power amplifier, Thermal stability and Heat sinks.

UNIT-V: BJT TUNED AMPLIFIERS (08 Periods)

Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading Single Tuned Amplifiers on Bandwidth, Double-tuned amplifier, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned Amplifiers, Class-C Tuned amplifier.

Total Periods: 45

TEXT BOOKS:

1. Jacob Millman and Christos C. Halkias, *Integrated Electronics*, Tata McGrawHill, 2nd Edition, 2010.
2. S Salivahanan, N.Suressh Kumar, A. Vallavaraj, *Electronic Devices and Circuits,* TataMcGraw Hill, 3rd Edition, 2008.

REFERENCE BOOKS:

1. Robert L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits Theory*, Pearson Education, 10th Edition, 2009.
2. David A. Bell, *Electronic Devices and Circuits*, Oxford University press, 5th Edition, 2014.
3. Donald A. Neamen, *Electronic Circuit Analysis and Design*, Tata McGraw-Hill, 3rd Edition, 2007.

II B. Tech. – II Semester

(19BT40403) LINEAR AND DIGITAL IC APPLICATIONS

(Common to ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Network Analysis, Switching Theory and Logic Design & Electronic Devices and Circuits

COURSE DESCRIPTION:

Linear & Non-Linear Applications of Op-Amp; IC 555 timer and phase locked loops; Application of PLL; filters; A-D & D-A Converters; CMOS and Bipolar Logic Interfacing; HDL with combinational and sequential logic design.

COURSE OUTCOMES:

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

CO1. Design different applications of op-amp, timer circuits and analyze PLL for specified applications.

CO2. Design active filters using op-amp for audio processing applications.

CO3. Analyze different analog to digital and digital to analog converters for data acquisition system.

CO4. Analyze Verilog HDL capabilities to model digital circuits.

CO5. Model combinational and sequential ICs using Verilog HDL to synthesize digital Circuits.

DETAILED SYLLABUS:

UNIT I– OP-AMP APPLICATIONS, IC555 TIMERS & PLL (11 periods)

Review of operational Amplifiers, Instrumentation amplifier, Log and Antilog amplifiers, RC phase shift oscillator.

Introduction to 555 timer, functional diagram, monostable and astable operations and applications. PLL - Introduction, block schematic, principles and description of individual blocks, Voltage Controlled Oscillator (IC 566).

UNIT II – FILTERS &D-A AND A-D CONVERTERS (09 periods)

Filters: First - order and second order LPF, HPF Butterworth Filters.

D-A Converter: Weighted resistor DAC, R-2R Ladder DAC.

A-D Converters: Flash type, Successive Approximation type and Dual slope ADC.

UNIT III – Verilog HARDWARE DESCRIPTION LANGUAGE (08 periods)

Introduction, Language Elements, operators, Expressions, Modeling-gate level modeling, data flow modeling, behavioral modeling, structural modeling.

UNIT-IV - COMBINATIONAL LOGIC DESIGN APPLICATIONS (08 Periods)

74x999 Adder and Subtractor, 74X138 3-to-8 Decoder,74x148 Priority Encoder,74x151 8X1 Multiplexer, 74x181 Arithmetic and Logic Unit,74x280 9-Bit Parity Generator, 74x85 4-bit Comparator, Barrel Shifter using 74x151 multiplexer, Simple Floating-Point Encoder, Dual priority Encoder, modeling of circuits by using Verilog HDL.

UNIT V – SEQUENTIAL LOGIC DESIGN APPLICATIONS (09 periods)

Flip-Flops- JK-74LS109 and D-74LS74. Counters - 74x163 binary counter, Modulo-11 & 193 counters with a counting sequence, Modulo-8 Binary counter, Excess 3 decimal Counter using 74X163,74x169 up/down counter, Self-Correcting Ring & Johnson Counter,3-bit LFSR Counter.74x194 universal shift register, Modeling of circuits using Verilog HDL.

Total Periods: *45*

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

T1. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International (p) Ltd, 4th Edition, 2011.

T2. John F. Wakerly, *Digital Design Principles & Practices*, Pearson Education Asia, 4th Edition, 2008.

REFERENCE BOOKS:

R1. Ramakanth A. Gayakwad, *Op-Amps & Linear ICs*, PHI, 3rd Edition, 1998

R2. J. Bhaskar, *A Verilog HDL Primer*, BS Publications, 2nd Edition, 2001

ADDITIONAL LEARNING RESOURCES:

1. https://www.coursera.org/learn/electronics
2. https://www.youtube.com/results?search_query=james+roberge

II B. Tech. – II Semester

(19BT40431) **DIGITAL DESIGN WORKSHOP**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Courses on Switching Theory and Logic Design & Electronic Devices and Circuits.

COURSE DESCRIPTION: Designand verification of Digital Circuits, PCB Design of Electronic Circuits.

COURSE OUTCOMES:

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

CO1. Design and Realize various Digital applications by using ICs for societal needs.

CO2. Implement Electronic Circuits using Passive and Active elements for specified applications.

CO3. Analyze performance parameters for PCB designed circuits using a simulation tool.

CO4. Work independently and in teams to solve problems with effective Communication.

List of Exercises/List of Experiments:

Part-A: Realize the Following in Hardware

(Minimum **Six** Experiments are to be conducted)

1. Realize gates using NAND & NOR gates.
2. Optimize and Realize a given Boolean Function.
3. Design and Realize BCD to Excess-3 Code Converter.
4. Design and Realize Adder and Subtractor using Multiplexer based on logic gates/ IC74153.
5. Design and Realize a BCD to 7-Segment Decoder using Logic Gates/ ICs.
6. Design and Realize a Hexadecimal to Binary Encoder using IC74148 and IC74157.
7. Design and Realize a Sequence Generator using IC7495.
8. Design and Realize Asynchronous and Synchronous counters using IC7476 (JK-FlipFlop).

Part-B: PCB Layout Design of Electronic Circuits using TINAPRO/ eSIM-KiCAD/ TinyCAD/ Fritzing Software

(Minimum **Four** Experiments are to be conducted)

1. RC Filter.
2. Half Wave Precision Rectifier.
3. Zener Regulator.
4. Diode Clamper.

5. Transistor as a Switch.
6. CMOS Inverter.

REFERENCE BOOKS/LABORATORY MANUALS:

1. John F. Wakerly, *Digital Design Principles & Practices*, Pearson Education Asia, 4th Edition, 2008.

SOFTWARE/Tools used:

TINAPRO/ eSIM-KiCAD/ TinyCAD PCB Design Tool.

ADDITIONAL LEARNING RESOURCES:

1. http://vlabs.iitb.ac.in/vlabsdev/vlab_bootcamp/bootcamp/cool_developers/index.html - Virtual labs for digital circuits
2. https://nptel.ac.in/courses/108/108/108108031/
3. https://swayam.gov.in/nd2_aic20_sp59/preview

II B.Tech. II Semester

(19BT40432) **ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB**

(Common to ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PREREQUISITES: A course on Electronic Devices and Circuits

COURSE DESCRIPTION:
Design, Simulation and verification of BJT and FET Amplifiers; Multistage Amplifiers; Feedback Amplifiers; Oscillators; Power Amplifiers; Tuned Amplifiers.

COURSE OUTCOMES:
After successful completion of this course, the students will be able to:
CO1. Design Multistage amplifiers and determine Gain, Bandwidth, Input and Output impedances for specified applications.
CO2. Design negative feedback amplifiers to determine Gain, Bandwidth, Input and Output Impedances
CO3. Design Oscillator circuits to generate sustained oscillations
CO4. Analyze power amplifiers to determine efficiency.
CO5. Work individually and in groups to solve problems with effective communication.

List of Exercises/List of Experiments:

Part-A: Design and Simulation of the following circuits
(Minimum **Seven** Experiments are to be conducted):

1. Two Stage RC Coupled Amplifier
2. Cascode Amplifier
3. Common Source MOSFET amplifier
4. Current shunt Feedback Amplifier
5. Voltage Series Feedback Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistor
8. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry Amplifier

Part-B: Design and verification of the following circuits
(Minimum **Three** Experiments are to be conducted):

1. Two Stage RC Coupled Amplifier
2. Cascode Amplifier
3. Current shunt Feedback Amplifier
4. Voltage Series Feedback Amplifier
5. LC Oscillator
6. RC Phase Shift Oscillator
7. Class A Power Amplifier

REFERENCE BOOKS/LABORATORY MANUALS:

1. Md H Rashid , Introduction to PSpice Using OrCAD for Circuits and Electronics, PHI, 3rd edition, 2012
2. S. Poorna Chandra, B. Sasikala "Electronics Laboratory Primer", S. Chand & Company Ltd. 1st Reprint Edition 2014

SOFTWARE/Tools used:

- **PSPICE /**Multisim

II B.Tech. - II semester

(16BT40432) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

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

PREREQUISITES:

A Course onElectronic Circuit Analysis and Design.

COURSE DESCRIPTION:

Design, Simulation and Implementation of Single stage, Multistage Amplifiers, Feedback Amplifiers and Oscillators, Power Amplifiers, Tuned BJT Amplifiers.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge in different electronic circuits and PSPICE tool.
CO2. Analyze amplifiers, Oscillator and Tuned circuits.
CO3. Design and develop single stage, multistage & Power amplifiers and Oscillator circuits.
CO4. Conduct of experiments, analysis and interpretation of data, and synthesis of the information to provide valid solutions.
CO5. Model an electronic circuit using simulation tools.
CO6. Function effectively as an individual and as a member in a group in the area of electronic circuits.
CO7. Communicate in verbal and written form in the area of electronic circuits.

LIST OF EXERCISES:

(Minimum of Twelve experiments to be conducted)

Part-A: Design and Simulation of the following circuits using simulation software

(Minimum of Six Experiments to be conducted):

1. Common Emitter (CE) amplifier
2. A Two Stage RC Coupled Amplifier
3. Cascode Amplifier
4. Current shunt and Voltage Series Feedback Amplifier
5. RC Phase Shift Oscillator
6. Class A Power Amplifier (Transformer less)
7. Class B Complementary Symmetry Amplifier

Part-B: Design and Implementation of the following circuits through hardware

(Minimum of Six Experiments to be conducted):

Any Three circuits from part-A

Any Three of the following

8. Darlington Pair
9. Hartley and Colpitt's Oscillators
10. Class A Power Amplifier (with transformer load)
11. Class-B push-pull amplifier
12. Class C Tuned Power Amplifier

II B. Tech. – II Semester

(19BT40433) **LINEAR AND DIGITAL IC APPLICATIONS LAB**

(Common to ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Acourse on Switching Theory and Logic Design

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

COURSE OUTCOMES:

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

CO1. Design various op-amp applications and timers circuits for societal applications.

CO2. Implement filters, timers, D-A converter using Op-amps and digital circuits for specified applications

CO3. Analyze performance parameters for combinational and sequential circuits using any simulation tool.

CO4. Work independently and in teams to solve problems with effective Communication.

LIST OF EXPERIMENTS:

PART-A: Design the following circuits

(Minimum **Five** Experiments are to be conducted):

1. RC Phase shift oscillator circuit using Op-Amp 741.
2. Instrumentation Amplifier using Op-Amp 741 with required gain.
3. Differentiator & Integratorusing Op-Amp 741.
4. Applications of 555 timer (Monostable / AstableMultivibrator) with given duty cycle and frequency.
5. Active first and second order LPF / HPF filter for a given cut off frequency using Op-amp 741.
6. D-A converter (R-2R ladder) using Op-amp 741 with required voltage levels.

PART B:**Perform simulation and synthesis of the following Digital circuits**

(Minimum **FIVE** experimentsareto be conducted using **Verilog HDL**)

1. Arithmetic and Logic Unit using IC 74x181
2. Barrel Shifter using 74x151 multiplexer
3. Floating Point Encoder
4. Dual Priority Encoder
5. Self-Correcting Ring Counter
6. Universal Shift Register using IC 74x194
7. 3-bit Linear Feedback Shift Register

REFERENCE BOOKS/LABORATORY MANUALS:

1. Ramakanth A. Gayakwad, *Op-Amps & Linear ICs*, PHI, 3rd Edition, 1998
2. John F. Wakerly, *Digital Design Principles & Practices*, Pearson Education Asia, 4th Edition, 2008

SOFTWARE/Tools used:

XILINX/ Multisim

ADDITIONAL LEARNING RESOURCES:

1. https://www.multisim.com/ - Online tool used for linear circuit simulations.
2. http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/cool_developers/index.html

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)

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.

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

II B. Tech. - II Semester

(19BT50409) **GREEN TECHNOLOGIES**

(Open Elective-2)

(Common to CE, ME, CSE, CSSE, IT, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

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

CO1. Analyze energy efficient communication systems such as Telecommunication systems, ICT, Wireless networks and cellular networks by understanding the principles of green communications.

CO2. Understand the impact of conventional energy sources on environment and realize the significance and principles of green energy sources for sustainability.

CO3. Understand the environmental impacts of IT and approaches for Green IT.

CO4. Analyze concepts of sustainable green construction using appropriate tools and techniques following latest developments and considering safety and environment besides communicating effectively in graphical form.

CO5. Demonstrate the environmental impact of traditional manufacturing and explore the need for green manufacturing process promoting sustainability.

DETAILED SYLLABUS:

UNIT I–PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS **(9 periods)**

Principles of Green Engineering: Introduction, Definition of green engineering, Principles of green engineering

Green Communications: Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT II–GREEN ENERGY **(9 periods)**

Introduction, green energy systems - composition, adverse impacts,Green energy and sustainability, the target and solution.Diversification and localization of energy systems, green energy and sustainable development.Energy sources and their availability. Green energy sources - solar energy, wind energy, geothermal energy, ocean energy, biomass and biogas.

UNIT III–GREEN IT **(9 periods)**

Introduction, Awareness to Implementation: Green IT Trends, Green Engineering, Greening by IT: Using RFID for Environmental Sustainability, Smart Grids, Smart Buildings and Homes, Green

Supply Chain and Logistics, Enterprise-Wide Environmental Sustainability, A Seven-Step Approach to Creating Green IT Strategy: Balancing the Costs and Benefits of Going Green, Research and Development Directions.

UNIT IV–GREEN CONSTRUCTION **(9 periods)**

Green Building: Concept, Necessity, Characteristics, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures, case studies of residential and commercial green buildings.

Vastu: Concept, History, scientific approach, elements of vastu for selecting a plot.

Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT V – GREEN MANUFACTURING **(9 periods)**

Green Manufacturing - Introduction, Background and Definition; Impact of traditional manufacturing in environmental ecology, Need for green manufacturing, Motivation and barriers to green manufacturing, Advantages and Limitations of green manufacturing, Green manufacturing strategies,Green manufacturing and sustainability, Green manufacturing through clean energy supply, Green packaging and Supply chain.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice*, John Wiley & Sons, 2015.
2. G.D. Rai, *Non-conventional Energy Sources*, KhannaPublishers, Delhi, 5th Edition,2011.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices*, John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, Volume 1, E & FN Spon, an imprint of Thomson Science & Professional.
5. J Paulo Davim, *Green Manufacturing: Processes and Systems*, Springer, 2012.
6. David A Dornfeld, *Green Manufacturing: Fundamentals and Applications*, Springer, 2013.

REFERENCE BOOKS:

1. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
2. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
3. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.

IV B.Tech. - I Semester

(16BT70412)GREEN TECHNOLOGIES

(Open Elective)

(Common to EEE, ECE & EIE)

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

PREREQUISITES: --

COURSE DESCRIPTION:

Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

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

CO1. Deploy conceptual knowledge in green technologies pertaining toengineering practice.
CO2. Analyze various green technologies for engineering practice.
CO3. Provide green solutions to engineering problems.
CO4. Apply various green techniques in the engineering practice.
CO5. Consider health and safety issues while providing green solutions to the society.
CO6. Understand issues related to environment sustainability.
CO7. Apply ethical standards for environmental sustainability in the engineering practice.

DETAILED SYLLABUS:

UNIT-I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS **(11 Periods)**

Principles of Green Engineering:

Introduction, Definition of green engineering, Principles of green engineering.

Green Communications:

Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT-II: GREEN ENERGY **(09 Periods)**

Introduction, adverse impacts of carbon emission, control of carbon emission– methods, greenhouse gas reduction – methods, Energy sources and their availability, Green energy for sustainable development. Green energy sources – Solar energy, Wind energy, Fuel cells, Biofuels, Wave and Geothermal energy (Principle of generation only).

UNIT-III: GREEN IT **(09 Periods)**

The importance of Green Information technologies, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media, Regulating Green IT- Laws, Standards and Protocols; RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment, Non-regulatory Government Initiatives, Industry Associations and Standard Bodies, Green Building Standards, Green Data Centres, Social Movements and Greenpeace, Conclusions.

UNIT-IV: GREEN CONSTRUCTION **(09 Periods)**

Green Building: Definition, Typical features, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's),

Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures.
Indian Green Building Council: Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT-V: GREEN MANUFACTURING (09 Periods)
Introduction, background, definition, motivation and barriers to green manufacturing, Impact of manufacturing in environmental ecology, Need for green manufacturing, Advantages and Limitations, green manufacturing strategies, Green manufacturing and sustainability, Sustainability tools; Waste stream mapping and application, Green manufacturing through clean energy supply, green lean manufacturing, green packaging and supply chain.

Total Periods: 47

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice,*John Wiley & Sons, 2015.
2. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices,* John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, *Volume 1*, E & FN Spon, an imprint of Thomson Science & Professional.
5. *IGBC Green Homes Rating System Version 1.0* – A bridged reference guide.
6. J Paulo Davim, Green Manufacturing: Processes and Systems, Springer, 2012.
7. David A Dornfeld, Green Manufacturing: Fundamentals and Applications, Springer, 2013.

REFERENCE BOOKS:

1. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5thEdition,2011.
3. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
4. R. K. Gautham, *Green Homes*, BS publications, 2009.

II B. Tech. – II Semester

(19BT40441) ANALOG ELECTRONICS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Basic Electrical and Electronic Engineering & Electronic Devices and Circuits.

COURSE DESCRIPTION:

Demonstrate Single Stage Amplifiers; Multi Stage amplifiers; Frequency Response; Negative Feedback Amplifiers; Oscillators; Multi vibrators; Large Signal Amplifiers.

COURSE OUTCOMES:

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

CO1. Design multistage amplifiers using voltage divider bias to determine the Gain, Bandwidth, Input and Output Impedances.
CO2. Analyze the concept of feedback to improve the stability of amplifiers and generate sustained oscillations.
CO3. Realize different classes of Power Amplifiers to improve efficiency.
CO4. Design filters to find the frequency response and operate IC555 in various modes for different applications

DETAILED SYLLABUS:

UNIT-I: BJT AMPLIFIERS (11 periods)

Classification of Amplifiers, Distortion in amplifiers, Analysis of Single Stage Common Emitter Amplifier- Frequency Response, Different coupling schemes used in multistage amplifiers, Effect of coupling and bypass capacitors on frequency response, Multistage Frequency Effects, Analysis of Two stage RC Coupled amplifier, Cascode amplifier, Darlington pair, Bootstrapped Darlington circuit, Hybrid- Pi (π)- Common Emitter model.

UNIT-II: NEGATIVE FEEDBACK AMPLIFIERS (09 periods)

Classification of Amplifiers, Concepts of feedback – Classification of feedback amplifiers – General characteristics of negative feedback amplifiers – Effect of Feedback on Amplifier characteristics, Method of analysis of Feedback amplifier, Voltage series Feedback, Voltage shunt feedback, Current series feedback and Current shunt Feedback configurations.

UNIT-III: OSCILLATORS (08 periods)

Conditions for oscillations, Classification, RC phase shift oscillator using BJT and FET, Wien bridge oscillator using BJT, Generalized analysis of LC oscillators, Hartley and Colpitts Oscillators, Crystal Oscillator, Frequency stability.

UNIT-IV: LARGE SIGNAL AMPLIFIERS (08 periods)

Classification, Series fed Class A Power Amplifier- Power conversion Efficiency, Transformer Coupled class A power Amplifier, Push Pull and Complimentary Symmetry Class B power amplifier, Class AB operation, Principle of operation of class –C Amplifier, Transistor Power Dissipation, Heat Sinks.

UNIT-V: ACTIVE FILTERS AND 555 TIMER **(09 Periods)**

Analog Filters: Introduction, RC Active Filters- first order and second order all pass, Low pass & high pass, Band pass and Band reject using Op-Amp.

IC 555 Timer: Introduction to 555 Timer, functional diagram, Monostable Operations, Astable operations & their applications.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

3. Jacob Millman, Christos C. Halkias and Satyabrata Jit , *Integrated Electronics,* McGraw-Hill Education, 3nd edition, 2010.
4. Ramakanth A. Gayakwad, *Op-Amps & Linear ICs*, PHI, 3rd Edition, 1998

REFERENCE BOOKS:

4. Adel S.Sedra, Kenneth C.Smith ,Micro Elctronic Circuits Theory and applications, OXFORD international student edition 5th edition, ,2009
5. Robert L. Boylestad and Louis Nashelsky, *Electronic Devices and Circuits Theory*, Pearson Education, 10th Edition, 2009.
6. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International (p) Ltd, 4thEdition, 2011.

II B. Tech. – I Semester
ANALOG ELECTRONIC CIRCUITS

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

PRE-REQUISITES:

Courses on Electronic Devices and Circuits and Electric Circuits.

COURSE DESCRIPTION:

BJT frequency response; Feedback amplifiers and Oscillators; Power amplifiers; Wave-shaping circuits; Multivibrators.

COURSE OBJECTIVES:

CEO1. To impart the knowledge in BJT Frequency Response, Feedback Amplifiers, Oscillators, Power Amplifiers, Wave-Shaping Circuits and Multi-Vibrators.

CEO2. To develop skills in analysis, design, problem solving and usage of techniques in different types of multi-vibrators, feedback amplifiers, oscillators, power amplifiers for different applications.

CEO3. To inculcate attitude for providing solutions for societal needs using analog electronic circuits.

COURSE OUTCOMES:

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

CO1. Apply the knowledge in
- BJT Frequency Response
- Feedback Amplifiers
- Oscillators
- Power Amplifiers
- Wave-shaping circuits
- Multi-vibrators

CO2. Analyze BJT frequency response, amplifiers, oscillators and pulse circuits.

CO3. Design and develop different types of amplifiers, oscillators and pulse circuits. .

CO4. Solve engineering problems pertaining to analog electronic circuits to provide valid conclusions.

CO5. Apply appropriate techniques to obtain optimum solution in the field of analog electronic circuits.

CO6. Provide real time solutions for societal needs in the area of analog electronic circuits.

DETAILED SYLLABUS

UNIT I – BJT FREQUENCY RESPONSE: (10 periods)

Review of BJT simplified hybrid model, analysis of CE amplifier with emitter resistance, emitter follower, Different coupled Schemes -RC coupled amplifier, transformer coupled amplifier, Direct coupled amplifier. Frequency response of BJT amplifier, analysis at low and high frequencies, effect of coupling and bypass capacitors, The hybrid-pi common-emitter transistor model, CE short circuit current gain, current gain with resistive load, gain-bandwidth product.

UNIT II – FEEDBACK AMPLIFIERS AND OSCILLATORS: (09 periods)

The feedback concept, The transfer gain with feedback, feedback amplifier topologies, general characteristics of negative feedback amplifiers, effect of feedback on input resistance and output resistance-voltage series, voltage shunt, current series and current shunt feedback configuration.

Oscillators: Conditions for oscillations, Hartley and Colpitts oscillators , RC phase shift oscillator, Wein bridge oscillators, crystal oscillator.

UNIT III – LARGE SIGNAL AMPLIFIERS (09 periods)

Class A amplifiers- series-fed, transformer coupled, efficiency. Second harmonic distortion, higher-order harmonic generation. Class B amplifier, Push pull amplifiers- class B push-pull and class B complementary symmetry push-pull amplifier, efficiency, Phase inverters, Distortion in power Amplifier.

UNIT IV – WAVE SHAPING CIRCUITS AND SWITCHING CHARACTERISTICS OF DEVICES (08 periods)

Wave-shaping circuits: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. Diode clippers, clipping at two independent levels, clamping operation, clamping circuits taking source and diode resistances into account, practical clamping circuits.

Switching characteristics of Devices: Diode as a switch, Diode Switching Times, transistor as a switch, Transistor switching times.

UNIT V – MULTIVIBRATORS: (09 periods)

Bistable multivibrator- Stable states of a bistable multivibrator, fixed bias transistor bistable multivibrator, unsymmetrical triggering, symmetrical triggering.Monostable Multivibrator-collector coupled monostable multivibrator, triggering of the monostable multivibrator. Astable multivibrator- Astable collector coupled multivibrator, Schmitt trigger

Total Periods: 45

TEXT BOOKS:

1. Jacob Milliman, Christors C Halkias, Integrated Electronics, Tata McGraw- Hill, 1991.
2. J.Millman and H.Taub, Pulse, Digital and Switching Waveforms, McGraw-Hill, 2000.

REFERENCE BOOKS:

1. S.Salivahana, N.Suresh Kumar, Electronic Devices and Circuits, Tata McGraw-Hill, 3rd edition, 2012.
2. A.Anand Kumar, Pulse and Digital Circuits, Prentice Hall India, 2nd edition, 2008.

I B. Tech. - I Semester (ECE, EEE & EIE) /
I B. Tech. - II Semester (CSE,CSSE,IT,CE & ME)

(19BT1AC01) SPOKEN ENGLISH

(Audit Course)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE OBJECTIVES:

- To impart the knowledge of day to day conversational expressions.
- To enhance contextual vocabulary and technical jargon for effective usage of language.
- To improve functional grammar for speaking and writing without errors.
- To acquaint with appropriate conversational and narrating techniques for effective communication.

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

CO1. Analyze the techniques of listening, speaking, reading, writing and apply through functional English to communicate effectively with the engineering community and society.

DETAILED SYLLABUS:

UNIT I - **FUNCTIONAL ENGLISH: (6 periods)**

Introduction - Functional Spoken English; Just a Minute; **Listening – Speaking:** Do's and Don'ts; **Expressing:** Ability/ Admiration/ Agreement/ Anger/ Annoyance/ Appreciation/ Pleasure/ Sarcasm/ Satisfaction/ Surprise/ Approval/ Capability/ Certainty/ Condolences/ Doubt/ Fear/ Gratitude/ Possibility/ Worry; **Asking for:** Advice/ Clarification/ Direction/ Information/ Permission/ Predictions/ a recommendation

UNIT II - **VOCABULARY BUILDING: (6 periods)**

Vocabulary for day-to-day conversations; Introduction: Vegetables/ Groceries/ Fruits/ Weather; Parts of a Human body/ Dresses/ Furniture/ Relations; Birds/ Cries of Animals; Food/ Hospitality/ Houses/ Rooms/ Tools; Airport/ News Paper/ Books/ Gems; Corporate Vocabulary/ Jobs/ Occupations/ Diseases; British/ American spelling; Slang Words and Technical Jargon

UNIT III - **FUNCTIONAL GRAMMAR - I: (6 periods)**

English Grammar and the Indian Student; Introduction: Parts of Speech, Verb forms; Tenses; Voice; Speech

UNIT IV - FUNCTIONAL GRAMMAR - II: (6 periods)

Universal Auxiliaries; Sentence making for an effective communication; Sentence Structure -WH-Questions - How to frame Questions and give answers; Question Tags; Subject and verb agreement; Spotting Errors

UNIT V – COMMUNICATION SKILLS: (6 periods)

Polite, Courteous and diplomatic terms; Useful daily expressions; Courtesy, Good manners and Etiquette; Conversation Techniques; Narrating/ Reading/ Listening to stories; Telling Stories

Total Periods: 30

TEXT BOOKS:

1. L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008
2. Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham Buddha Publications, Hyderabad, 2002.

REFERENCE BOOKS :

1. Sabina Pillai, *Spoken English for my World,* Oxford University Press, New Delhi, 2016.

2. K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009.

ADDITIONAL LEARNING RESOURCES

- https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills.
- https://www.fluentu.com/blog/english/websites-to-learn-english/

I- B. Tech - I/II Semester

(19BT1BS02) BIOLOGY FOR ENGINEERS

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	2	-	-	2

PRE REQUISITE: --

COURSE OBJECTIVES:

- To introduce the molecular basis of life and provide the basis for classification of living organisms
- To describe about biomolecules, enzymes, genes and the transfer of genetic information**.**
- To introduce the techniques used for modification of living organisms and applications of biology**.**

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

CO1. Apply the basic knowledge of biology to understand the significance of various biological techniques.

CO2. Identify the role of DNA in the molecular basis of information transfer and understand single gene disorders related to the health perspective.

CO3. Apply the basic knowledge of bio-analytical devices and methods to address societal, health and legal issues.

DETAILED SYLLABUS:

UNIT I – LIVING ORGANISMS (6 Periods)

Comparison of biological organisms with manmade systems, Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources, molecular taxonomy

UNIT II – PROTEINS, NUCLEIC ACIDS AND ENZYMES (6 Periods)

Biomolecules, structure and functions of proteins and nucleic acids, Industrial applications of enzymes, Fermentation and its industrial applications

UNIT III – GENETICS AND MOLECULAR BIOLOGY (6 Periods)

Mendel's laws, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation.

UNIT IV – RECOMBINANT DNA TECHNOLOGY (6 Periods)

Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips

UNIT V –HUMAN PHYSIOLOGY AND APPLIED BIOLOGY (6 Periods)

Fundamentals of Human physiology, neurons, synaptic and neuromuscular junctions, Introduction to EEG, DNA fingerprinting, DNA Micro array and Genomics.

Total Periods: 30

TEXT BOOKS:

1. N. A. Campbell, J. B. Reece, et al., *Biology: A global approach*, Pearson Education Ltd, 2018.
2. S. Sing and T. Allen, *Biology for Engineers*, Vayu Education of India, 2014.

REFERENCE BOOKS:

1. B. Alberts, A. Johnson et al., *The molecular biology of the cell*, Garland Science, 6th edition, 2014.

2. A. T. Johnson, *Biology for Engineers*, CRC press, 2011.

I B. Tech – I Semester (CSE, CSSE, IT, CE & ME)
I B. Tech – II Semester (ECE, EEE & EIE)
(19BT1HS01) COMMUNICATIVE ENGLISH

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	--	3

PRE-REQUISITES: -

COURSE OBJECTIVES:

1. To acquaint with the nuances of effective communication correlating with academic content.
2. To understand and interpret the importance of listening techniques for effective communication.
3. To develop reading and writing techniques for effective technical communication.
4. To make use of speaking techniques to communicate effectively in formal and informal situations.

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

CO1. Analyze the modes and techniques of listening, speaking, reading, writing and apply appropriately to communicate effectively with the engineering community and society.

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) - Case study

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

Introduction –Traits of a Good Listener – Listening Modes – Types of Listening – Barriers to Effective Listening – Listening for General Content and Specific Information - Case study

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

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Conferences; significance, planning and preparation and procedure – Symposia and Seminars - Persuasive Speaking - Case study

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

Introduction – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – –Techniques for Good Comprehension- SQ3R Reading Technique –Study Skills - Case study

UNIT V – TECHNICAL WRITING **(9 periods)**

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Paragraphs Construction – Essays: types, Steps to Essay Writing and Checklist – Précis Writing - Case study

Total Periods: 45

TEXT BOOKS:

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

2. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.

2. Rajendra Pal and J. S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES

1. https://www.skillsyouneed.com/ips/active-listening.html: A useful summary of what active listening skills are.
2. https://en.wikipedia.org/wiki/Active_listening: Wikipedia entry about active listening.
3. https://www.forbes.com/sites/womensmedia/2012/11/09/10-steps-to-effective-listening/#4b27a2503891: Ten steps to Active Listening (by Forbes magazine).
4. https://goo.gl/t1Uqrt: 20 tips for organizing a conference.
5. https://goo.gl/kPMr9u: 10 important issues for speakers at a conference.
6. https://goo/gl/C5bDvv: Wikihow guide to organizing a conference.

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.

I B. Tech. - I/II Semester
(19BT1BS03**) ENGINEERING PHYSICS**
(Common to CSE, CSSE, ECE, EEE, EIE & IT Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	0	--	3

PRE-REQUISITES: -

COURSE OBJECTIVES:

1 To impart knowledge in basic concepts of wave optics, electromagnetic theory and fiber optics.
2 To identify the importance of semiconductors in the functioning of opto-electronic devices.
3 To familiarize the properties and applications of dielectric, magnetic , superconducting and nanomaterials relevant to engineering branches.

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

CO1. Apply the knowledge of light waves to interpret the concepts of Interference, Diffraction and Polarization.

CO2. Demonstrate the concepts of electromagnetic wave propagation in Optical fibers.

CO3. Apply the basic knowledge of semiconductors to understand the functioning of various optoelectronic devices.

CO4. Demonstrate the basic knowledge of dielectric and magnetic properties to understand the various dielectric polarizations and magnetic materials.

CO5. Understand the concepts of superconductors and nanomaterials to familiarize their applications in relevant fields.

DETAILED SYLLABUS:

UNIT-I: WAVE OPTICS (09 periods)

Interference: Principle of superposition - Interference of light - Theory of interference fringes - Conditions for sustained interference - Interference in thin films (reflected light) - Newton's rings - Determination of wavelength.

Diffraction: Fraunhofer diffraction - Single slit diffraction - Diffraction grating - Grating spectrum - Determination of wavelength.

Polarization: Polarization by reflection, refraction and double refraction - Nicol's prism - Half wave and Quarter wave plate - Engineering applications of interference, diffraction and polarization.

UNIT-II: ELECTROMAGNETIC WAVES AND FIBER OPTICS (10 periods)

Divergence, Curl of Electric and Magnetic Fields - Maxwell's Equations (qualitative) - Electromagnetic wave propagation (conducting and non conducting media).

Introduction to fiber optics - Total Internal Reflection - Critical angle of propagation -Acceptance angle, Acceptance cone - Numerical Aperture - Classification of fibers based on Refractive index profile, modes - Attenuation losses - Dispersion - Propagation of electromagnetic wave through optical fiber - Block diagram of fiber optic communication - Applications of an optical fiber - Fiber optic Sensors (temperature, displacement).

UNIT-III: SEMICONDUCTORS (10 periods)

Origin of energy bands - Classification of solids based on energy bands - Intrinsic semiconductors - Density of electrons in intrinsic semiconductor - Density of holes in intrinsic semiconductor (qualitative) - Intrinsic carrier concentration - Fermi energy - Electrical conductivity of intrinsic semiconductors - Extrinsic semiconductors - Density of charge carriers in n-type - Density of charge carriers in p-type (qualitative) - Direct and Indirect band gap semiconductors - Hall effect, Hall coefficient - Applications of Hall effect - Drift and Diffusion currents - pn junction - Semiconducting materials for optoelectronic devices : Photodiode and Semiconductor diode laser.

UNIT-IV: DIELECTRICS AND MAGNETISM (09 periods)

Introduction to dielectrics - Electric polarization - Dielectric polarizability, susceptibility and dielectric constant - Types of polarizations (qualitative) - Frequency dependence of polarization - Lorentz (internal) field - Dielectric break down - Piezoelectricity - Applications of dielectrics.

Introduction to magnetics - Magnetic dipole moment, magnetization, magnetic susceptibility and permeability - Origin of magnetic moment - Classification of magnetic materials - Hysteresis loop - Soft and hard magnetic materials.

UNIT-V: SUPERCONDUCTORS AND NANOMATERIALS (7 periods)

Introduction to Superconductors, Properties - Critical parameters of Superconductors - Meissner effect - Penetration depth - Types of Superconductors - BCS Theory - Josephson effect (AC & DC) - High T_C Superconductors - Applications.

Basic principles of nanomaterials - Synthesis of nanomaterials by PLD method - Properties of nanomaterials - Applications of nanomaterials.

Total Periods: 45

TEXT BOOKS:

1. M.N. Avadhanulu, P.G.Kshirsagar & T.V.S Arun Murthy, *A Text book of Engineering Physics*, S. Chand Publications, 11th edition, 2019.
2. P. K. Palaniswamy, *Engineering Physics*, Scitech Publications India Private Limited, 2nd edition, 2009.

REFERENCE BOOKS:

1. K. Thyagarajan, *Engineering Physics*, McGraw-Hill Education (India) Pvt. Ltd, 2016.
2. R.K. Gaur and S.L. Gupta, *Engineering Physics*, Dhanpat Rai Publications (P) Ltd, 2015.

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 nanomaterials.

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 nanomaterials.
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 (11periods)

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

I B. Tech. - I/II Semester

(19BT1BS31**) ENGINEERING PHYSICS LAB**

(Common to CSE, CSSE, ECE, EEE, EIE & IT Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE REQUISITE: --

COURSE OBJECTIVES:

1 To impart knowledge in basic principles of optical, electrical and electronic instrumental techniques.
2 Develop skills in the design and functioning of components in the electronic circuits.
3 Develop the practical skills in analyzing optical, electrical and electronic properties of materials using different instruments for engineering applications.
4 Imbibe scientific attitude in applications of various experiments.

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

CO1. Apply the basic knowledge of light waves and semiconductors to demonstrate the functioning of optoelectronic devices.
CO2. Understand the experimental procedures to calculate the thickness of a thin film, Hall coefficient, Hysteresis losses, and acceptance angle of an optical fiber.
CO3. Determine the experimental values of magnetic field induction, wave length of a light source, energy gap of a semiconductor.
CO4. Apply skills to plot characteristic curves to determine the various parameters of semiconductor diodes.
CO5: Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS:

1. Determine the thickness of the wire using wedge shape method.
2. Determination of wavelength of light source by Newton's ring method.
3. Determination of wavelength by plane diffraction grating method.
4. Estimation of magnetic field along the axis of a circular coil carrying current.
5. Study the variation of Magnetic field induction (B) vs Magnetic field strength (H) by magnetizing the magnetic material (B-H Curve).
6. Determination the numerical aperture of a given optical fiber and hence to estimate its acceptance angle.
7. Determination of number of charge carriers and Hall coefficients of a given semiconductor using Hall Effect.
8. Determine the resistivity of semiconductor by Four probe method.
9. Determine the energy gap of a semiconductor.
10. Study the I-V characteristics of pn junction diode.
11. Estimation of threshold voltages of different LED's.
12. Study the characteristics of Photodiode.
13. Determination of wavelength of laser by using diffraction grating.

REFERENCES:

1. S. Balasubramaniah and M.N. Srinivasan, *A Text book of practical physics*, S Chand Publications, 2017.
2. *http://vlab.amrita.edu/index.php* - Virtual Labs, Amrita University.

I B. Tech. – Semester

(16BT1BS32) ENGINEERING PHYSICS LABORATORY

(Common to all Branches)

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

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and a.c source using a.c sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OBJECTIVES:

CEO 1: Develop skills in the design and functioning of components in the electronic circuits.

CEO 2: Develop the practical skills in analyzing optical, electrical, electronic and mechanical properties of materials using different instruments for engineering applications.

CEO 3: Imbibe scientific atitude in applications of various experiments.

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

CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3: Develop skills in designing electronic circuits using semiconductor components.

CO4: Acquire skills to use instrumental techniques in ac sonometer and Melde's experiment.

CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

LIST OF EXCERSICES:

Conduct a minimum of any **Ten** of the following experiments.

1. Determination of wavelength of a laser source using Diffraction Grating.
2. Determination of particle size by using a laser source.
3. Determination of Numerical aperture and acceptance angle of an optical fiber.
4. Melde's experiment - transverse & longitudinal modes.
5. Magnetic field along the axis of a current carrying coil- Stewart and Gee's method.
6. Calculation of ac frequency using sonometer.
7. I-V Characteristics of a p-n Junction diode.
8. Energy gap of a material of a p-n Junction.

9. Characteristics of LED source.
10. Characteristics of Photo diode.
11. Hall Effect.
12. Determination of rigidity modulus of the material of the wire using torsional pendulum.

I B. Tech. - I/II Semester
(19BT1BS04**) ENGINEERING CHEMISTRY**
(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE REQUISITE: -

COURSE OBJECTIVES:

1 To provide basic knowledge in quantum-mechanical model of atom, bonding theories, water treatment, electrochemistry, corrosion, instrumental methods, fuels and lubricants.

2 To develop skills in identification of molecular shapes, measurement of hardness of water, calculation of cell potential, calorific value of fuels.

3 To impart basic knowledge pertains to various instrumental methods, their applications and characterization of molecular structures using instrumental methods.

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

CO1. Apply the basic knowledge of quantum mechanical approach to atomic structure and bonding theories to identify shapes of different orbitals and molecules.

CO2. Analyze and solve problems associated with hardness of water, boiler troubles and address the societal, health and safety issues related to quality of water.

CO3. Apply the basic knowledge of corrosion phenomenon to identify solutions for control of corrosion and demonstrate competency in the basic concepts of electrochemical cells.

CO4. Demonstrate the basic knowledge of instrumental methods and their applications in the structural analysis of materials.

CO5. Apply the basic knowledge of fuel chemistry and lubricants to identify the quality of fuels and lubricants.

DETAILED SYLLABUS:

Unit I: Atomic Structure and Bonding Theories (9 periods)

Quantum-mechanical model of atom, Schrodinger wave equation, significance of Ψ and Ψ^2 , applications to particle in a box and hydrogen atom; Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of N_2, O_2, NO and CO; Π-molecular orbitals of butadiene and benzene; VSEPR theory and molecular shapes.

Unit II: Water Treatment (9 periods)

Introduction, types of water, Impurities in water and their consequences. Hardness of water, units of hardness, disadvantages of hardness, measurement of hardness by EDTA method, numerical problems on measurement of hardness of water, boiler troubles- priming & foaming, scales & sludge, caustic embrittlement, boiler corrosion, softening of water– Ion exchange

process, zeolite process, desalination of brackish water by reverse osmosis, Drinking water treatment- Ozonisation & chlorination, specifications of potable water as per WHO and BIS standards. Fluoride in ground water: Effects on human health, defluoridation method – Nalgonda method; merits and demerits of various defluoridation methods.

Unit III: Electrochemistry and Applications (10 periods)

Electrode potential, Nernst equation, reference electrodes (Calomel electrode and glass electrode), electrochemical cell, cell potential calculations. Primary cells – dry cell, alkali metal sulphide batteries, Secondary cells – lead acid, lithium ion batteries, Fuel cells - Hydrogen-oxygen fuel cell, Methanol-oxygen fuel cell, Solid-oxide fuel cell.

Corrosion: Introduction, Definition, types of corrosion- wet (galvanic corrosion, concentration cell corrosion) and dry corrosion, Factors influencing corrosion, control of corrosion- sacrificial anodic protection, Impressed current cathodic protection, electroplating method (Nickel).

Unit IV: Instrumental Methods and Applications (9 periods)

Introduction to spectroscopy–types of energy present in molecules, types of spectra, UV-Vis spectroscopy – principle, types of electronic transitions, chromophore, auxochrome, Bathochromic shift, Hypsochromic shift, Instrumentation of UV-Vis spectrophotometer, applications; Infrared spectroscopy – principle, types of vibrational modes, group frequencies, Instrumentation of IR spectrophotometer, applications. principle and applications of physicochemical methods (SEM, TEM, X-ray diffraction).

Unit V: Fuel chemistry and Lubricants (8 Periods)

Fuel chemistry: Types of fuels, calorific value, numerical problems based on calorific value; Liquid fuels, cracking of oils (Thermal and Fixed-bed catalytic cracking), knocking and anti-knock agents, Octane and Cetane values, Synthetic petrol: Fischer-Tropsch method and Bergius process.

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity and viscosity index , flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total Periods: 45

TEXT BOOKS:

1. P. C. Jain & Monika Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy and C. Ramachandriah, *Engineering Chemistry,* Mc.Graw Hill Publishers, New Delhi.

REFERENCE BOOKS:

1. J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5th edition 2010.
2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6th edition, 2007.
3. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th edition, 2010.

I B. Tech - I/II Semester
(16BT1BS01): ENGINEERING CHEMISTRY
(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 Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nano Chemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OBJECTIVES:

1. To impart basic and applied knowledge in water technology, Chemistry of Engineering materials, Nano Chemistry, Green Chemistry, bio-diesel, electro chemical cells, sensors, corrosion and lubricants.

2. To develop skills in analysis of materials and design of systems for engineering applications.

3. To imbibe an attitude among students to practice Engineering in compliance with principles of Green Chemistry.

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

1. Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.
2. Develop analytical skills in:
   a. Determination of hardness of water.
   b. Determination of viscosity, flame and fire points, cloud and pour points.
3. Develop designing skills in:
   a. Synthesis of engineering plastics.
   b. Chemical methods for the synthesis of Nano materials.
4. Develop skills for providing solutions through:
   a. Mitigation of hardness of water.
   b. Newer Nanomaterials and engineering plastics for specific applications
5. Acquire awareness to practice engineering in compliance to modern techniques such as:
   a. Nalgonda technique for defluoridation of water
   b. Electroplating technique for control of corrosion.
6. Acquire awareness to societal issues on:
   a. Quality of water.
   b. Bio-diesel
   c. Chemical materials utility and their impact.

DETAILED SYLLABUS:

UNIT–I: WATER TECHNOLOGY [9 periods]

Introduction, types of water, impurities in water and their consequences, types of hardness of water, units of hardness of water, disadvantages of hardness of water, estimation of hardness of

water by EDTA method, Boiler troubles: Scales and Sludges, Caustic embrittlement, Boiler corrosion and Priming and Foaming. Softening of water: Zeolite process and Ion exchange process, advantages and disadvantages. Desalination of brackish water by Reverse Osmosis, Numerical problems on estimation of hardness of water.
Fluorides in water: effects on human health, defluoridation method-Nalgonda method; comparison of merits and demerits of various defluoridation methods (Nalgonda, Bone Charcoal, Activated Alumina, Contact precipitation, Brick, Reverse osmosis).

UNIT – II: CHEMISTRY OF ENGINEERING MATERIALS [9 periods]

Engineering Plastics: Definition, general properties, synthesis, properties and applications of PC, PTFE, and PMMA.

Conducting polymers: Definition, types of conducting polymers: Intrinsic and extrinsic conducting polymers with examples, engineering applications of conducting polymers.

Biodegradable polymers: Definition, properties, classification, mechanism of degradation of biodegradable polymers and their applications.

Composites – Introduction, types of composites: fiber reinforced particulate and layered composites with examples, advantages of composites and applications.

UNIT– III: NANO CHEMISTRY AND GREEN CHEMISTRY [9 periods]

Nano Chemistry: Introduction, classification, properties and applications of Nano materials (nano particles, nano tubes, nano wires, nano composites, dendrimers); synthesis of Nano materials – Sol-gel process.

Green Chemistry: Introduction, principles of green chemistry, Tools of Green Chemistry with Examples, Applications of Green Chemistry in science and technology.

Biodiesel: Introduction, Synthesis (Trans esterification method), advantages, disadvantages and applications.

UNIT–IV: ELECTROCHEMICAL CELLS AND SENSORS [9 periods]

Electrochemical cell: Introduction, EMF of an electrochemical cell.

Batteries: Introduction, types of Batteries: primary and secondary batteries with examples, Ni-Cd batteries, Lithium-ion batteries, Lithium- Polymer batteries, Applications of batteries.

Fuel Cells: Definition, examples: H_2 – O_2 Fuel cell, solid oxide fuel cell, Bio-fuel cell and applications of fuel cells.

Sensors - Introduction, Types of Sensors, electrochemical sensor: construction and working principle of potentiometric sensor, and applications of electrochemical sensors.

UNIT–V: CORROSION AND LUBRICANTS [9 periods]

Corrosion: Introduction, Definition, types of corrosion (dry and wet corrosion), galvanic corrosion, concentration cell corrosion, Factors influencing corrosion, Corrosion control: cathodic protection; sacrificial anodic protection and impressed current cathodic protection; protective coatings: Galvanizing and Electroplating (Nickel).

Lubricants: Definition, functions of lubricants, mechanism of lubrication, classification of lubricants, properties of lubricants – viscosity, flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total periods: 45

TEXT BOOKS:

1. P.C.Jain & Monika Jain, **Engineering Chemistry**, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy & C. Ramachandraiah **Engineering Chemistry**, Mc. Graw-Hill Higher Education, Hyderabad, 1st edition, 2015.

REFERENCE BOOKS:

1. A.K. Bandyopadhyay, **Nano Materials,** New Age international publishers, 2nd edition, 2014.
2. Paul T. Anastas, John C Warner, **Green Chemistry: Theory and practice,** Oxford University Press, 2000

I B.Tech. - I/II Semester
(19BT1BS32**) ENGINEERING CHEMISTRY LABORATORY**
(Common to All Branches of Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE REQUISITE: -

COURSE OBJECTIVES:

- To impart knowledge in basic principles of volumetric and instrumental methods of analysis.
- To develop practical skills encompassing quantitative analysis of materials by volumetric methods.
- To develop practical skills to analyze the materials by instrumental methods.

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

CO1. Apply analytical skills for the quantitative estimation of materials through volumetric methods of analysis and address the societal, health issues related to quality of water.
CO2. Develop analytical skills for the quantitative estimation of materials through instrumental methods of analysis.
CO3. Work independently and in teams to solve problems with effective communication.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS :

1. Estimation of Hardness of water by EDTA method
2. Determination of alkalinity of Water sample
3. Estimation of Dissolved Oxygen in water by Winkler's method.
4. Estimation Fe (II) by Dichrometry
5. Conductometric titration of strong acid Vs strong base
6. Estimation of Ferrous ion by Potentiometry
7. Determination of strength of acid by P^H metric method
8. Determination of Strength of an acid in Pb-Acid battery
9. Determination of Viscosity by Ostwald's viscometer
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of residual chlorine in drinking water.
12. Identification of simple organic compounds by UV-Vis and IR spectroscopy

TEXT BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.
2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

I-B. Tech- I/II Semester

(16BT1BS31): ENGINEERING CHEMISTRY LABORATORY

(Common to All Branches of Engineering)

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

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OBJECTIVES: This course enables the students to:

1. Develop practical skills encompassing quantitative analysis of materials by volumetric methods, instrumental methods and acquire designing skills for the synthesis of Nano materials and Engineering plastics.

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

1. Acquire basic knowledge about the volumetric analysis and synthesis of materials used for engineering applications**.**
2. Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.
3. Develop designing skills for the synthesis of polymers and Nanomaterials.
4. Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, P^H of a solution, determination of viscosity of lubricants and estimation of iron in cement.
5. Provide solutions for environmental issues through determination of quality of water.

A minimum of any **Ten** experiments are to be conducted among the following:

LIST OF EXPERIMENTS:

1. Estimation of Hardness of water by EDTA method.
2. Estimation of alkalinity of Water.
3. Estimation of Dissolved Oxygen in water.
4. Estimation of Ferrous Iron by Dichrometry.
5. Preparation of Novalac Resin.
6. Synthesis of Nano metal-oxide using sol– gel process.
7. Conductometric titration of strong acid Vs strong base

8. Estimation of Ferrous ion by Potentiometry.
9. Determination of amount of corrosion of metals in different medium
10. Measurement of viscosity of lubricants by Ostwald viscometer.
11. Determination of P^H of a given solution by P^H metry.
12. Estimation of Ferric iron in cement by Colorimetric method.

Duration: 3 Periods for each experiment

Total periods: 36

TEXT BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.
2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M. Enterprises Limited, 2013.

I B. Tech. - II semester
(19BT2BS01) **TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA**
(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	--	4

PRE-REQUISITE: -

COURSE OBJECTIVES:

- To familiarize with Fourier series of a periodic function, the Fourier integral of a function and the Fourier transformation.
- To introduce Laplace transform techniques for solving differential equations.
- To acquaint the students with concepts of matrices and linear transformations useful in engineering contexts.

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

CO1: Apply the knowledge of Fourier and Laplace transform techniques to solve differential equations.

CO2: Analyze linear transformations and associated matrices to solve engineering problems by applying the knowledge of linear algebra.

DETAILED SYLLABUS:

UNIT- I: Fourier Series and Fourier Transforms (9 Periods)

Fourier series: Determination of Fourier coefficients, Euler's formulae, convergence of Fourier series (Dirichlet's conditions), Fourier series in $(0,2l),(-l,l)$; Fourier series of even and odd functions; Half-range Fourier sine and cosine expansions in $(0,l)$; Fourier integral theorem (statement only), Fourier sine and cosine integrals; Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

UNIT-II: Laplace Transforms (9 Periods)

Definition of Laplace transform, existence conditions, Laplace transform of standard functions, Properties of Laplace transforms, Laplace Transforms of derivatives, Laplace Transforms of integrals, multiplication by t^n, division by t, Laplace transform of periodic functions, Laplace transforms of unit step function and unit impulse function.

UNIT- III: Inverse Laplace Transforms (9 Periods)

Inverse Laplace transform by different methods; Convolution theorem (without proof), inverse Laplace transforms by convolution theorem; Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT- IV: Linear Algebra-I (Matrices) **(9 Periods)**

Rank of a matrix: echelon form; Linear systems of equations: solving system of Homogeneous and Non-Homogeneous equations; Eigen values and Eigen vectors of a matrix and properties (without proofs), Diagonalization of matrix by orthogonal transformation; Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

UNIT- V: Linear Algebra-II (Vector Spaces) **(9 Periods)**

Vector spaces, Linear dependence and independence of vectors, basis, dimension, Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem (without proof), matrix associated with a linear map.

Total Periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, *Engineering Mathematics-II*, S. Chand & Company, 10th edition, 2016.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
3. David Poole, *Linear Algebra: A Modern Introduction*, Brooks/Cole, 2nd edition, 2005.

REFERENCE BOOKS:

1. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw hill, 1st edition, 2017.
2. V.Krishna Murthy, Mainra and Arora: *An Introduction to Linear Algebra*, Affiliated East-West Press, 1993.

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'sconditions),Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT- II: FOURIER INTEGRALSAND 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 (ECE, EEE and EIE)/

III B. Tech. – I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)

(19BT4BS01) MATERIAL SCIENCE

(Open Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Material Science and Engineering; Composite Materials; Smart Materials; Nano and Biomimetic Materials; Emerging Materials.

COURSE OBJECTIVES:

- To impart knowledge on processing, structure and properties of materials like composite materials, smart materials, biomimetric materials and nanomaterials.
- To develop awareness among the students about the impact of material science in engineering practices.

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

CO1. Attain the basic knowledge on composites, smart materials, biomimetic materials and nano materials.

CO2. Demonstrate essential information about structure and properties of various composites used in various engineering applications.

CO3. Understand the basic properties of electro-rheostatic, magneto-rheostatic and shape memory alloys used in device applications.

CO4. Accomplish the basic knowledge in nanomaterials to familiarize various nano structured device applications.

CO5. Outline the processing and properties of functionally graded materials and identify its applications in various fields.

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO MATERIAL SCIENCE AND ENGINEERING (08 Periods)

Introduction - historical perspective - material science and engineering, classification of materials (metals, ceramics, polymers and composites) and advanced materials and their applications (biomaterials, smart materials and nanomaterials), modern materials needs. Processing, properties and applications of metals, polymers and ceramics (Qualitative).

UNIT- II: COMPOSITE MATERIALS (10 Periods)

Composite Materials - Classification, Laminated composites and Reinforced composite materials – Classification, structure and properties of sandwich composites – applications (commercial Aircraft, Marine Grade Sandwich, Automobile Grade Sandwich and Wind Turbine Blades), properties and applications of Nano composites - Advantages and Limitations of composites.

UNIT- III: SMART MATERIALS (07 Periods)

Classification of smart materials - Magneto-rheostatic (MR) and Electro-rheostatic (ER) materials - Shape Memory Alloys (SMA)- characteristics, Shape memory effect applications in different fields, advances in smart materials.

UNIT – IV: NANO AND BIOMIMETIC MATERIALS (10 Periods)

Nanomaterials: Introduction, Low dimensional structures and energy quantization. Fabrication of nano materials - Lithographic technique using photons, metallic, semiconducting and magnetic properties of nano materials and applications (renewable energy and nano electro-mechanical systems (NEMS)).

Biomimetic materials – Introduction- classification and their applications (Lotus effect, Dolphin sound wave technology and viper as a model in defence)

UNIT- V: EMERGING MATERIALS (10 Periods)

Functionally graded materials (FGM) - Types, processing, properties and potential applications, functionally graded fibre cement – structural material, Functionally Graded Nanoelectronic, Optoelectronic and Thermoelectric Materials (Qualitative) and its applications.

Total Periods: 45

TEXT BOOKS:

1. William D Callister, David G Rethwisch, *Materials Science and Engineering*, Wiley, 9th edition, 2014.
2. K M Gupta, *Engineering Materials – Research, Applications and Advances*, CRC press (Taylor & Francis group), 2015.

REFERENCE BOOKS:

1. Sulabha K Kulkarni*, Nanotechnology: Principles and practices*, Springer, 9th edition, 2014.
2. Charles P. Poole and Frank J. Owens, *Introduction to Nanotechnology*, Wiley- Interscience, May 2003.

1. Sulabha K Kulkarni, *Nanotechnology: Principles and Practices,* Springer, 3rd edition, 2014.

II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/
III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS05) GENDER AND ENVIRONMENT

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Gender and the environment relationship, Gendered Roles in the family & community, Gender and sustainable development, Gender in environmental justice, Gender &environmental security.

COURSE OBJECTIVES:

- To enhance understanding of environmental issues by considering the particular experiences of women and men in the face of environmental degradation and key areas in gender-environment relations and gender roles in thefamily, community and international levels.
- To trace how different feminisms, build on the core concepts of sustainability and justice to transform familiar debates in global environmental politics.
- To provide analysis of how gender relations affect the natural environment and how environmental issues have a differential impact on women and men.

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

CO1: Apply the knowledge of gender & environment connections, key issues and topics within global environmental politics in environmental decision-making.

CO2: Comprehend the concepts of gender and sustainable development through debates, and policy documents.

CO3: Analyze the concept of environmental security and justice by identifying the sources of insecurity.

DETAILED SYLLABUS

UNIT I: GENDER ANDENVIRONMENT RELATIONSHIP (9 Periods)

Introduction–Gender and Environment–Development of gender roles–Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism - Cultural eco-feminism–Social eco-feminism - Feminist political ecology

UNIT II: GENDERED ROLES IN THE FAMILY & COMMUNITY (9 Periods)

Organization of the household – Domestic division of labour - Food: growing, harvesting, shopping, preparing, and cooking
Gender & Power- Planning – Politics – NGO – Gendering of environmental protest – Environmental decision-making

UNIT III: GENDER ANDSUSTAINABLE DEVELOPMENT (9 Periods)

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates - Gender in policy documents – Gender, poverty & equity in sustainable development

UNIT IV: GENDER IN ENVIRONMENTAL JUSTICE (9 Periods)

Normative Concerns (Fairness, Inequality & Justice) - Making sense of Environmental justice – Ecological debt, Transnational harm,& human rights – Ecological justice – Gender & Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability& justice as guiding concepts

UNITV: GENDER AND ENVIRONMENTAL SECURITY (9 Periods)

Connections between security & the environment – **Gender, environment & security:**Sustainability as security - poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security - **Case Study** – The impacts of natural disasters

Total Periods: 45

TEXT BOOKS:

1. Nicole Detraz. (2017) "Gender and the Environment"Polity Press, Cambridge, UK.
2. Susan Buckingham- Hatfield. (2000) "Gender and Environment"Routledge, London.

REFERENCE BOOKS:

1. Promillakapur (ed). (2000). "Empowering Indian Women" Publication Division, Government of India, New Delhi.
2. Ronnie Vernooy, (Ed). (2006). "Social and gender Analysis Natural Resource Management: Learnning studies and lessons from Aisa" Sage, New Delhi.
3. Swarup, Hemlata and Rajput, Pam. (2000). Gender Dimensions of Environmental and Development Debate: The Indian Experience" In SturatS.Nagel, (ed). "India"s Development and Public Policy".Ashgate, Burlington.

II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/
III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS09) LIFE SKILLS

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Positive attitude; Self-discovery-Interpersonal relationships; Cross-cultural communication; Core thinking-Problem solving and Decision making; Business presentations and Public speaking.

COURSE OBJECTIVES:

- To inculcate skills for self-efficacy required to manage effective interpersonal relationships.
- To familiarize the strategies involved in problem solving, decision making and SWOT analysis.
- To develop presentation skills required in professional arena.

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

CO1. Gain knowledge in strategies involved in developing positive attitude, process ofknowing oneself and managing effective interpersonal relationships.

CO2. Analyse problem solving strategies in Decision Making and SWOT analysis.

CO3. Communicate effectively with Engineering Community and Society by demonstrating presentation skills in professional arena.

DETAILED SYLLABUS:

UNIT I: POSITIVE ATTITUDE (9 Periods)

Introduction, Features of attitudes, Formation of attitudes, Ways of changing attitude in a person, Attitude in a work place, Developing positive attitude, Obstacles in developing positive attitude, Measuring attitude.

UNIT II: SELF DISCOVERY AND INTERPERSONAL RELATIONSHIPS (9 Periods)

Importance of knowing yourself, Process of knowing yourself, SWOT Analysis, Elements of attitude in interpersonal relationships, Methods to deal with different types of interpersonal relationship skills.

UNIT III: CROSS-CULTURAL COMMUNICATION (9 Periods)

Different Communication Styles, Cultural variables, communication sensitivity and variables of national culture, Individual Cultural Variables, Cross-cultural Communication Strategies, Potential hot spots in cross-cultural communication, Cross-cultural communication – Basic Tips.

UNIT IV: CORE THINKING, PROBLEM SOLVING AND DECISION MAKING (9 Periods)

Process of developing core thinking skills, Categories of thinking: Critical & Creative, Understanding problem solving, Cause of problems, Stages of problem solving, Methods of problem solving, Types of decision making.

UNIT V: BUSINESS PRESENTATIONS AND PUBLIC SPEAKING (9 Periods)

Business presentations and speeches, structuring the material, Types of delivery, Guidelines for delivery, Effective sales presentation, Controlling nervousness and stage fright.

Total Periods: 45

TEXT BOOKS:

1. Dr. K. Alex (2018) Soft Skills, S. Chand and Company Limited, New Delhi.

2. Manmohan Joshi (2017) Soft Skills, bookboon.com, Bangalore.

REFERENCE BOOKS:

1. Meenakshi Raman and Prakash Singh (2013), Oxford University Press, New Delhi.

2. Jeff Butterfield (2011) Soft Skills for Everyone, Cengage Learning India Private Limited, Delhi.

II B. Tech. – II Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)/

III B. Tech. – I Semester (ECE, EEE and EIE)

(19BT4HS11) PROFESSIONAL ETHICS

(Open Elective -2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering Ethics; Professional Ideals and Virtues; Engineering as Social Experimentation; Responsibilities and Rights; Global Issues.

COURSE OBJECTIVES:

- To impart fundamental concepts of engineering ethics, professional values and social responsibility.
- To develop skills in discharging the professional responsibilities as managers, advisors and leaders
- To apply code of ethics in workplace.

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

CO1. Demonstrate knowledge in Engineering Ethics, Responsibilities and Rights.

CO2. Analyze the concepts of Engineering in Social Experimentation and Global Issues.

CO3**.** Apply the nuances of professional ideals at work place and in social context.

DETAILED SYLLABUS:

UNIT - I: ENGINEERING ETHICS (9 periods)

Scope and aim of engineering ethics, Senses of engineering ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory, Gilligan's theory, Consensus and controversy.

UNIT - II: PROFESSIONAL IDEALS AND VIRTUES (8 periods)

Theories about virtues, Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion, Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories, Resolving moral dilemmas and moral leadership.

UNIT - III: ENGINEERING AS SOCIAL EXPERIMENTATION (10 periods)

Engineering as experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, Engineers as responsible experimenters, Conscientiousness, Moral autonomy and accountability, The challenger case, Codes of ethics and limitations, Industrial standards, Problems with the law of engineering.

UNIT - IV: RESPONSIBILITIES AND RIGHTS (9 periods)

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights and discrimination.

UNIT - V: GLOBAL ISSUES (9 periods)

Multinational corporations, Professional ethics, Environmental ethics, Computer ethics, Engineers as consultants, Witnesses, Advisors and Leaders, Engineers as Managers, Managerial ethics applied to Engineering Profession, moral leadership.

Total Periods: 45

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd edition, 2007.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V. S., *Engineering Ethics*, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt Ltd., 2009.
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001.

II B.Tech.- II Semester(ECE, EEE and EIE)/
III B.Tech.- I Semester (CSE, CSE (AI), CSE (DS), CSBS, CSSE, IT, CE and ME)

(19BT4HS12) WOMEN EMPOWERMENT (Open Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Concept & Framework, Status of Women, Women's Right to work, International Women's Decade, and Women Entrepreneurship.

COURSE OBJECTIVES:

- To provide knowledge on the concept and framework for women empowerment, socio-economic political status of the women and develop consciousness among themselves to fight for their rights,
- To witness unprecedented efforts from various sectors to reassess the roles of women, to enlarge the information base, to search for alternative strategies for women's equality and development and to develop policies and programs addressed to women's specific problems and needs.
- To create awareness on women entrepreneurship and schemes for the development of women entrepreneurship and entrepreneurial challenges and opportunities

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

CO1: Demonstrate the characteristics of empowered women, their achievements, and frame work for women empowerment, legal laws, and political status of women.

CO2: Apply the knowledge of women rights to address various societal issues and obstacles in different fields including science and technology.

CO3: Understand the significance of participation in policy debates, National conferences and common forums for women's' equality and development.

CO4: Analyze the concept of women entrepreneurship, government schemes and entrepreneurial challenges and opportunities.

DETAILED SYLLABUS:

UNIT I: CONCEPT & FRAMEWORK (9 Periods)

Introduction- Empowered Women's Characteristics- Achievements of Women's Empowerment **Concept of Empowerment:** Meaning& Concept- Generalizations about Empowerment - Empowerment Propositions - Choices women can make for empowerment - Women's participation in decision making, development process & in Governance. **Framework for Women's Empowerment** - Five levels of equality- Tenets of Empowerment- Elements - Phases and aspects - Techniques - Categories and Models – Approaches.

UNIT II: STATUS OF WOMEN (9 Periods)

Legal Status: Present Scenario- Call for Social change- Significant trends - Legal & Schemes - Personal Law- Joint Family- Criminal Law- Shift towards Dowry - Deterrent Punishment - Criminal Law(II Amendment) - Discrimination in Employment

Political Status: Present Scenario - Political Participation & its Nature- Socio-economic Characteristics - Political Mobilization: Mass Media - Campaign Exposure - Group Orientation - Awareness of issues and participation - Progress & Future Thrust.

UNIT III: WOMEN'S RIGHT TO WORK (9 Periods)

Introduction- Present Scenario - Changes in Policy &Programme - National Plan of Action- Women's Cells and Bureau - Increase in work participation rate- Discrimination in labourmarket - Women in unorganized sector - Issues and Obstacles- Women in Education - Women in Science & Technology –

Case Study: Linking Education to Women's Access to resources.

UNIT IV: WOMEN'S PARTICIPATORY DEVELOPMENT (9 Periods)

Dynamics of social change- conscious participation - Information Explosion - Organized Articulation - National Conference - Common Forums - Participatory Development - New Issues Identified - Role of other Institutions.

UNIT V: WOMEN ENTREPRENEURSHIP (9 Periods)

Introduction–Definition-Concept- Traits of women Entrepreneurs- Role of women Entrepreneurs in India -Reasons of Women Entrepreneurship- Government schemes & Financial Institutions to develop Women Entrepreneurs - Key policy recommendations - Project Planning-Suggestions and measures to strengthen women entrepreneurship - Growth & Future challenges - Training and Opportunities –

Case Study: Training Women as Hand-pump Mechanics

Case Study : Literacy for Empowering Craftswomen

Total Periods: 45

TEXT BOOKS:

1. NayakSarojini, Nair Jeevan(2017), "Women's Empowerment in India". Pointer Publishers, Jaipur
2. SahaySushama (2013), "Women and Empowerment" Discovery Publishing House, New Delhi.

II B. Tech. - II Semester

(19BT40107) SUSTAINABLE ENGINEERING

(Open Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

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

CO1. Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.

CO2. Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.

CO3. Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO4. Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO5. Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT I–PRINCIPLES OF SUSTAINABILITY (9 periods)

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT II–SUSTAINABILITY METRICS AND ASSESSMENT TOOLS (9 periods)

Sustainability indicators, metrics and assessment tools, Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment (SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT III–SUSTAINABLE ENGINEERING PRACTICES (9 periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT IV–SUSTAINABLE ENGINEERING APPLICATIONS (9 periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT V–SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION (9 periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley &Sons, Inc., Hoboken, New Jersey, 2019, 544p (ISBN: 978-1-119-49393-8).
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo,A.O., Maria, P.,*EngineeringApplications in Sustainable Design and Developmen*t, Cengage Learning, 1st Edition, 2016.
2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.
4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.
2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, https://doi.org/10.1061/9780784407509, 2004.
3. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
4. *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

I B. Tech. – I Semester

(19BT10201) **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

(Common to EEE, ECE, EIE, CSE (AI), CSE (DS) and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of Electrical Systems; AC Machines; Semiconductor Devices and Op-Amps.

COURSE OUTCOMES:

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

CO1. Analyze electrical circuits by applying the conceptual knowledge of circuit elements.

CO2. Demonstrate knowledge on various generation technologies, protection devices, safety procedures and BEE standards.

CO3. Demonstrate knowledge on characteristics and applications of transformers and AC machines.

CO4. Demonstrate knowledge on characteristics and applications of diode, BJT and Op-amps.

DETAILED SYLLABUS:

UNIT-I: Principles of Electrical Systems-I (9 Periods)

Basic electrical sources: DC-Battery, AC sources–Single loop generator; Single phase and three phase supply; Electrical circuit elements (R, L and C), Ohm's law, Kirchhoff's laws, Representation of sinusoidal waveforms, peak and RMS values, phasor representation, reactive power, apparent power, real power, energy and power factor.

UNIT-II: Principles of Electrical Systems-II (9 Periods)

Significance of Power factor and power factor correction, most economical power factor. Typical layout of electrical grid; Typical layout and operation of Hydro, Thermal and Solar Power Plants; Fuse, circuit breaker (MCB, MCCB, RCCB, ELCB), relay (elementary treatment); Inverter and UPS (block diagram approach only). Earthing – importance of earthing, pipe earthing and plate earthing; Safety measures. Energy Efficiency (Star rating) standards by BEE.

UNIT-III: Transformers and AC Machines (9 Periods)

Construction and working of a single phase transformer, EMF Equation; Construction and working of three phase induction motor, torque equation, torque-slip characteristics, applications; construction and working of a resistor start &capacitor start and run single phase induction motor, applications; Construction and working of synchronous machine, applications.

UNIT-IV: Semiconductor Devices (10 Periods)

PN Junction diode, Characteristics, applications - half wave and full wave rectifier.Zener diode, characteristics, application–Regulator.BJT- operation, configurations, characteristics, applications - switch and amplifier.

UNIT-V: Op-Amps (8 Periods)

Operational Amplifier: Block diagram of Op-Amp, equivalent circuit, Op-Amp AC and DC Characteristics, Inverting and Non-Inverting modes. Applications - Adder, Comparator, Integrator and Differentiator.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. AshfaqHussain*, Fundamentals of Electrical Engineering,* Dhanpatrai& Co. (P) Ltd., *3*rd edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, *Electronics Devices and Circuits*, PHI, 11th edition, 2009.

REFERENCE BOOKS:

1. M.S. Naidu, S. Kamakshaiah, *Introduction to Electrical Engineering* ,Tata McGraw-Hill Education, New Delhi, 2007.
2. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International Pvt. Ltd., 4th edition, 2011.

I B. Tech. – I Semester

(19BT10231) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

(Common to EEE, ECE, EIE, CSE(AI), CSE(DS) and CSBS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Physics at intermediate level.

COURSE DESCRIPTION: Practical investigations on Electrical circuits, AC Machines, Semiconductor Devices and Op-Amps.

COURSE OUTCOMES:

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

CO1. Analyze, measure, interpret and validate the practical observations by applying the fundamental knowledge of electrical circuits, machines and electronic devices.

CO2. Design Op-amp based amplifier, voltage summer and integrator circuits for desired specifications.

CO3. Work independently and in teams to solve problems with effective communication.

List of Experiments:

Minimum **Ten** experiments are to be conducted.

1. Measurement of electrical quantities (AC & DC) using Voltmeter, Ammeter and Wattmeter.
2. Verification of Ohm's law and Kirchhoff's laws.
3. Circuit
   (a) with one lamp controlled by one switch and provision of 2-pin or 3-pin socket PVC surface conduit system.
   (b) With two lamps controlled by two switches with PVC surface conduit system.
   (c) for Stair case wiring and Godown wiring.
4. Measurement of Power factor and it's improvement.
5. Load test on 1-Phase Transformer.
6. Brake test on 3-Phase Induction Motor.
7. Brake test on 1- phase induction motor.
8. VI Characteristics of PN and Zener Diodes.
9. Ripple factor and load regulations of rectifier with and without filters.
10. Input and output characteristics of CE configuration.
11. Design of inverting and non-inverting amplifiers using op-amp.
12. Design of voltage summer and integrator using op-amp.
13. Soldering practice.

REFERENCES BOOKS/ LAB MANUALS:

1. P. S. Dhogal, *Basic Practicals in Electrical Engineering*, Standard Publishers, 2004.
2. YannisTsividis, *A First Lab in Circuits and Electronics*, Wiley, 1st edition., 2001

ADDITIONAL LEARNING RESOURCES:

1. www.vlab.co.in, Virtual Electric Circuits Lab, A initiative of MHRD under NMEICT.
2. www.vlab.co.in, Basic Electronics Lab, A initiative of MHRD under NMEICT.
3. https://nptel.ac.in/courses/117106108/
4. https://ocw.mit.edu/high-school/physics/exam-prep/electric-circuits/
5. https://nptel.ac.in/courses/108105017/
6. https://nptel.ac.in/courses/108108112/
7. https://nptel.ac.in/courses/117107094/

I B.Tech. – I Semester

(19BT10341) BASIC CIVIL AND MECHANICAL ENGINEERING

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:--

COURSE DESCRIPTION: Overview of Civil Engineering; Surveying, Civil Engineering Materials, Mechanics of Materials, Building Components, Civil Engineering Infrastructure; Overview of Basic Mechanical Engineering; Internal Combustion Engines and Turbines, Mechanical Power Transmission Systems, Manufacturing Processes, Machining Processes, Non-Conventional Machining.

COURSE OUTCOMES:

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

CO1. Apply the basic principles of civil engineering, Techniques and tools for analyzing civil structures and solve related problems.

CO2. Describe the working of principles of basic mechanical engineering and solve problems related to it.

DETAILED SYLLABUS:

Part – A: CIVIL ENGINEERING

UNIT –I: SURVEYING AND CIVIL ENGINEERING MATERIALS (10 Periods)

Overview of Civil Engineering: Civil Engineering contributions to the welfare of society, specialized sub disciplines in Civil Engineering.

Surveying: Objectives, classification and principles; Measurements – distances, angles, levels, areas and volumes; contouring; Illustrative examples.

Civil Engineering Materials: Bricks, stones, concrete, steel, glass, timber, composite materials.

Mechanics of Materials: Forces, system of forces, laws of mechanics ,moment of a force, equilibrium, resultant, Internal and External forces, Stress, Strain, Hooke's law and Elasticity.

UNIT–II: BUILDING COMPONENTS AND CIVIL ENGINEERING INFRASTRUCTURE (8 Periods)

BUILDING COMPONENTS:

Sub structure - Types of foundations, Bearing capacity and settlement, Requirement of good foundations.

Superstructure - Civil engineering construction - Brick masonry, Stone masonry, Beams, Columns, Lintels, Roofs, Floors, Stairs, Building bye-laws - bye-laws floor area, carpet area and floor space index, basics of interior design and landscaping.

Civil Engineering Infrastructure - Types of Bridges and Dams, Water supply and Sanitary systems, Rainwater harvesting, Types of Highways and Railways, Ports and Harbours.

Part – B: MECHANICAL ENGINEERING

UNIT –III: INTERNAL COMBUSTION ENGINES, TURBINES AND PUMPS (9 Periods)

Overview of Mechanical Engineering: Introduction to Mechanical Engineering**,** specialized sub disciplines in Mechanical Engineering.

Internal Combustion Engines - Classification – Working principle of Petrol and Diesel Engines – Four stroke and two stroke engines – Comparison of four stroke and two stroke engines.

Turbines and Pumps – Classifications of Steam turbines - Impulse turbine, Reaction turbines; Working principle of Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps.

UNIT –IV: MECHANICAL POWER TRANSMISSION SYSTEMS (9 Periods)

Power Transmission Systems: Belt, rope and chain drives, Gears and Transmission screw

Power transmission by belts: Classification of belts, Length of the Belt (Open and Crossed-Belt Drives), Power Transmitted by Belt Drive, Tension due to Centrifugal Forces, Initial Tension, Maximum Power Transmitted.

Power transmission by Gear train: Gear terminology, Classification of gears, Gear train-Simple Gear Train and Compound Gear Train, Power Transmitted by Simple Gear Train.

UNIT –V: MANUFACTURING PROCESSES (9 Periods)

Manufacturing processes: Elementary ideas of Casting, Forging, Rolling, Welding, Soldering and Brazing.

Machining processes- Lathe-Turning, Taper turning, Thread cutting, Shaping, Drilling, Grinding, Milling (simple sketches and short notes).

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXTBOOKS:

1. Shanmugam G. and Palanichamy M.S., *Basic Civil and Mechanical Engineering*, Tata McGraw Hill PublishingCo.,NewDelhi, 1st edition 2018.
2. R. Vaishnavi, M. Prabhakaran& V. Vijayan, *Basic Civil and Mechanical Engineering*, S.CHAND Publications, 2nd edition, 2013.
3. B.C Punmia, Ashok Kumar Jain, Arunkumar Jain, *Surveying (vol-I),* Laxmi publications, 16th edition, 2005.
4. B. C Punmia, Ashok Kumar Jain, Arunkumar Jain, *Building Construction,* Laxmi publications, 10th edition, 2008.

REFERENCES:

1. Seetharaman S., *Basic Civil Engineering*, Anuradha Agencies, 2005.
2. Ramamrutham S., *Basic Civil Engineering*, DhanpatRai Publishing Co.(P) Ltd.1999.
3. Kalpakjian, Serope, *Manufacturing Engineering and Technology,* Pearson Education, 7th edition, 2014.
4. Prabhu.T.J, Jai Ganesh. V and Jebaraj.S, *Basic Mechanical Engineering*, Scitech Publications, Chennai, 2000.
5. Pravin Kumar, *Basic mechanical engineering* Pearson Education, 1st edition, 2013.

I B. Tech. – II Semester

(19BT10501) PROGRAMMING FOR PROBLEM SOLVING

(Common to EEE, ECE, EIE and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	4

PRE-REQUISITES: A course on Basic Mathematics

COURSE DESCRIPTION: Introduction to problem solving approach, Introduction to Python programming, control structures, sequences, sets, Dictionaries, Implementation of Data structures using Python, Modular programming, file handling, Data representation and Visualization.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on Python constructs to solve basic problems.

CO2. Demonstrate knowledge on Python constructs to solve basic problems.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO PROBLEM SOLVING AND PYTHON PROGRAMMING (10 Periods)

Problem Solving Aspect: top-down design, implementation of algorithms, building blocks of flow charts, program verification and efficiency of algorithms.

Python Programming: tokens, literals, identifiers, keywords, special symbols and operators; fundamental data types, expressions, type conversions, handling Input and output in Python.

UNIT-II: CONTROL STRUCTURES (8 Periods)

Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

UNIT-III: SEQUENCES, SETS, DICTIONARIES AND DATA STRUCTURES (9 Periods)

Sequences: Lists and operations - creating, inserting elements, updating elements, deleting elements, searching and sorting, list comprehensions, nested lists; **tuples -** creating, searching and sorting, nested tuples; **strings -** Initializing a string and string operations, string handling methods, string formatting; **sets -** set creation and operations; **dictionaries -** operations on dictionaries, dictionary methods, sorting elements using lambdas.

Data structures: Stacks - push, pop, peek and display operations on stack, applications of stack; **Queues –** enqueue, dequeue and display operations on queue, applications of queues.

UNIT-IV: MODULAR PROGRAMMING AND FILE HANDLING (10 Periods)

Modular Programming: need for functions, function definition, function call, variable scope and lifetime, return statement, positional arguments, keyword arguments, default arguments and variable-length arguments, recursive functions; Modules - math, NumPy, date and time.

File Handling: types of files, opening and closing files, reading and writing data.

UNIT-V: DATA REPRESENTATION AND VISUALIZATION (8 Periods)

Pandas: creating data frame, reading data from CSV files, indexing and selecting data, dealing with rows and columns; Visualization - bar plots, histogram, Scatter Plot.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. R. NageswaraRao, *Core Python Programming,* 2nd edition, Dreamtech Press, 2018.
2. R. G. Dromey, *How to solve i*t by Computer,* Pearson, 2006.

REFERENCE BOOKS:

1. ReemaThareja, *Python Programming using Problem Solving Approach*, 1st edition, Oxford University Press, 2017.
2. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem-Solving Focus*, Wiley India, 2016.

I B. Tech. – II Semester

(19BT10531) PROGRAMMING FOR PROBLEM SOLVING LAB

(Common to EEE, ECE, EIE and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: A course on Basic Mathematics

COURSE DESCRIPTION: The course is designed to provide hands on practice on Scratch programming and python programming for problem solving.

COURSE OUTCOMES:

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

CO1. Develop scripts using Scratch tool to simulate simple problems.

CO2. Apply Python Constructs and Modules to develop solutions for real-life problems.

CO3. Function effectively as an individual and in team to foster knowledge and creativity.

CO4. Write and present a substantial technical report/ document effectively.

PRACTICAL EXERCISES:

1) a) Design a script in Scratch to simulate Airplane for take-off and land.

   b) Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.

2) a) Design a script in Scratch to calculate factorial of a given number.

   b) Design a script in Scratch to simulate Maze game. (Hint: To get Maze images refer http://inventwithScratch.com/downloads/)

3) a) Write a python script to read two integer numbers and perform arithmetic operations.

   b) Write a python script to evaluate following expressions by considering necessary inputs.

   i) $ax^2 + bx + c$ ii) $ax^5 + bx^3 + c$ iii) (ax + b) / (ax - b) iv) x - a / b + c

4) a) Write a python script to convert given decimal number into octal, hexa decimal and binary.

   b) Write a python script to read four integer values separated with commas and display the sum of those four numbers.

   c) Write a python script to print "SVEC" with prefix of ten spaces by using format().

5) a) Write a python script to calculate electricity bill based on following slab rates.

Consumption units	Rate (in Rupees/Unit)
0-100	4
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8

(Hint: To get Consumption units take current Meter reading, old meter reading from the user as input)

b) Print the following pattern using python script.

```
                1
            1   2   1
        1   2   3   2   1
    1   2   3   4   3   2   1
1   2   3   4   5   4   3   2   1
```

6) a) Write a python script to read *N* student details like name, roll number, branch and age. Sort the student details based on their names and display.

b) Write a python script to delete duplicate strings from a list of strings. (Insertion order should maintain after deleting duplicate string).

c) Write a python script to read N number of student details into nested list and convert that as a nested dictionary.

7) a) Design a function that can perform sum of two or three or four numbers.

b) Write a python script to implement towers of Hanoi problem.

c) Write a Python function prime square (l) that takes a nonempty list of integers and returns True if the elements of l alternate between perfect squares and prime numbers, and returns False otherwise. Note that the alternating sequence of squares and primes may begin with a square or with a prime. Here are some examples to show how your function should work.

```
>>>primesquare([4])
True
>>>primesquare([4,5,16,101,64])
True
>>>primesquare([5,16,101,36,27])
False
```

8) a) Write a python script to perform arithmetic operations on numpyarrays.

b) Write a python script to perform following matrix operations using numpy.

i) Dot product ii) Matrix product iii) Determinant iv) Inverse

9) a) Write a python script to Create Pandas data frame using list of lists.

b) Write a python script to load data from a CSV file into a Pandas Data Frame and perform basic operations on it.

10) a) Draw a Scatter Plot by considering an appropriate data set.

b) Draw histograms by considering an appropriate data set.

11) **Mini Project-1**

12) **Mini Project-2**

TEXT BOOK:

1. R. NageswaraRao, *Core Python Programming*, 2nd edition, Dreamtech Press, 2018.

II B. Tech. - II Semester

(19BT315AC) DESIGN THINKING

(Audit Course)
(Common to ECE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION:

Design thinking process, Design thinking phases, empathy tools; Idea generation, visualizing and empathizing; Fidelity for prototypes, prototyping; prototyping for physical products.

COURSE OUTCOMES:

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

CO1. Analyze design thinking concepts and principles to perform human centered design process for creative problem solving.

CO2. Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.

CO3. Develop innovative products or services for a customer base using ideation techniques.

CO4. Build prototypes for complex problems using gathered user requirements.

CO5. Apply design thinking tools techniques to produce good design and relevant products or services for a specific target market.

CO6. Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.

DETAILED SYLLABUS:

UNITI:INTRODUCTION TO DESIGN THINKING (6 Periods)

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools.

UNIT II: EMPATHIZE (6 Periods)

Design thinking phases, How to empathize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools : Customer Journey Map, Personas.

UNIT III:IDEATION (6 Periods)

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method**,** Ideation Tools: How Might We? (HMW), Story board, Brainstorming.

UNITIV: PROTOTYPING (6 Periods)

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products;

Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

UNIT V: TESTING PROTOTYPES (6 Periods)

Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

Total Periods: 30

Topics for Self Study are provided in the Lesson Plan

TEXTBOOKS:

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam, "Introduction to Design Thinking",TataMcGraw Hill, First Edition,2019.
2. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly,2017.

REFERENCE BOOKS

1. Michael G. Luchs, Scott Swan , AbbieGriffin,"Design Thinking – New Product Essentials from PDMA", Wiley, 2015.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. https://nptel.ac.in/courses/110106124/

III B. Tech – I Semester

(19BT50405)FIBER OPTIC COMMUNICATIONS

(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Engineering Physics, Electronic Devices & Circuits, Analog Communications and Digital Communications.

COURSE DESCRIPTION: Single and Multimode fibers; Fiber materials; Fiber Joints; Optical sources and detectors; Power launching in to the fiber; Optical links; WDM; Introduction to optical networks.

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge on structure, properties, fabrication and advantages of optical fibers.

CO2: Analyze attenuation losses and signal distortion in optical fibers.

CO3: Analyze the performance Optical sources and Detectors

CO4: Demonstrate Power launching & coupling, splicing and fiber connectors.

CO5: Analyze Analog optical link to determine Carrier to Noise ratio and Digital optical link to determine Link budgets and power penalties.

CO6: Demonstrate the concepts of WDM and various components of optical Multiplex and De-multiplexer.

DETAILED SYLLABUS:

UNIT-I: OVERVIEW OF FIBER OPTIC COMMUNICATION **(08 periods)**

The General system, Advantages of Optical Fiber Communication, Modes in a planar guide, Phase and group velocity, Goos-Haenchen shift.

Cylindrical Fiber-Modes, Mode Coupling, Step index fibers, Graded index fibers; Single mode fibers, Fiber materials, Fiber Fabrication, Mechanical properties of Fibers.

UNIT-II: FIBER LOSSES **(07 Periods)**

Attenuation, Absorption, Scattering, Bending and Core & Cladding losses. Signal Distortion in Fibers - Pulse Broadening, Intermodal Delay, Intramodal or chromatic dispersion, Overall Fiber Dispersion in Multi Mode and Single Mode Fibers, Polarization-Mode Dispersion, Design optimization of Single-Mode Fibers.

UNIT-III: OPTICAL SOURCES AND DETECTORS **(11 Periods)**

OPTICAL SOURCES: Light Emitting Diodes **-** LED Structures, Light Source Materials, Internal Quantum Efficiency,Modulation capability,Power-Bandwidth product, Laser Diodes**-**

Modes and Threshold Conditions, Laser Diode Rate Equations, External Quantum Efficiencies, Resonant Frequencies.

OPTICAL DETECTORS: Physical Principles of Photo Diodes, Photo Detector Noise, Detector Response Time, Avalanche Multiplication Noise, Structures for InGaAs & APDs, Temperature Effect on Avalanche Gain, Comparisons of Photo Detectors.

UNIT-IV: POWER LAUNCHING AND COUPLING **(07 Periods)**

Source to Fiber Power Launching, Lensing Schemes for Coupling Improvement, Fiber-to-Fiber Joints, Fiber alignment and joint loss, LED coupling to single mode fibers, Fiber Splices, Fiber Connectors.

UNIT-V: OPTICAL LINKS AND COMPONENTS **(12 Periods)**

DIGITAL LINKS: Point-to-Point Links, budgets, Power penalties.

ANALOG LINKS: Overview, Carrier to Noise ratio, Multi-channel Transmission techniques, RF over Fiber, Radio over Fiber Links.

WDM concepts and Components: Overview of WDM, Components (Qualitative treatment only) - Passive Optical Couplers, Isolators and circulators, Fiber Grating Filters, Multiplexing and De-multiplexing, Introduction to Optical Networks.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Gerd Keiser, *Optical Fiber Communications*, McGraw Hill International, 4th Edition, 2009.
2. John M. Senior, *Optical Fiber Communications principles and practice*, Pearson Edn, 3rd Edition, 2010.

REFERENCE BOOKS:

1. Max Ming-Kang Liu, *Principles and Applications of optical Communications,* TMH,2010.

2. S.C.Gupta, *Optical Fiber Communication and its Applications*, PHI, 2011.

III B. Tech. – I Semester

(19BT50406) FPGA ARCHITECTURES AND APPLICATIONS

(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Switching Theory and Logic Design & Linear and Digital IC Applications.

COURSE DESCRIPTION: Evolution of Programmable Devices, Design with PLDs, FPGA-Organization, Programming, Xilinx-XC2000, XC3000, XC4000 Architectures, Programming Technologies, Anti-Fuse Programmed FPGAs, Design Applications.

COURSE OUTCOMES:

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

CO1: Implement Boolean functions using programmable logic devices to develop a digital system.

CO2: Analyze FPGA's and its programmable technologies to assess the impact of digital functions in the design and development of digital system.

CO3: Analyze Xilinx & Actel based FPGA architectures, place and route designs for high speed digital Circuits.

CO4: Develop various sub systems using FPGA for specified applications.

DETAILED SYLLABUS:

UNIT-I: DESIGNING OF PROGRAMMABLE LOGIC DEVICES (09 Periods)

Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Sequential Programmable Logic Devices (22CEV10), Implementation of a serial Adder with Accumulation.

UNIT-II: FIELD PROGRAMMABLE GATE ARRAYS (08 Periods)

Introduction to FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT-III: SRAM Programmable FPGAS (08 Periods)

Introduction, Programming Technology, Device Architecture, the Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT-IV: ANTI-FUSE PROGRAMMED FPGAS (10 Periods)

Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT-V: DESIGN APPLICATIONS **(10 Periods)**

General Design Issues, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Stephen M. Trimberger, *Field Programmable Gate Array Technology*, Springer International Edition,Eighth Indian Reprint 2015.
2. Charles H. Roth Jr, LizyKurian John, *Digital Systems Design using VHDL, 3rd edition,* Cengage Learning, 2017.

REFERENCE BOOKS:

1. John V. Oldfield, Richard C. Dorf, Field Programmable Gate Arrays, Wiley India,2008.
2. Pak K. Chan/SamihaMourad, Wayne Wolf, Digital Design Using Field Programmable Gate Arrays, Pearson Low Price Edition,2009.

ADDITIONAL LEARNING RESOURCES

http://www2.eng.cam.ac.uk/~dmh/4b7/resource/section16.htm

https://nptel.ac.in/courses/106103016/21

https://nptel.ac.in/courses/106105161/54

III B. Tech. –I Semester

(19BT50431) ANALOG AND DIGITAL COMMUNICATIONS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Courses on Signals and systems & Analog Communications.

COURSE DESCRIPTION: Simulation and verification of various analog and digital modulation schemes.

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

CO1: Analyze, measure and validate the practical observations by applying the conceptual knowledge of various Analog modulations.

CO2: Analyze, measure and validate the practical observations by applying the conceptual Knowledge of various Digital modulation schemes &Techniques.

CO3: Simulate various Analog and Digital modulations Using MATLAB tool.

CO4: Work independently or in teams to solve problems with effective communication.

List of Exercises/List of Experiments:

(Minimum **Ten** Experiments are to be conducted):

1. Amplitude modulation and demodulation(AM, DSB-SC,SSB)
2. Frequency modulation and demodulation.
3. Pulse Analog Modulation & Demodulation (PAM,PWM,PPM)
4. Verification of Sampling Theorem
5. Study the Pulse code modulation system.
6. Study the Delta Modulation system.
7. Perform Digital carrier modulations (ASK, PSK, FSK, DPSK)
8. Spectral analysis of AM signals using spectrum analyzer.
9. Generate the AM and FM signals using MATLAB
10. Generate the PSK & FSK modulation and demodulation signals using MATLAB
11. Generate the QPSK & DPSK modulation and demodulation signals using MATLAB
12. Generate the PCM and DM modulation and demodulation signals using MATLAB
13. Design of Matched filter and constellation diagrams using MATLAB.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Herbert Taub. Donald L Schiling, Goutam Sana, *Principles of Communication Systems*, McGraw-Hill, 4th Edition, 2012.

1. B.P.Lathi, Zhi Ding *Modern Digital and Analog Communication Systems*, Oxford, 4th Edition, 2012.
1. Simon Haykin, *Digital Communications Systems*, Wiley, 2013.
2. K. Sam Shanmugam, *Digital and Analog Communication Systems*, Wiley, 2019.
3. R.P Singh and S.D Sapre, *Communication Systems Analog and Digital*, *McGraw Hill Education*, 3rd Edition, 2017.

SOFTWARE/Tools used: MATLAB

Major Equipments required for Laboratories:

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. MAT Lab/Equivalent Simulation Package with Communication tool box
6. Analog and Digital Modulation and Demodulation Trainer Kits.

III B. Tech. – I Semester

(19BT61531) INTERNET OF THINGS LAB

(Common to ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	2	2

PRE-REQUISITES:-

COURSE DESCRIPTION:

Setting up **IoT** work-flow, Programming with Python, Micro-controller programming using Arduino, Building **IoT** Applications using Raspberry Pi, **IoT** Cloud Infrastructure.

COURSE OUTCOMES:

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

CO1: Design an interface to embedded systems using real time sensors with Arduino and Raspberry Pi.

CO2: Develop applications to capture the data generated by sensors and send to cloud.

CO3: Develop real time applications using NodeMCU and BLYNK.

CO4: Design applications to push sensor data to cloud using MQTT protocol.

CO5: Work independently and in team to solve problems with effective communication.

Theory Component: **(10 Periods)**

Arduino IDE, 7-segment display, Servo motor, ultrasonic sensor, LCD, Flame sensor, gas sensor, Humidity & temperature sensors, MQTT protocols, ECG System, Raspberry Pi, Home security system with camera, PIR sensor, light sensor, motion detector, NodeMCU, BLYNK, cloud

LIST OF EXPERIMENTS:

1. (a) Design and Simulate LED 7-Segment Display interfacing with Arduino.
(b) Design and Simulate Servo motor interfacing with Arduino.
2. (a) Design and Simulate ultrasonic sensor and LCD interfacing with Arduino.
(b) Design and Simulate Flame Sensor interfacing with Arduino.
3. Design and Implement to capture Gas Sensor and send sensor data to cloud from your NodeMCU device using Arduino IDE.
4. Design and Implementation of Humidity and Temperature Monitoring Using Arduino and upload data to cloud using MQTT.
5. Design and Implementation of an IoT ECG (Electrocardiogram) System to record hearts electrical activity.
6. Design and Simulate controlling an LED 7-Segment Display with Raspberry Pi.
7. Design and implementation of Raspberry Pi Home Security System with Camera and PIR Sensor with Email Notifications.
8. Design and Implement to upload Light sensor (TSL) data to cloud through Raspberry Pi.

9. Design and Implementation of Motion Detector with NodeMCU and BLYNK.
10. Design and Implementation of Fire notification IoT system with BLYNK.

REFERENCE BOOKS:

1. Adrian McEwen and Hakin Cassimally, *Designing the Internet of Things,* Wiley India.
2. Simon Monk, *Programming Aurdino,* Second Edition, McGraw-Hill Education**,**2016.
3. Matt Richardson and Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly, 2014.
4. Rahul Dubey, *An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications* , Cengage Learning India Pvt. Ltd,2019

III B. Tech. - I semester

(19BT50432) **SOCIALLY RELEVANT PROJECT-1**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	-	1

PREREQUISITES: -

COURSE DESCRIPTION:

Identification of topic for the socially relevant project; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the socially relevant project; Preparation of thesis and presentation.

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

CO1: Create/Design engineering systems or processes to solve complex societal problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.

CO2: Consider environment, sustainability, economics and project management in addressing societal problems.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical formson socially relevant project.

III B. Tech. - I Semester

(19BT503AC) FOUNDATIONS OF ENTREPRENEURSHIP

(Audit Course)

(Common to CE, ME, ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PREREQUISITE: --

COURSE DESCRIPTION:The nature and growth of entrepreneurship; Characteristics of an entrepreneur; Types of Entrepreneurs; Ethics and social responsibility of entrepreneurs; Generating ideas; Opportunity identification; Implementing and managing the venture; Principles of creativity and innovation; Methods of protecting innovation and creativity; Market research; Feasibility analysis; Sources of funding; Preparation of business plan; Start-Ups; Social Entrepreneurship; Rural entrepreneurship.

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

CO1: Demonstrate knowledge on personal attributes that enable best use of entrepreneurial opportunities.
CO2: Apply suitable method to protect creativity and innovation.
CO3: Design and prepare high impact strategic and business plan.
CO4: Analyze the major steps and requirements in order to convert innovative idea into a successful start-up.
CO5: Develop an idea to create a business for social change by identifying social entrepreneurship opportunities.

DETAILED SYLLABUS:

UNIT-I: ENTREPRENEURIAL MINDSET **(06 Periods)**

The nature and growth of entrepreneurship, Entrepreneurship and Intrapreneurship, Characteristics of an entrepreneur, Types of Entrepreneurs, Women as an Entrepreneur, Factors that contribute to the success of entrepreneurs, Ethics and social responsibility of entrepreneurs.

UNIT-II: ENTREPRENEURIAL PROCESS **(06 Periods)**

Generating ideas, Opportunity identification, Business concepts, Resources (Financial, Physical and Human), Implementing and managing the venture, Harvesting the venture, Harvesting strategies: Absorption of new concept into mainstream operations, Licensing of rights, Family succession, Liquidate (Shut down) venture, Selling the venture, Management Buy-Out (MBO).

UNIT-III: CREATIVITY AND INNOVATION **(06 Periods)**

Principles of creativity and innovation, Disruptive, incremental and open innovations, Nurturing and managing innovation, Methods of protecting innovation and creativity:

Intellectual property rights, Branding, Trademarks, Patents, Copyrights, Registered design protection, Trade secrets.

UNIT-IV: NEW VENTURE PLANNING AND CREATION **(06 Periods)**

Market research (venture opportunity screening), Feasibility analysis, Start-up capital;

Sources of funding: equity financing, debt financing (loans, venture funding, angel funding), grants, gifts, bequests and financial statements, Introduction to the business plan, Preparation of business plan.

UNIT-V: START-UPS AND SOCIAL ENTREPRENEURSHIP **(06 Periods)**

Start-Ups: Definition to start-up, Start-up activities, Promising start-ups, Venture-backed start-ups, Corporate-supported start-ups.

Social Entrepreneurship: Social enterprise-Need - Types - Characteristics and benefits of social enterprises, Rural entrepreneurship.

Total Periods: 30

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Robert D. Hisrich, Mathew J. Manimala, Michael P. Peters, Dean A. Shepherd, *Entrepreneurship*, McGraw Hill Education (India) Private Limited, Eighth Edition, 2013.
2. Marc J Dollinger, *Entrepreneurship: Strategies and Resources*, Pearson, Third Edition, 2003.

REFERENCE BOOKS:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management,* Himalaya Publ. House, 2004.
2. *Harvard Business Review on Entrepreneurship,* HBR Paper Back.
3. Thomas W. Zimmerer& Norman M. Scarborough, *Essential of Entrepreneurship and small business management,* PHI.

III B. Tech. – II Semester

(19BT60401) **ANTENNAS AND PROPAGATION**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on Electromagnetic Fields and Transmission Lines

COURSE DESCRIPTION: Antenna Parameters; Wire antennas; Antenna Arrays; VHF, UHF and Microwave antennas; Antenna Measurements and Wave propagation.

COURSE OUTCOMES:

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

CO1: Design various antennas with required radiation levels for communication needs, meeting the public health and safety conditions.

CO2: Develop high gain antenna arrays for satellite, radar and mobile applications.

CO3: Analyze antenna parameters such as radiation pattern, directivity and gain by various measurement methods.

CO4: Analyze different modes of wave propagation through various layers of atmosphere.

DETAILED SYLLABUS:

UNIT-I: ANTENNA BASICS AND THIN LINEAR WIRE ANTENNAS (10 Periods)

Introduction, Radiation mechanism, Antenna parameters patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective height; Antenna Field Zones, Antenna theorems, Friis transmission equation, Retarded potentials, Radiation from small electric dipole, Quarter wave monopole and half wave dipole Current distributions, Field components, Radiated power, Radiation resistance, Beam width, Directivity, Effective area and Effective height; Natural current distributions, far-fields and patterns of Thin linear center-fed antennas of different lengths, Illustrative problems.

UNIT-II: ANTENNA ARRAYS (09 Periods)

Point sources- Definition, Patterns, arrays of 2 isotropic sources different cases; Principle of pattern multiplication, Uniform linear arrays - Broadside arrays, End fire arrays, EFA with increased directivity, Derivation of their characteristics and comparison, BSA with non-uniform amplitude distribution - General considerations and Binomial arrays, Arrays with parasitic elements, Yagi-Uda arrays, Folded dipoles & their characteristics, Illustrative problems.

UNIT-III: VHF, UHF AND MICROWAVE ANTENNAS (10 Periods)

Helical Antennas - Helical geometry, Helix modes, Practical design considerations for monofilar helical antenna in axial and normal modes ,Horn antenna, Microstrip antennas - Introduction, Features, Advantages and limitations; Rectangular patch antennas - Geometry and parameters, characteristics of microstrip antennas, Impact of different parameters on

characteristics; Reflector types-paraboloidal, cassegrain, feed methods for parabolic reflectors; RF radiation hazards and solutions, Illustrative problems.

UNIT-IV: ANTENNA MEASUREMENTS **(07 Periods)**

Introduction, Concepts- Reciprocity, Near and far fields, Coordinate system, Sources of errors, Pattern measurement arrangement, Measurement of Directivity, Gain(by comparison, Absolute and 3-Antenna Methods), Radiation pattern.

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*

Topics for Self Study are provided in the Lesson Plan

TEXT BOOK:

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, *Antennas and Wave Propagation*, TMH, 4th Edition, 2017.

REFERENCE BOOKS:

1. C.A. Balanis, *Antenna Theory*, John Wiley & Sons, 2nd Edition, 2007.
2. G.S.N.Raju, *Antennas and Wave Propagation*, Pearson Education India, 1st Edition, 2006.

ADDITIONAL LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_ee20/unit?unit=7&lesson=8
2. https://onlinecourses.nptel.ac.in/noc20_ee20/unit?unit=7&lesson=9

III B.Tech. - II semester

(16BT60401) ANTENNAS AND WAVEGUIDES

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

PREREQUISITES:ACourse on Electro Magnetic Theory and Transmission Lines.

COURSE DESCRIPTION:
Waveguides, Antenna Parameters; Wire antennas; Antenna Arrays; VHF, UHF and Microwave antennas; Antenna Measurements.

COURSE OUTCOMES:
On successful completion of the course, students will be able to:
CO1. Apply the knowledge of fundamentals in antenna theory and waveguides.
CO2. Analyze the characteristics and performance of different antennas and waveguides.
CO3. Design and develop various antennas.
CO4. Provide solutions through different antenna designs.
CO5. Apply appropriate techniques, resources to complex engineering activities in the field of antennas.
CO6. Apply contextual knowledge for design of antennas with required radiation levels for communication needs meeting the public health and safety conditions.

DETAILED SYLLABUS:

UNIT-I: WAVEGUIDES (09 Periods)
Introduction, Rectangular waveguides-Solutions of wave equations in rectangular coordinates, TE and TM modes 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; Micro strip lines-Introduction, Z_O relations, Effective dielectric constant, Losses, Q-factor, Illustrative Problems.

UNIT-II: ANTENNA BASICS AND THIN LINEAR WIRE ANTENNAS (10 Periods)
Introduction, Radiation mechanism, Antenna parameters - patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective height; Antenna Field Zones, Antenna theorems, Friis transmission equation, Retarded potentials, Radiation from small electric dipole, Quarter wave monopole and half wave dipole - Current distributions, Field components, Radiated power, Radiation resistance, Beam width, Directivity, Effective area and Effective height; Natural current distributions, far-fields and patterns of Thin linear center-fed antennas of different lengths, Illustrative problems.

UNIT-III: ANTENNA ARRAYS (10 Periods)
Point sources- Definition, Patterns, arrays of 2 isotropic sources different cases; Principle of pattern multiplication, Uniform linear arrays - Broadside arrays, End fire arrays, EFA with increased directivity, Derivation of their characteristics and comparison, BSA with non-uniform amplitude distribution - General considerations and Binomial arrays, Arrays with parasitic elements, Yagi-Uda arrays, Folded dipoles & their characteristics, Illustrative problems.

UNIT-IV: VHF, UHF AND MICROWAVE ANTENNAS (10 Periods)

Helical Antennas - Helical geometry, Helix modes, Practical design considerations for monofilar helical antenna in axial and normal modes ,Horn antenna,Microstrip antennas - Introduction, Features, Advantages and limitations; Rectangular patch antennas - Geometry and parameters, characteristics of microstrip antennas, Impact of different parameters on characteristics; Reflector antennas- Introduction, Flat sheet and corner reflectors, Paraboloidal reflectors - Geometry, Pattern characteristics, Feed methods, Reflector types, Illustrative problems.

UNIT-V: ANTENNA MEASUREMENTS (06 Periods)

Introduction, Concepts- Reciprocity, Near and far fields, Coordination system, Sources of errors, Pattern measurement arrangement, Measurement of Directivity, Gain(by comparison, Absolute and 3-Antenna Methods), Radiation pattern.

Total Periods: 45

TEXT BOOKS:

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

REFERENCE BOOKS:

1. C.A. Balanis, *Antenna Theory*, 2nd Edition, John Wiley & Sons, 2001.
2. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems*, 2nd Edition, PHI, 2000

III B. Tech. - II semester

(19BT60402) MICROCONTROLLERS

(Common to ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PREREQUISITES: Courses on Switching Theory and Logic Design & Linear and Digital IC Applications

COURSE DESCRIPTION: 8051 Microcontroller - Architecture, programming, interrupts and applications; PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, interfacing

COURSE OUTCOMES:

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

CO1: Analyze Architectural features and Instruction Set of 8051 for control applications.

CO2: Analyze PIC18 Architecture and Instruction Set to develop computing applications.

CO3: Develop Programs for PIC18 using ports, timers and associated on Chip resources for Specified Applications.(3,4)

CO4: Design microcomputer based systems with the knowledge of Interfaces and Peripherals of PIC18 to Solve various engineering problems.

DETAILED SYLLABUS:

UNIT-I: 80C51/31 **(10 Periods)**

Microprocessors vs Microcontrollers, 8051 Architecture, Internal and external memories, Addressing modes, Timers/Counters structure & configuration, Instruction set of 8051, simple programs using 8051.

UNIT-II: PIC ARCHITECTURE & PROGRAMMING **(10 Periods)**

Architecture of PIC18, Register Organization, Memory Organization - ROM space & RAM; Data formats & Directives, Instruction Set: Arithmetic, Logic, branching, Bit wise, bank switching, Simple PIC Programs.

UNIT-III: PORTS, TIMERS & PROGRAMMING **(10 Periods)**

Pin description of PIC18F452, Basic Port Structure, I/O port programming; Macros and modules, Structure of Timer 0 & its Programming using Assembly and C, Counter programming, Structure of timers 1, 2 and 3 & their Programming.

UNIT-IV: PIC-SERIAL PORT AND INTERRUPTS **(07 Periods)**

Basics of communication – Serial/Parallel, RS232 & PIC18 connection to RS232, Serial Port Structure & programming; PIC18 interrupts, Programming timer interrupts, Programming serial interrupts.

UNIT-V: PIC INTERFACING **(08 Periods)**

7 segment LED and LCD interfacing, keyboard interfacing, interfacing ADC, DAC, Interfacing DC motor, stepper motor, PWM using CCP.

Total Periods: *45*

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D, *The 8051 Microcontroller and Embedded Systems-using assembly and C,* PHI, 2006/ Pearson New International Edition 2014
2. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems: Using C and PIC18*, Pearson Education, 2015.

REFERENCE BOOKS:

1. Kenneth J. Ayala, *The 8051 Microcontroller-Architecture, Programming & Applications,* 3rd Edition, Cengage learning, June 2007.
2. Ramesh S. Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (With PIC18 Microcontroller Family),* Penram International, 2010.
3. M Rafiquzzaman, *Microcontroller Theory And Applications With The PIC, Wiley India Publications, March 2014*

ADDITIONAL LEARNING RESOURCES:

1. http://crystal.uta.edu/~zaruba/CSE3442/
2. https://owd.tcnj.edu/~hernande/ELC343/
3. http://www.ciebookstore.com/Content/Images/uploaded/PIC18-Study-Guide-CIE.pdf

III B. Tech. – II Semester

(19BT60404) ARM AND AVR CONTROLLERS

(Professional Elective- 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Switching Theory and Logic Design & Linear and Digital Integrated Circuits.

COURSE DESCRIPTION: ARM Architecture; ARM Instruction Set; ARM Programming; AVR Architecture; AVR Programming in Assembly Language & C;

COURSE OUTCOMES:

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

CO1: Analyze ARM Architectures and Instruction Set to develop fundamental Programs .

CO2: Develop efficient ARM based Prototypes by analyzing modes of ARM operation to program ARM Cortex M3 at Assembly and high levels.

CO3: Realize efficient Embedded Systems with an understanding of limitations by evaluating architectural features of AVR Family Microcontrollers.

CO4: Apply Programming techniques at Assembly and High Level to develop industry standard microcontroller based systems.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ARM ARCHITECTURE (09 Periods)

Introduction to ARM family of processors and controllers, Architecture of ARM Cortex M3, Cortex M3 fundamentals, registers, Operation modes, ARM Instruction Set: Data transfer, Data Processing Call & Branch, Bit Manipulation, Pseudo Instructions and other useful instructions in Cortex M3, ARM Assembly Language Programming.

UNIT-II: THUMB PROGRAMMING & OTHER ARM FEATURES (09 Periods)

Thumb Instruction Set, ARM Mode & Thumb mode Programming, ARM Programming in C. Memory system, memory map, Memory system attributes, ARM Pipeline, Exception types, Cortex M3 Processor applications.

UNIT-III: INTRODUCTION to AVR MICROCONTROLLER (09 Periods)

Overview of AVR family, AVR Microcontroller architecture, status register, Special function registers, RAM, ROM & EEPROM space, On-Chip peripherals, ATmega32 pin configuration & function of each pin, Fuse bits of AVR.

UNIT-IV: AVR ASSEMBLY LANGUAGE PROGRAMMING **(10 Periods)**

AVR data types and assembler directives, Addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions, AVR studio setup for assembly language programming, AVR I/O Port Programming, Time delay loop, Look-up table, Bit addressability, MACROs, Intel HEX file.

UNIT-V: AVR PROGRAMMIN IN C **(08 Periods)**

AVR Data types, AVR I/O port programming, Timer programming, Input capture and Wave Generator, PWM programming External Interrupt programming, ADC programming, EEPROM programming.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Joseph Yiu, *The Definitive Guide to the ARM Cortex-M3 & M4*, Elsevier, 3rd Edition, January 2014.
2. Muhammad Ali Mazidi, SarmadNaimi and SepehrNaimi, *The AVR Microcontroller and Embedded Systems Using Assembly and C*, Pearson Education, January 2014.

REFERENCE BOOKS:

1. Ramesh Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18 Microcontroller Family)*, Penram International, First edition,2010
2. Andrew Sloss, Dominic Symes, Chris Wright, *ARM System Developer's Guide: Designing and Optimizing System Software (The Morgan Kaufmann Series in Computer Architecture and Design*), October 2004.
3. AVR ATmega32 data sheet

III B. Tech. – II Semester

(19BT60405) DIGITAL IC DESIGN

(Professional Elective- 2)

(Common to ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on VLSI Design

COURSE DESCRIPTION: Introduction to MOS transistors; Characteristics of CMOS digital circuits; Transistor Sizing; memory design; Design strategies; Design of subsystems.

COURSE OUTCOMES:

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

CO1: Design combinational and Sequential logic circuits using various design styles.

CO2: Analyze timing issues to improve the performance of sequential logic circuits.

CO3: Develop memories and sub systems using CMOS logic for high speed networks.

CO4: Analyze design methodologies and tools at various levels of abstraction.

DETAILED SYLLABUS:

UNIT-I: CMOS INVERTER CHARACTERISTICS AND DESIGN STYLES (09 Periods)

MOS Inverters: Introduction, Definitions and Properties, Static CMOS Inverter, Static and Dynamic Power Dissipation, CMOS inverter delay time definitions and calculations

Design of Combinational Logic Gates in CMOS: Introduction, Static CMOS Design, Dynamic CMOS Design, Domino and NORA logic, Power Consumption in CMOS Gates.

UNIT-II: DESIGN OF SEQUENTIAL LOGIC GATES IN CMOS (10 Periods)

Introduction, Static Sequential Circuits, Dynamic Sequential Circuits, Non-Bistable Sequential Circuit, Logic Style for Pipelined Structures.

Timing Issues in Digital Circuits: Introduction, Clock Skew and Sequential Circuit Performance, Clock Generation and Synchronization.

UNIT-III: HIGH SPEED NETWORK AND MEMORY DESIGN (09 Periods)

Methods of Logical Effort for transistor sizing - Power consumption in CMOS Gates, Low power CMOS design. CMOS Memory design – SRAM, DRAM.

UNIT-IV: SUBSYSTEM DESIGN PROCESS (09 Periods)

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.

UNIT-V: DESIGN METHODOLOGY AND TOOLS **(08 Periods)**

Introduction, Structured Design Strategies, Design Methods, Design Flows, Design Economics, Data Sheets and Documentation.

Total Periods: *45*

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Jan M Rabaey, *"Digital Integrated Circuits*‖, Pearson, 2nd Edition, 2016.
2. Kamran Eshranghian, Douglas A.Pucknell and Sholeh Eshranghian‖, *Essential of VLSI Circuits and Systems"*, PHI, 1st edition, 2005.

REFERENCE BOOKS:

1. Sung-Mo Kang & Yusuf Leblebici, *CMOS Digital Integrated Circuits*-‖, McGraw Hill, 3rd edition, 2003.
2. Neil H. E. Weste, David Money Harris, *"CMOS VLSI Design-A Circuit and Systems Perspective",* Pearson Education, 4th Edition, 2011.

III B. Tech. – II Semester

(19BT60408) NANOSTRUCTURES AND NANOTECHNOLOGY

(Professional Elective- 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Engineering Physics, Engineering Chemistry & Electronic Devices and Circuits.

COURSE DESCRIPTION: Nanostructures – Classification and Peculiarities, Characterization and Properties of Nanomaterials, Micro Electro-Mechanical Systems (MEMS) & Nano Electro-Mechanical Systems (NEMS), Carbon Nanotubes (CNT) – Properties and Synthesis, Interdisciplinary Applications of Nanomaterials.

COURSE OUTCOMES:

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

CO1: Analyze the peculiarities of nanostructured materials, their characterization and properties to solve structural, mechanical and electrical problems in manufacturing Nanostructures.

CO2: Apply physical techniques to fabricate nanostructured materials

CO3: Analyze the chirality of carbon nanotube and synthesize for various applications.

CO4: Identify the appropriate nanomaterial in Quantum Devices, Emitters, Photo electrochemical Cells, Photonic Crystals and Plasmon Waveguides for societal application.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO NANOSTRUCTURED MATERIALS (09 Periods)

Gleiter's classification of nanostructured materials, Classification of nanostructures by dimensionality, Concept of "surface form engineering" in nanomaterial science, Extended internal surface, Increasing of surface energy and tension, Grain boundaries, Instability of 3D0 NSM due to grain growth.

UNIT-II: CHARACTERIZATION OF NANOMATERIALSAND PROPERTIES (11 Periods)

Structural Characterization: X-ray diffraction (XRD),Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Chemical Characterization: Optical spectroscopy, Electron spectroscopy, Ionic spectrometry, Physical Properties of Nanomaterials: Melting points and lattice constants, Mechanical properties, Optical properties Electrical conductivity.

UNIT-III: NANOSTRUCTURES FABRICATION BY PHYSICAL TECHNIQUES

(09 Periods)

Introduction, Lithography, Nanomanipulation and Nanolithography,Soft Lithography, Assembly of Nanoparticles and Nanowires, Other Methods for Microfabrication.

UNIT-IV: CARBON NANOTUBES (CNT)–PROPERTIES AND SYNTHESIS

(08 Periods)

Dimensions, Chirality, Material Properties, Mechanical Properties, Electrical Properties, Optical Properties, Thermal Properties, Nanotube Growth Methods, Chemical Vapor Deposition, Thermal Chemical Vapor Deposition, Applications

UNIT-V: INTERDISCIPLINARY ARENA OF NANOMATERIALS **(08 Periods)**

Molecular Electronics and Nanoelectronics, Nanobots, Biological Applications of Nanoparticles, Catalysis by Gold Nanoparticles, Band Gap Engineered Quantum Devices, Nanomechanics Carbon Nanotube Emitters, Photoelectrochemical Cells, Photonic Crystals and Plasmon Waveguides.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Pokropivny, Vladimir, RynnoLohmus, Irina Hussainova, Alex Pokropivny, and Sergey Vlassov, "*Introduction to nanomaterials and nanotechnology*", Tartu, Estonia: Tartu University Press, 2007.
2. Guozhong Cao and Ying Wang, "*Nanostructures and Nanomaterials: Synthesis, Properties, and Applications",* Imperial College Press, 2004.

REFERENCE BOOKS:

1. Bhushan, Bharat, "*Springer Handbook of Nanotechnology*", 2nd edition, 2006.
2. A I Gusev and A ARempel, "*Nanocrystalline Materials*", Cambridge International Science Publishing, 1st Indian edition, 2008.
3. Kamal K. Kar, "*Carbon Nanotubes: Synthesis, Characterization and Applications",* Research Publishing Services, 1st edition, 2011.

ADDITIONAL LEARNING RESOURCES

1. *Introduction to Nanotechnology,* nanohub.org
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf

III B. Tech. – II Semester

(19BT60409) TESTING AND TESTABILITY

(Professional Elective- 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

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

COURSE DESCRIPTION: Need for Testing, Types of Testing, Fault Modeling, Test Methods for evaluation, Test Generation Algorithms, Delay Tests, IDDQ Tests, Ad-Hoc DFT Methods, Scan Based Designs, Built-In Self Test.

COURSE OUTCOMES:

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

CO1: Understand the importance of Testing, fault models and related theorems.

CO2: Analyze various test methods, combinational and sequential circuit test generation Algorithms for Functional Verification of Digital Circuits.

CO3: Analyze delay test algorithms and IDDQ test algorithms for at-speed testing of CMOS Integrated Circuits.

CO4: Understand the concepts and architectures for Built-In Self Testto satisfy industry specifications.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO TESTING **(09 Periods)**

Role of Testing, VLSI Technology Trends Affecting Testing, Types of Testing, Test Economics, Yield, Fault Modeling, Fault Equivalence, Fault Collapsing, Fault Dominance and Checkpoint Theorem.

UNIT-II: TEST METHODS **(10 Periods)**

Simulation for Design Verification and Test Evaluation, Algorithms for Fault Simulation – Serial, Parallel, Deductive, Concurrent Fault Simulations; Fault Sampling.

UNIT-III: COMBINATIONAL AND SEQUENTIAL CIRCUIT TEST GENERATION **(11 Periods)**

ATPG Algorithms – D-Algorithm, PODEM, FAN; Test Compaction, Time Frame Expansion Method – Nine-Value Algorithm; Simulation Based Sequential ATPG - CONTEST Algorithm.

UNIT-IV: DELAY AND IDDQ TESTS **(06 Periods)**

Delay Test – Path-Delay Test, Transition Faults, At-Speed Testing; IDDQ Test –Limitations, Delta IDDQ Testing, IDDQ Built-in Current Testing.

UNIT-V: DESIGN FOR TESTABILITY **(09 Periods)**

Ad-Hoc DFT Methods, Full Scan Design, Partial Scan Design, Random Logic BIST – Test-per-Clock and Test-per-Scan BIST Systems; Boundary Scan Standard – TAP Controller and Port.

Total Periods: *45*

Topics for Self Study are provided in the Lesson Plan

TEXT BOOK:

1. Michael L. Bushnell, Vishwani D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Pulishers, Springer US, New York, 2006.

REFERENCE BOOKS:

1. Miron Abramovici, Melvin A. Breur, Arthur D.Friedman, "Digital Systems Testing and Testable Design", Wiley, Jaico Publishing House, 1st Edition, 2001.
2. Alfred L. Crouch, "Design for Test for Digital ICs & Embedded Core Systems", Pearson Education, 1st Reprint Edition, 2007.
3. Robert J.Feugate, Jr., Steven M.Mclntyre, "Introduction to VLSI Testing", Prentice Hall, 1st Illustrated Edition,1998.

ADDITIONAL LEARNING RESOURCES:

1. https://www.classcentral.com/course/swayam-digital-vlsi-testing-7956

III B. Tech. – II Semester

(19BT60410) **WIRELESS SENSOR NETWORKS**

(Professional Elective- 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Analog Communications & Digital Communications.

COURSE DESCRIPTION: Wireless Sensor Networks (WSN) architecture, types, Quality measures of wireless channels, various MAC protocols, Sensor deployment and routing related protocols, congestion control and cross layer architectures in WSNs.

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

CO1: Analyze the Single node architecture, Sensor nodes and nodes mobility.

CO2: Analyze physical layer design issues of wireless sensor networks.

CO3: Develop the MAC and link layer protocols for efficient energy usage.

CO4: Build minimum path routing protocols and data aggregation schemes for efficient energy utilization.

CO5: Apply sensing models and cross layer approaches for coverage and performance of WSNs.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO WIRELESS SENSOR NETWORKS (10 Periods)

Challenges for wireless sensor networks, Comparison of sensor network with ad-hoc network, Single node architecture - Hardware components, energy consumption of sensor nodes. Examples of sensor nodes - Mica Mote, EYES Nodes, BTnodes. Network architecture: Sensor network scenarios - types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, Three types of mobility.

UNIT-II: PHYSICAL LAYER (07 Periods)

Introduction, wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, Physical layer and transceiver design consideration in wireless sensor networks - Energy usage profile, choice of modulation, Antenna considerations.

UNIT-III: DATA LINK LAYER (10 Periods)

MAC protocols: fundamentals of wireless MAC protocols - Requirements and design constraints for wireless MAC protocols, Important classes of MAC protocols, MAC protocols for wireless sensor networks. Low duty cycle protocols and wakeup concepts - STEM, S-MAC. Contention-based protocols - CSMA protocols, PAMAS. Schedule-based protocols - LEACH, BMAC, Traffic-adaptive medium access protocol (TRAMA).

Link Layer protocols – fundamentals task and requirements, error control - Causes and characteristics of transmission errors, ARQ techniques.

UNIT-IV: NETWORK LAYER **(09 Periods)**

Gossiping and agent-based uni-cast forwarding - Basic idea, Randomized forwarding. Energy-efficient unicast, Broadcast and multicast - Source-based tree protocols, Shared, core-based tree protocols. Mobile nodes - Mobile sinks, Mobile data collectors, Mobile regions. Data centric and content-based networking - Introduction, Data-centric routing, Data aggregation.

UNIT-V: TRANSPORT LAYER AND CROSS LAYER DESIGN **(09 Periods)**

The transport layer and QoS in wireless sensor networks - Quality of service/reliability, Transport protocols. Coverage and deployment - Sensing models, Uniform random deployments: Poisson point processes, Reliable data transport. Congestion control and rate control - Congestion situations in sensor networks. The CODA congestion-control framework.

Cross-Layer Design: Definition, Cross-layer architectures for Sensor Networks: Sensor Protocol, TinyCubus, Lu.

Total periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Holger Karl, Andreas willig "Protocol and Architecture for Wireless Sensor Networks", John wiley publication, Oct 2007.
2. Raja Jurdak, Wireless Ad Hoc and Sensor Networks: A Cross-Layer Design Perspective, Springer Series, New York, 2007.

REFERENCE BOOKS:

1. Fengzhao, Leonidas, Guibas, "Wireless Sensor Networks: an information processing approach –publication, Elsevier, 2004.
2. Edgar H .Callaway,"Wireless Sensor Networks: Architecture and protocol", 1st Edition, CRC press 2003.
3. C.S.Raghavendra Krishna, M.Sivalingam and Taribznati, "Wireless Sensor Networks", Springer publication, 2006.

III B.Tech. - II semester

(16BT61241) WIRELESS SENSOR NETWORKS

(Interdisciplinary Elective-2)

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

PREREQUISITES:--

COURSE DESCRIPTION: WSN architecture, types; Physical Layer;MAC protocols;Routing related Protocols; QoS in WSNs.

COURSE OUTCOMES:

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

CO1. Demonstrateknowledge on:
- Wireless Sensor Networks
- Physical layer
- Data link layer
- Network layer
- Transport layer

CO2. Analyze various design issues related to Data link, network and transport protocols of wireless sensor network architectures.

CO3. Solve complex engineering problems pertaining to the field of wireless sensor networks.

CO4. Design and develop feasible and optimal wireless sensor networks based solutions for societal use.

DETAILED SYLLABUS:

UNIT I– INTRODUCTION TO WIRELESS SENSOR NETWORKS (09 Periods)

Challenges for Wireless Sensor Networks, Comparison of Sensor Network with Ad Hoc Network; Single Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes; Network Architecture: Sensor Network Scenarios - Types of Sources and Sinks, Single Hop Versus Multi-Hop Networks, Multiple Sinks and Sources; Design Principles for Wireless Sensor Networks.

UNIT II – PHYSICAL LAYER (09 Periods)

Introduction, Wireless Channel and Communication Fundamentals – Frequency Allocation, Modulation and Demodulation, Wave Propagation Effects and Noise, Channels Models, Spread Spectrum Communication, Packet Transmission and Synchronization, Quality of Wireless Channels and Measures for Improvement; Physical Layer and Transceiver Design Consideration in Wireless Sensor Networks - Energy Usage Profile, Choice of Modulation, Power Management.

UNIT III –DATA LINK LAYER (09 Periods)

MAC Protocols: Fundamentals of Wireless MAC Protocols - Requirements and Design Constraints for Wireless MAC Protocols, Important Classes of MAC Protocols, MAC Protocols for Wireless Sensor Networks; Link Layer Protocols – Fundamentals Task and Requirements; Error Control - Causes and Characteristics of Transmission Errors, ARQ Techniques, FEC Techniques, Hybrid Schemes, Power Control.

UNIT IV – NETWORK LAYER (09 Periods)

Gossiping and Agent-Based Uni-Cast Forwarding - Basic Idea, Randomized Forwarding; Energy-Efficient Unicast, Broadcast and Multicast - Source-Based Tree Protocols, Shared, Core-Based Tree Protocols, Mesh-Based Protocols. Geographic Routing - Basics of Position-Based Routing, Geocasting; Mobile Nodes - Mobile Sinks, Mobile Data Collectors, Mobile Regions; Data Centric and Content-Based Networking - Introduction, Data-Centric Routing, Data Aggregation.

UNIT V – TRANSPORT LAYER (09 Periods)

The Transport Layer and QoS in Wireless Sensor Networks - Quality of Service/Reliability Transport Protocols; Coverage and Deployment - Sensing Models, Coverage Measures; Uniform Random Deployments: Poisson Point Processes, Coverage of Random Deployments: Boolean Sensing Model, General Sensing Model, Coverage Determination, Coverage of Grid Deployments; Reliable Data Transport, Single Packet Delivery - Using A Single Path, Multiple Paths, Multiple Receivers.

Total Periods:45

TEXT BOOK:

1. Holger Karl and Andreas willing,*Protocols and Architecture for Wireless Sensor Networks,*John wiley publication, 2007.

REFERENCE BOOKS:

1. Edgar H .Callaway, *Wireless Sensor Networks: Architecture and protocol*, CRC press, 2003.
2. C.S.Raghavendra Krishna, M.Sivalingam and Taribznati, *Wireless Sensor Networks,*Springer publication, 2006.

III B. Tech. –II Semester

(19BT60502) MACHINE LEARNING

(Inter Disciplinary Elective- 2)

(Common to CSE, CSSE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES:- Courses on Probability and Stochastic Process, Differential equations and Multivariable calculus & Transformation Techniques and Linear Algebra

COURSE DESCRIPTION: Concept learning, General to specific ordering, Decision tree learning, Support vector machine, Artificial neural networks, Multilayer neural networks, Bayesian learning, Instance based learning, reinforcement learning.

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

CO1: Analyze the concept learning algorithms to automatically infer a general description for a given learning problem.

CO2: Analyze the underlying mathematical models within machine learning algorithms and learning tasks.

CO3: Evaluate and apply suitable machine learning algorithms for various types of learning tasks.

CO4: Design efficient neural architectures to model patterns for a given learning problem.

CO5: Select and apply machine learning algorithms to solve societal problems such as face recognition, text classification.

DETAILED SYLLABUS:

UNIT-I: CONCEPT LEARNING AND GENERAL-TO-SPECIFIC ORDERING **(09 Periods)**

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning, Concept learning task, Concept learning as search, FIND-S, Versionspaces and candidate elimination algorithm, Inductive bias.

UNIT-II: DECISION TREE LEARNING AND KERNEL MACHINES **(09 Periods)**

Decision Tree Learning: Decision tree representation, Problems for decision tree learning, Decision tree learning algorithm, Hypothesisspace search, Inductive bias in decision tree learning, Issues in decision tree learning.

Kernel Machines: Support vector machines – SVMs for regression, SVMs for classification, Choosing C, A probabilistic interpretation of SVMs.

UNIT-III: ARTIFICIAL NEURAL NETWORKS **(09 Periods)**

Neural network representations, Appropriate problems for neural network learning, Perceptrons, Multilayer networks and Backpropagation algorithm, Convergence and local

minima, Representational power of feedforward networks, Hypothesis space search and inductive bias, Hidden layer representations, Generalization, Overfitting, Stopping criterion, An Example -Face Recognition.

UNIT-IV: BAYESIAN LEARNING **(10 Periods)**

Bayes theorem and concept learning, Maximum likelihood and least-squared error hypothesis, Maximum likelihood hypotheses for predicting probabilities, Minimum Description Length principle, Bayes optimal classifier, Gibbsalgorithm, Naive Bayes classifier, An Example – Learning to classify text; Bayesian belief networks, EMAlgorithm.

UNIT-V: INSTANCEBASED LEARNING AND REINFORCEMENT LEARNING

(08 Periods)

Instance Based Learning:k-Nearest Neighbor learning, Locallyweighted regression, Radial basis functions, Case-based reasoning.

Reinforcement Learning: The learning task, Q-learning, Nondeterministic rewards and actions, Temporal difference learning, Generalizing from examples, Relationship to dynamic programming.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Tom M. Mitchell,*Machine Learning*, McGrawHill,2013.
2. Kevin P. Murphy, *Machine Learning*: *A Probabilistic Perspective*, MIT Press, 2012.

REFERENCE BOOKS:

1. EthemAlpaydin, *Introduction to Machine Learning*, MIT Press, 4thEdition, 2020.
2. Shai Shalev Shwartz, Shai Ben David, *Understanding Machine Learning: From Theory to Algorithms,* Cambridge University Press, 2014.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd1_noc19_cs52/preview
- https://www.udemy.com/course/machinelearning/

III B. Tech. – II Semester

(19BT60201) **POWER ELECTRONICS**

(Inter Disciplinary Elective- 2)

(Common to EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	--	--	3

PRE-REQUISITES: A course on Electronic Devices and Circuits.

COURSE DESCRIPTION: Power semiconductor devices; Silicon Controlled Rectifier — Turn-on methods, Triggering and commutation circuits for SCR; Single phase and three phase controlled rectifiers; Choppers; AC voltage controllers and Cyclo-converters; Inverters.

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

CO1: Understand the switching operations/characteristics of uncontrolled, semi-controlled and fully controlled power semiconductor devices.
CO2: Analyze commutation circuits, buck and boost operations of DC-DC converters circuit for different duty cycles.
CO3: Analyze AC-DC, AC-AC and dual converters circuit operation and evaluate their output parameters for R & RL loads with different firing pulses.
CO4: Analyze the conduction modes and PWM techniques of DC-AC converters circuit by single phase or three phase topologies.

DETAILED SYLLABUS:

UNIT-I: POWER SEMICONDUCTOR DEVICES **(11 Periods)**

Introduction to power electronics, Power diode — switching characteristics. Power transistors — power BJT, power MOSFET, IGBT and their characteristics; Thyristor — basic theory and operation, static and dynamic characteristics; two transistor analogy, turn-on methods, UJT firing circuits, series and parallel operation; protection against dv/dt and di/dt, design of snubber circuit.

UNIT-II: PHASE CONTROLLED RECTIFIERS **(11 Periods)**

Single phase controlled rectifiers — half wave controlled rectifier, bridge connections semi and fully controlled rectifiers with R and RL loads, derivation of average load voltage and current, effect of freewheeling diode; effect of source inductance; Three phase controlled rectifiers — half and fully controlled rectifiers-midpoint connection with R load, Bridge connections with R and RL loads, derivation of average load voltage and current.

UNIT-III: COMMUTATION CIRCUITS AND CHOPPERS **(07 Periods)**

Thyristor forced commutation circuits; Chopper — step-down and step-up operation, control strategies, derivation of load voltage with R load. Load commutated chopper.

UNIT-IV: DUAL CONVERTERS & AC VOLTAGE CONTROLLERS **(07 Periods)**

Dual converters — circulating and non-circulating current modes of operation of single phase and three phase dual converters with R-Load; Single phase AC voltage controllers — two SCRs in anti-parallel with R and RL loads, derivation of RMS load voltage and load current;Cyclo-converters — single phase midpoint and bridge type (step-up and step-down operations) with R and RL loads.

UNIT-V: INVERTERS **(09 Periods)**

Single phase inverters — basic operation, voltage source inverters, current source inverter and basic series & parallel inverters. Voltage control by pulse width modulation techniques — single pulse, multiple pulse and sinusoidal PWM techniques; Three phase bridge Inverters — $180^0$and 120^0conduction modes of operation.

Total Periods: 45

Topics for Self study are provided in the Lesson Plan

TEXT BOOKS:

1. Dr. P. S. Bimbhra, *Power Electronics*, Khanna Publishers, 6th Edition, Delhi, 2018.
2. M. D. Singh & K. B. Kanchandhani, *Power Electronics,* TataMcGraw - Hill Publishing Company, 2013.

REFERENCE BOOKS:

1. Mohan, Undeland, Robbins, *Power Electronics: Converters, Applications and Design*, 3rd Edition, Wiley, 2007.
2. Muhammad H. Rashid, *Power Electronics – Devices, Circuits and Applications*, 4th Edition, Pearson, 2017.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108/102/108102145/
2. https://nptel.ac.in/courses/108/101/108101126/
3. https://nptel.ac.in/courses/108/101/108101038/
4. https://nptel.ac.in/courses/108/107/108107128/

III B. Tech. - II Semester

(19BT51041) PLC AND SCADA

(Inter Disciplinary Elective- 2)

(Common to EEE & ECE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PREREQUISITES: A course on Switching Theory and Logic Design.

COURSE DESCRIPTION: Introduction to PLC, PLC ladder diagrams, programming on PLC, timers, counters and sequences used in PLC, Display Conventions and Navigation, Remote Terminal Units, Master Terminal Units, SCADA Works Station Application Programmes.

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

CO1: Demonstrate knowledge on programmable logic controllers and various functions of PLCs.

CO2: Develop PLC program, to solve various problems in process industries.

CO3: Demonstrate knowledge on various elements of SCADA Software.

CO4: Analyse the industrial process by using various displays in SCADA software and provide appropriate solutions.

DETAILED SYLLABUS:

UNIT-I: PLC BASICS AND PROGRAMMING (10 Periods)

Introduction, PLC system, CPU, I/O modules and interfacing, power supplies, Programming equipment, Programming formats, Construction of PLC ladder diagrams, Devices connected to I/O modules. Input instructions, Outputs, Operational procedures.

UNIT-II: LADDER DIAGRAMS, REGISTERS AND TIMER FUNCTIONS (10 Periods)

Digital logic gates, Boolean algebra PLC programming, Fail-Safe Circuits, characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers. Timer function, Counter function & industrial applications.

UNIT-III: INTERMEDIATE AND DATA HANDLING FUNCTION (09 Periods)

Intermediate functions: Arithmetic functions, Number comparison functions, Number conversion functions. Skip, Master control relay, Jump functions, Sequencer functions and applications, Controlling of two-axis & three axis Robots with PLC, Matrix functions.

UNIT-IV: The Elements of SCADA Software **(10 Periods)**

SCADA System Architecture - Field Devices and Signals, Programmable Process Controller, Communication Network, Central Control Facilities, Display Conventions and Navigation. Remote Terminal Units-Discrete control, analog control, Monitor discrete signals, monitor analog signals. Master terminal Units.

UNIT-V: SCADA WORKS STATION APPLICATION PROGRAMME **(06 Periods)**

Identifying the process areas, configuring HMI applications. Process Graphic Displays-Current Process Operations, Equipment Control Displays, Alarm and Event Summaries, Trends and Historical Reports, Maintenance Displays. Configuration of I/O Server, System graphic displays Sample Application: Water Treatment Plant SCADA System.

Total Periods: 45

Topics for Self study are provided in the Lesson Plan

TEXT BOOKS:

1. John W. Webb & Ronald A. Reiss, *Programmable Logic Controllers Principles and Applications*, 5th edition, PHI, 2009.
2. Stuart G. Mc. Crady, *Designing SCADA Application Software A Practical Approach*, 1st Elsevier, 2013.

REFERENCE BOOKS:

1. Frank D. Petruzella, *Programmable Logic Controller*, 3rd edition, Tata McGraw-Hill Edition 2010.
2. Stuart A. Boyer, *Supervisory Control and Data Acquisition*, 3rd edition, ISA 2004.

WEBLINKS:

1. https://openautomationsoftware.com/use-cases/allen-bradley-wpf-scada/
2. https://new.siemens.com/global/en/products/automation/industry-software/automation-software/scada.html
3. https://ab.rockwellautomation.com/Programmable-Controllers
4. https://en.wikipedia.org/wiki/SCADA
5. http://www.isa.org
6. http://www.controleng.com
7. http://literature.rockwellautomation.com
8. http://www.automation.siemens.com

III B. Tech. - II semester

(19BT60433) **SOCIALLY RELEVANT PROJECT-2**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	-	1

PREREQUISITES: -

COURSE DESCRIPTION:

Identification of topic for the socially relevant project; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the socially relevant project; Preparation of thesis and presentation.

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

CO1: Create/Design engineering systems or processes to solve complex societal problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.

CO2: Consider environment, sustainability, economics and project management in addressing societal problems.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical forms on socially relevant project.

III B. Tech. - II semester

(19BT5MC01) UNIVERSAL HUMAN VALUES

(Audit Course)

(Common to ME, EEE, ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	-	40	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION: Process for Value Education; Harmony in the Human Being - Harmony in Myself!; Harmony in Family and Society- Human Relationship; Harmony in the Nature and Existence – Coexistence; Implications of Holistic Understanding of Harmony on Professional Ethics.

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

CO1: Understand Values and skills for sustained happiness and prosperity.

CO2: Analyse realistic implications of a Holistic understanding of ethical human conduct, trustful and mutually fulfilling human behaviour.

CO3: Apply holistic approach in personal life and profession through a positive understanding of the Human reality and existence.

DETAILED SYLLABUS:

UNIT-I: VALUE EDUCATION **(06 Periods)**

Human Values-Introduction; Self-Exploration - Natural Acceptance; Human Aspirations- Right understanding- the current scenario: understanding and living in harmony.

UNIT-II: HUMAN BEING AND SELF **(06 Periods)**

Understanding human being - I' and the material 'Body'; needs of Self ('I') and 'Body'- happiness and physical facility; Body as an instrument of 'I' - characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body.

UNIT-III: FAMILY, THE SOCIETY AND THE NATIONS **(06 Periods)**

Values in human relationship (nine universal values) - foundational values of relationship; Difference between intention and competence; Difference between respect and differentiation; harmony in the society; Universal harmonious order in society.

UNIT-IV: HARMONY WITH THE NATURE **(06 Periods)**

Harmony in the Nature; Interconnectedness and mutual fulfilment - the four orders of nature - Recyclability and Self-regulation; Existence as Co-existence; Holistic perception of harmony and existence.

UNIT-V: HARMONY WITH PROFESSIONAL ETHICS **(06 Periods)**

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

Total Periods: 30

Topics for Self Study are provided in the Lesson Plan

TEXT BOOK:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidya Prakashan, Amarkantak, 1999.

III B. Tech. - II semester

(19BT60432) **MICROCONTROLLERS LAB**

(Common to ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	2	1

PRE-REQUISITES: Courses on Switching Theory and Logic Design & Linear and Digital IC Applications

COURSE DESCRIPTION: PIC Microcontrollers; Interfacing standard peripherals & Programming DAC, Stepper Motor, ADC, DAC, Keyboard, Seven Segment Display & Serial Communication**.**

COURSE OUTCOMES:

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

CO1: Analyze the instruction set to program 8051 for control applications.

CO2: Analyze the instruction set to program PIC18 for computing applications.

CO3: Develop Programs using on chip resources and interface external components such as LCD, Keypad, and Motors for societal needs.

CO4: Work independently and in teams to solve problems with effective Communication.

LIST OF EXPERIMENTS: (Minimum Twelve experiments to be conducted)

PART: A (Programs using 8051)

1. Arithmetic operations using internal and external memory.
2. Programs using special instructions like SWAP, bit/byte, set/ reset etc.
3. Bank Switching & Branch operations

PART: B (Programs using PIC Microcontroller)

1. Arithmetic operations.
2. Logical & Branch operations
3. Bit manipulation operations.
4. Macros & Modular programming.
5. Time Delay programs.

PART: C (Interfacing with PIC microcontrollers)

1. Interface switches, LEDs, 7-segment display.
2. Interfacing of PIC18 with Keyboard and LCD.
3. Interfacing of PIC18 with DAC.
4. Interfacing using serial communication & DC Motor

5. Interfacing Stepper Motors

REFERENCE BOOKS/LABORATORY MANUALS:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D, *The 8051 Microcontroller and Embedded Systems-using assembly and C*, PHI, 2006/ Pearson 2008
1. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems: Using C and PIC18*, Pearson Education, 2015.

SOFTWARE/Tools used: -

IV B. Tech. - I Semester

(19BT70402) **MICROWAVE ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PREREQUISITES: A course on Electromagnetic Fields and Transmission Lines.

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

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

CO1: Analyze Waveguides as alternatives to transfer power at microwave frequencies.

CO2: Design microwave components using waveguides to analyze the Performance of microwave networks.

CO3: Analyze the Performance of microwave sources and solid state devices for high frequency radio applications.

CO4: Evaluate power, attenuation, frequency, VSWR and impedance by various measurement methods for industrial and societal applications.

DETAILED SYLLABUS:

UNIT-I: WAVEGUIDES **(10 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, Illustrative Problems.

UNIT-II: MICROWAVE COMPONENTS **(10 Periods)**

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 and rotary vane types, Illustrative problems.

UNIT-III: MICROWAVE SOURCES **(12 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-IV: MICROWAVE SOLID STATE DEVICES (08 Periods)

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

UNIT-V: MICROWAVE MEASUREMENTS and MODERN TRENDS (05 Periods)

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

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Samuel Y. Liao, *Microwave devices and circuits*, Pearson Education, 3rd Edition, 2003.
2. M.Kulkarni, *Microwave and Radar Engineering*, Umesh Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. F.E. Terman, *Electronic and Radio Engineering*, McGraw-Hill, 4th Edition, 1955.
2. Sushrut Das, *Microwave Engineering*, Oxford University Press, 2014.

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:

3. Samuel Y. Liao, *Microwave devices and circuits*, Pearson Education, 3rd Edition, 2003.
4. 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:

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

IV B. Tech. – I Semester

(19BT70404) CELLULAR AND MOBILE COMMUNICATIONS

(Professional Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Analog Communications, Digital Communications & Antennas and Propagation.

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, GPRS; 3G systems – WCDMA, 4G-LTE Systems.

COURSE OUTCOMES:

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

CO1: Design antenna systems and to analyze cochannel interference in Cellular systems.

CO2: Analyze Point to point prediction model for different geographical conditions.

CO3: Apply appropriate handoff techniques for various scenarios to overcome call drops.

CO4: Demonstrate knowledge on 2G GSM, 3G WCDMA and 4G LTE cellular communication systems and their standards.

DETAILED SYLLABUS:

UNIT-I: (07 Periods)

INTRODUCTION TO CELLULAR MOBILE SYSTEMS

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells.

ELEMENTS OF CELLULAR RADIO SYSTEMS DESIGN

Concept of frequency reuse channels, co-channel interference reduction factor, Design of Antenna systems for worst case, cell splitting

UNIT-II: (11 Periods)

INTERFERENCE REDUCTION AND CELL COVERAGE FOR SIGNAL: Introduction to co-channel interference, Exploring co-channel interference areas in a system, Design of different antenna systems, Diversity Receiver, Near End Far End Interference, Lee model.

FREQUENCY MANAGEMENT& CHANNEL ASSIGNMENT: Frequency Management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.

HANDOFFS: Introduction tohandoff, types of handoff and their characteristics.

UNIT-III: **(08 Periods)**

GLOBAL SYSTEM FOR MOBILE (2G SYSTEMS): GSM architecture, Radio specifications, Communication channels in GSM, Mapping Logical channels on to Physical Channels, signaling during a call.

GPRS (2.5G SYSTEMS)

Introduction to GPRS, GPRS support nodes, GPRS Interfaces, GPRS procedures in Packet call setup, GPRS Mobility management.

UNIT-IV: THIRD GENERATION NETWORK (3G), UMTS **(09 Periods)**

Introduction to 3G, WCDMA concept, Parameters of 3G WCDMA Air interface, Spectrum allocation for WCDMA, 3G services, UMTS Reference network architecture and Interfaces, Air-interface architecture and processing, Channels on the Air Interface, Introduction to High-Speed Packet Data Access (HSPA)

UNIT-V: 4G-LTE SYSTEMS **(10 Periods)**

Introduction, Architecture of an evolved Packet system, LTE integration with 2G/3G network, E-UTRAN Interfaces, USER Equipment, LTE Mobility, LTE Radio interface, Principles of OFDM, LTE Multiple Access scheme, Single-Carrier FDMA, OFDMA verses SC-FDMA operation, Introduction to MIMO.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. William C. Y. Lee, *Mobile Cellular Telecommunications*, McGraw Hill, 2nd Edition, 1995.
2. Alexander Kukushkin, Introduction to Mobile Network Engineering: GSM, 3G-WCDMA, LTE and the Road to 5G, Wiley, First Edition, 2018.

REFERENCE BOOKS:

1. Theodore S Rappaport, *Wireless Communication Principles and Practice*, Pearson Education, 2nd Edition, 2002.
2. C. Y. Lee, *Wireless and Cellular Telecommunications*, McGraw Hill, 3rd Edition, 2006.

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. – I Semester

(19BT70405) **SPEECH PROCESSING**

(Professional Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Signals and Systems & Digital Signal Processing

COURSE DESCRIPTION: Acoustic Theory of speech production; model for speech signals and speech processing systems; Mathematical analysis of speech signal - Homomorphic and LPC models; Speech and Speaker recognition systems.

COURSE OUTCOMES:

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

CO1: Analyze digital models of speech signals for various losses in vocal tract by articulators and estimate pitch period and cepstrum.

CO2: Understand the operation of different types of synthesizers for speech synthesis.

CO3: Apply coding using different types of vocoders for speech coding.

CO4: Use Hidden Markov Model in speech recognition and speaker identification to classify speech for authentication.

DETAILED SYLLABUS:

UNIT-I: DIGITAL MODEL FOR THE SPEECH SIGNAL (10 Periods)

The process of speech production - the mechanism of speech production, acoustic phonetics. The Acoustic theory of speech production- sound propagation, uniform lossless tubes, Effect of losses in the vocal tract, Effect of radiation at the lips, Vocal tract transfer functions for vowels, the effect of nasal coupling, Excitation of sound in the vocal tract, Digital models for speech signals.

UNIT-II: TIME DOMAIN MODELS FOR SPEECH PROCESSING (10 Periods)

Introduction, Window considerations, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Cepstral Analysis of Speech.

UNIT-III: SPEECH SYNTHESIS (07 Periods)

History of speech synthesis, Formant synthesisers, Linear predictive synthesisers, Copy synthesis, Phoneme synthesis, Concatenation of multi-phonemic units, Text-to-speech synthesis, Articulatory speech synthesis

UNIT-IV: SPEECH CODING **(07 Periods)**

Sub-band coding, Transform coding, Channel Vocoder, Formant vocoder, Cepstralvocoder, Linear predictive vocoders, The LPC-10 algorithm, Multi-pulse and RELP vocoders, Vector quantiser coders.

UNIT-V: SPEECH AND SPEAKER RECOGNITION SYSTEMS **(11 Periods)**

Basic pattern recognition approaches, parametric representations of Speech recognition, Speech recognition system- isolated digit recognition system. Speaker Verification vs. recognition, features that distinguish speaker, Speaker recognition system-speaker verification system, speaker identification systems, Hidden Markov models, Word recognition using HMMs, Training hidden Markov models.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. L.R. Rabiner and R.W. Schafer, *Digital processing of speech signals*, Pearson Education, 2006.
2. F. J. Owens, *Signal Processing of Speech*, Macmillan, 1993.

REFERENCE BOOKS:

1. Douglas O Shaughnessy, *Speech Communications*, Oxford University Press, 2nd Edition, 2000
2. L R Rabiner, BH Juang, B Yegnanarayana, *Fundamentals of Speech Recognition*, Pearson Education, 2009.

IV B.Tech. - I semester

(16BT70410) SPEECH PROCESSING

(Program Elective - 4)

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

PREREQUISITES: Courses on Signals and Systems & Digital Signal Processing

COURSE DESCRIPTION:
Acoustic Theory of speech production; model for speech signals and speech processing systems; Mathematical analysis of speech signal - Homomorphic and LPC models; Speech and Speaker recognition systems.

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

CO1. Demonstrate fundamental knowledge in
- Digital Model representation of speech signal
- STFT analysis
- LPC analysis
- Homomorphic models.

CO2. Analyze speech signal using homomorphic and linear predictive techniques.
CO3. Design efficient algorithms for feasible and optimal solutions in speech processing.
CO4. Synthesize features of speech signals to solve the problems in designing of speech and speaker recognition system.
CO5. Apply appropriate techniques and approaches to analyze and synthesis speech signals with an understanding of limitations.
CO6. Use speaker recognition system for societal needs.

DETAILED SYLLABUS:

UNIT-I: DIGITAL MODEL FOR THE SPEECH SIGNAL (10 Periods)
The process of speech production - the mechanism of speech production, acoustic phonetics. The Acoustic theory of speech production- sound propagation, uniform lossless tubes, Effect of losses in the vocal tract, Effect of radiation at the lips, Vocal tract transfer functions for vowels, the effect of nasal coupling, Excitation of sound in the vocal tract. Digital models for speech signals.

UNIT II: TIME DOMAIN MODELS FOR SPEECH PROCESSING (09 Periods)
Introduction, Window considerations, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT-III: HOMOMORPHIC SPEECH PROCESSING (09 Periods)
Short time Fourier transform: Definition, Fourier transform interpretation, linear filter interpretation, Filter Bank summation method, Overlap Addition method. Homomorphic systems for convolution – properties of the complex Cepstrum, computational

considerations. The complex Cepstrum of speech, pitch detection, formant estimation, Homomorphic vocoder.

UNIT-IV: LINEAR PREDICTIVE CODING OF SPEECH (10 Periods)

Basic principles of linear predictive analysis – Auto correlation method, The covariance method. Computation of the gain for the model, solution of LPC Equations – Cholesky Decomposition solution for the covariance method. Durbin's Recursive solution for the autocorrelation equations.Comparison between methods of solutions of LPC analysis equations.Applications of LPC parameters – Pitch detection using LPC parameters, Formant analysis using LPC parameters.

UNIT-V: SPEECH AND SPEAKER RECOGNITION SYSTEMS (08 Periods)

Speaker Verification vs. recognition, features that distinguish speaker, Speaker recognition system-speaker verification system, speaker identification systems.

Basic pattern recognition approaches, parametric representations of Speech recognition, Speech recognition system- isolated digit recognition system, continuous digit recognition system, LPC distance measure.

Total Periods: 46

TEXT BOOK:

3. L R Rabiner and SW Schafer, *Digital processing of speech signals*, Pearson Education, 2006.

REFERENCE BOOKS:

3. Douglas O Shaughnessy, *Speech Communications*, Oxford University Press, 2nd Edition, 2000
4. L R Rabiner, BH Juang, B Yegnanarayana, *Fundamentals of Speech Recognition*, Pearson Education, 2009.

IV B. Tech. – I Semester

(19BT71001) BIOMEDICAL INSTRUMENTATION

(Professional Elective - 4)

(Common to ECE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITE: -

COURSE DESCRIPTION: Human Anatomy & Physiology; Bio-signals; Cardiovascular and Neuro-muscular Instrumentation; Therapeutic Equipment; Advanced Imaging techniques.

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

CO1: Demonstrate knowledge on Bioelectric Potentials and various electrodes for measuring Potentials.

CO2: Analyze ECG signals and measure various cardiovascular parameters.

CO3: Analyze EEG and EMG signals and measure various parameters in neuro muscular and respiratory systems.

CO4: Demonstrate the working of various theraptic instruments.

CO5: Demonstrate the working of imaging instruments used for diagnosis by following ethical values.

UNIT-I: BIO ELECTRIC POTENTIALS AND ELECTRODES **(09 Periods)**

Block diagram of biomedical instrumentation, Problems encountered in measuring a living system, system, Structure of cell, Resting and Action Potentials, Propagation of Action Potentials, sources of Bioelectric Potentials, Electrode theory, Bio potential electrodes, Bio chemical transducers.

UNIT-II: CARDIOVASCULAR INSTRUMENTATION **(09 Periods)**

Physiology of cardiovascular system, electrical conduction system of the heart, interpretation of ECG waveform, standard 12-lead configurations, Einthoven triangle, specifications of ECG Machine; Blood pressure, blood flow and heart sound measurements; Relation between electrical and mechanical activities of the heart.

UNIT-III: NEURO-MUSCULAR AND RESPIRATORY INSTRUMENTATION **(09 Periods)**

Physiology of nervous system, electrode placement for EEG and EMG recording, Specification of EEG and EMG machines, Interpretation of EEG and EMG.

Respiratory Instrumentation: Mechanism of respiration, Spirometry, Pnemuotachograph Ventilators.

UNIT-IV: THERAPEUTIC EQUIPMENT **(09 Periods)**

Pacemakers: Need for Cardiac pacemakers, pacing modes, Ventricular asynchronous Pacemaker (Fixed rate Pacemaker), Ventricular inhibited Pacemaker (demand Pacemaker), Atrial Synchronous pacemaker, Comparision between internal & external Pacemakers; Defibrillators: AC Defibrillator, DC Defibrillator, Synchronised DC Defibrillator; Diathermy: Shortwave and microwave, Dialysis: Hemo Dialysis, Peritonal Dialysis.

UNIT-V: MEDICAL IMAGING SYSTEM **(09 Periods)**

Ultrasonic Imaging: Doppler principle, Modes of Display: A-Mode, B-Mode and Echocardiography. Computed Tomography: Block diagram of CT scanner, Applications of Computed Tomography.MRI Imaging System, Cine angiogram, Endoscope.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXTBOOKS:

1. Leslie Cromwell, Fred. J. Weibell and Erich. A. Pfeiffer, "*Biomedical Instrumentation and Measurements"*, 2nd Edition, PHI, 2003.
2. R.S. Khandpur, "*Hand Book of Biomedical Instrumentation*", Tata McGraw Hill, 2nd Edition, 2002.

REFERENCES:

1. John G.Webster, "*Medical Instrumentation Application and Design*", 3rd Edition, Wiley India Pvt. Ltd.,2004
2. M. Arumugam, "*Biomedical Instrumentation*", Anuradha Publications, 1992.

ADDITIONAL LEARNING RESOURCES:

- https://www.nibib.nih.gov›science-education›students-resource
- https://www.who.int›medical_devices›support
- https://nptel.ac.in

IV B. Tech. - I Semester

(19BT70406) ADAPTIVE SIGNAL PROCESSING

(Professional Elective - 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on Digital Signal Processing.

COURSE DESCRIPTION: Development of adaptive filter theory; Method of steepest descent;Least-Mean-Square Algorithm and recursive least square algorithm; Kalman filtering algorithm; order-recursive adaptive filters.

COURSE OUTCOMES:

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

CO1: Analyze Error- Performance Surface of linear optimum and adaptive filters.

CO2: Analyze Steepest-Descent Algorithm to assess the error performance of the Wiener filters.

CO3: Apply LMS and RLS Algorithms for error minimization in noise cancellation.

CO4: Apply kalman and non Linear adaptive filters in the fields of signal processing, communications, Bio-Medical, Instrumentation and control engineering for error optimization.

CO5: Analyze order recursive adaptive filters to estimate mean square error.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ADAPTIVE SYSTEMS & DEVELOPMENT OF ADAPTIVE FILTER THEORY (10 Periods)

Eigen Value Problem,Properties of eigen values and eigen vectors(proof is not required), Eigen Filters, eigen Value computations.The Filtering problem,Linear Optimum Filters,Adaptive Filters,Linear Filter sturucters,Approaches to the development of linear adaptive filters. Linear Optimum Filtering: Statement of the problem, Principle of Orthogonality, Minimum Mean Square Error, Wiener- Hopf equations, Error- Performance Surface.

UNIT-II: METHOD OF STEEPEST DESCENT (07 Periods)

Basic Idea of Steepest-Descent Algorithm, Steepest-Descent Algorithm applied to the Wiener Filter, Stability of the Steepest-Descent Algorithm, Examination of the transient behavior of the Steepest-Descent Algorithm, the Steepest-Descent Algorithm as a deterministic search method, Virtue and limitation of the Steepest-Descent Algorithm.

UNIT-III: LEAST-MEAN-SQUARE ADAPTIVE FILTERS AND RECURSIVE LEAST-SQUARES ADAPTIVE FILTERS **(10 Periods)**

Overview of the structure and operation of the Least-Mean-Square Algorithm, Least-Mean-Square adaptation Algorithm, Applications-Adaptive Noise cancelling Applied to a Sinusoidal Interference and Adaptive Beam forming, Comparison of the LMS Algorithm with Steepest-Descent Algorithm.

Matrix Inversion lemma, exponentially weighted recursive least square algorithm, update recursion for the sum of weighted error squares, Single-Weight Adaptive Noise Canceller convergence analysis of RLS Algorithm.

UNIT-IV: KALMAN FILTERING & NON LINEAR ADAPTIVE FILTERING

(10 Periods)

Recursive Minimum Mean-Square Estimation for Scalar Random variables, Statement of Kalman filtering problem, The Innovations Process, estimation of the state using the Innovations Process, Filtering, Initial conditions, Extended kalman filter.

An overview of the Blind Deconvolution problem, Buss Gang Algorithm for blind Equalization.

UNIT-V: ORDER-RECURSIVE ADAPTIVE FILTERS **(08 Periods)**

Gradient-Adaptive Lattice Filter, order-recursive adaptive filters using least square estimation, adaptive forward linear prediction, adaptive backward linear prediction, conversion factor, least-square lattice predictor, angle-normalized estimation errors, first order state space models for lattice filtering.

Total periods: *45*

Topics for Self Study are provided in the Lesson Plan

TEXT BOOK:

1. Simon Haykin, *"Adaptive Filter Theory",* Pearson Education, 5th edition, 2014.

REFERENCE BOOK:

1. Bernard Widrow, Samuel D. Streams, *"Adaptive Signal Processing",* Pearson Education, 1st edition, 2002.

IV B. Tech. - I Semester

(19BT70407) ERROR CONTROL CODING

(Professional Elective - 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Analog Communications and Digital Communications

COURSE DESCRIPTION:

Mathematical concepts related to coding; Channel coding techniques – Linear Block Codes, Cyclic Codes, Binary BCH Codes and Convolutional Codes

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

CO1: Understand mathematical concepts related to coding.

CO2: Analyze the concepts involved in formulation and computation of Linear Block Codes.

CO3: Analyze the concepts involved in formulation and computation of Cyclic Codes and Binary BCH Codes.

CO4: Analyze Convolutional Codes and different algorithms associated with Convolutional Coding.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION **(10 Periods)**

Coding for Reliable Digital Transmission and Storage – Types of codes, Modulation and coding, Maximum likelihood decoding, Types of errors, Error control strategies, Coded modulation. Introduction to Algebra- Groups & fields, Binary field arithmetic, Construction of Galois field and its basic properties, Computations, Vector spaces, matrices.

UNIT-II: LINEAR BLOCK CODES **(10 Periods)**

Linear Block Codes: Introduction linear block codes, Syndrome and Error detection, Error detection and Error correction capabilities of a Block code, Standard array and syndrome decoding, Probability of an undetected error for linear codes over a BSC, Single parity check codes, repetition codes, and self-dual codes, A class of single error correcting and double error detecting codes, Reed-Muller codes and other constructions, The squaring construction of codes, The Golay code, Interleaved codes, Illustrative Problems.

UNIT-III: CYCLIC CODES **(08 Periods)**

Cyclic Codes: Description of Cyclic codes, Generator and parity – check matrices of cyclic codes, Encoding of Cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes, Cyclic Hamming codes, The (23,12) Golay code, Shortened cyclic codes, Cyclic product codes.

UNIT-IV: BINARY BCH CODES **(08 Periods)**

Binary primitive BCH codes, Decoding of BCH codes, Iterative algorithm for finding the error location polynomial & its iterative algorithm, Finding the error location numbers and error correction, Correction of errors and erasures, Implementation of Galois Field arithmetic, Implementation of error correction, Weighted distribution & Error detection of binary BCH codes, Illustrative Problems.

UNIT-V: CONVOLUTIONAL CODES: **(09 Periods)**

Convolutional Codes: Encoding of Convolutional codes, Structural properties and distance properties of Convolutional codes, The Viterbi Algorithm, Performance bounds for Convolutional codes, Construction of good Convolutional codes, Implementation and performance of the Viterbi algorithm, The soft output of Viterbi algorithm (SOVA), The BCJR algorithm, Punctured and Tail-biting Convolutional codes, Illustrative problems.

Total Periods: *45*

Topics for Self study are provided in the lesson plan

TEXT BOOKS:

1. Shu Lin, Daniel J. Costello, Jr., "Error Control Coding," Pearson Publications, Second Edition, 2011.
2. Bernard Sklar, Pabitra Kumar Ray, "Digital Communications Fundamentals and Applications," Pearson Publications, Second Edition, 2009.

REFERENCE BOOKS:

1. Thomas M. Cover and Joy A. Thomas, Elements of Information Theory, John Wiley & Sons, 1st Edition, 1999.
2. John G. Proakis, "Digital Communications", Mc.GrawHill Publication, 5th Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

NPTEL Courses

IV B. Tech. - I Semester

(19BT70409) REAL TIME SYSTEMS

(Professional Elective - 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: Courses on Switching Theory and Logic Design & Microcontrollers.

COURSE DESCRIPTION: Real Time Systems Modeling; Scheduling Approaches; Multiprocessor and Distributed Scheduling Algorithms; Fault Tolerant Systems; Real Time Operating Systems.

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

CO1: Analyze Real Time System Characterization, Workload and Resource management algorithms and apply suitable techniques to model hard and soft real time systems.

CO2: Solve scheduling problems and apply suitable techniques in constrained RT systems by surveying various Real Time scheduling approaches for uniprocessor, Multiprocessor and distributed environments.

CO3: Evaluate appropriate Fault tolerant techniques and apply them to design fail safe RT systems.

CO4: Implement Efficient Real Time Systems porting suitable operating system on to hardware by Investigating POSSIX standard Kernel structure, services and Kernel objects.

DETAILED SYLLABUS:

UNIT-I: MODELING OF REAL TIME SYSTEMS **(09 Periods)**

Hard Vs Soft Real Time Systems, A Reference Model of Real Time Systems- Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency. Functional Parameters, Resource Parameters of Jobs and Parameters of Resources, Scheduling hierarchy.

UNIT-II: APPROACHES TO REAL TIME SCHEDULING **(09 Periods)**

Clock Driven, Weighted Round Robin, Priority Driven, Dynamic Vs Static Systems, Effective Release Times and Dead Lines, Optimality and Non-optimality of EDF and LST algorithms, Challenges in Validating Timing Constraints in Priority Driven Systems, Offline Vs Online Scheduling.

UNIT-III: SCHEDULING REAL TIME TASKS IN MULTIPROCESSOR AND DISTRIBUTED SYSTEMS (09 Periods)

Multiprocessor task allocation, Dynamic allocation of tasks, Fault tolerant scheduling of tasks, Clocks in distributed Real Time Systems, Centralized clock distribution, Distributed clock synchronization.

UNIT-IV: FAULT TOLERANCE TECHNIQUES (09 Periods)

Introduction, Failures- Causes, Types, Detection. Fault and Error Containment, Redundancy- Hardware, Software, Time, Integrated Failure Handling.

UNIT-V: OPERATING SYSTEMS (09 Periods)

Overview- Threads and Tasks, the Kernel. Time Services and Scheduling Mechanisms, Basic Operating System Functions- Communication and Synchronization, Event Notification and Software Interrupt Memory Management, I/O and Networking. Processor Reserves and Resource Kernel, Capabilities of Commercial Real Time Operating Systems.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Jane W.S. Liu, "Real Time Systems", Pearson Education, 1st Edition, 2006.
2. Rajib Mall, "Real Time Systems-Theory and Practice", Pearson Education India, 1st Edition, Nov.2012.
3. C. M. Krishna, Kang G Shin, "Real Time Systems", MCgraw-Hill Series,1997

REFERENCE BOOKS:

1. Phillip A. Laplante and Seppo J. Ovaska, "Real-Time Systems Design and Analysis: Tools for the Practitioner", Wiley-IEEE Press, 4th edition, Nov. 2011.
2. Hermann Kopetz, "Real-Time Systems: Design Principles for Distributed Embedded Applications ", Springer; 2nd Edition, 2011.

IV B. Tech. – I Semester
(19BT70433) INTERNSHIP

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

PREREQUISITES: -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

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

CO1: Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.

CO2: Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solvingcomplex engineering problems.

CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

IV B. Tech. - I Semester

(19BT704AC) PRINCIPLES OF OPERATING SYSTEMS

(Audit course)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITE:--

COURSE DESCRIPTION: Basics of Operating System; Process Management; Scheduling; Process Synchronization; Deadlocks; Memory Management; I/O Management; Disk Scheduling; File Systems.

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

CO1: Demonstrate knowledge on basics and types of Operating Systems, Process management and scheduling.

CO2: Analyze scheduling algorithms, process synchronization, Memory and I/O Management, File Organization and access methods

DETAILED SYLLABUS:

UNIT-I: **(06 Periods)**

INTRODUCTION TO OPERATING SYSTEM: Definition, need, objectives of Operating System; Evolution, Real-time Operating System; System Components; Services; System Calls; Types of Operating Systems; Virtual Machines; System Design and Implementation.

UNIT-II: **(06 Periods)**

PROCESS MANAGEMENT: Process, Process States; Multiple and Cooperating Processes; Process Control Block and Context Switching, Process Control, Inter Process Communication; Exception Conditions, Threads, Symmetric Multi-processing.

SCHEDULING: Basics, Scheduler; Types of Scheduling; Scheduling Criteria, CPU Scheduling Algorithms.

UNIT-III: **(06 Periods)**

PROCESS SYNCHRONIZATION: Introduction, Racing Problem, Critical Section, Mutual Exclusion; Semaphores, Producer Consumer Problem; Readers and writers Problem; Monitors, Message Passing.

DEADLOCKS: Introduction, conditions for deadlock; deadlock detection, prevention, avoidance, and recovery.

UNIT-IV: **(07 Periods)**

MEMORY MANAGEMENT: Introduction, Logical Vs Physical Addressing; Memory Management Requirement; Loading Program into main memory; Memory allocation; Page Replacement Algorithms.

I/O MANAGEMENT AND DISK SCHEDULING: I/O- devices, functions, and buffering; Spooling, Operating System design issues; Disk I/O, Disk Scheduling Algorithms.

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

FILE SYSTEMS: Introduction, File attributes and Naming; File Organization and access methods; Directory Structures; File Protection and File System Organization.

TEXT BOOKS:

1. V. Ramesh*, Principles of Operating Systems,* University Science Press, 2010.
2. Abraham Silberschatz, Greg Gagne, Peter B. Galvin, *Operating System Concepts,* 7th Edition, Wiley India, 2011.

REFERENCE BOOK:

1. Wlliam Stallings, *Operating Systems, Internals and Design Principles*, 7th Edition, Pearson Education, 2013.

III B. Tech. – I Semester

(19BT40107) SUSTAINABLE ENGINEERING

(Open Elective-2)

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

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

CO1: Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.

CO2: Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.

CO3: Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO4: Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO5: Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT-I: PRINCIPLES OF SUSTAINABILITY **(09 Periods)**

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT-II: SUSTAINABILITY METRICS AND ASSESSMENT TOOLS **(09 Periods)**

Sustainability indicators, metrics and assessment tools, Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment

(SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT-III: SUSTAINABLE ENGINEERING PRACTICES (09 Periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT-IV: SUSTAINABLE ENGINEERING APPLICATIONS (09 Periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT-V: SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION (09 Periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: 45

Topics for self study are provided in the lesson plan

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley &Sons, Inc., Hoboken, New Jersey, 2019, 544p (ISBN: 978-1-119-49393-8).
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo, A.O., Maria, P., *Engineering Applications in Sustainable Design and Developmen*t, Cengage Learning, 1st Edition, 2016.
2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.
4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.

2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, https://doi.org/10.1061/9780784407509, 2004.
3. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
4. *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

III B. Tech. – I Semester

(19BT40107) SUSTAINABLE ENGINEERING

(Open Elective-2)

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

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

CO1: Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.

CO2: Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.

CO3: Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO4: Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

CO5: Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

DETAILED SYLLABUS:

UNIT-I: PRINCIPLES OF SUSTAINABILITY **(09 Periods)**

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT-II: SUSTAINABILITY METRICS AND ASSESSMENT TOOLS **(09 Periods)**

Sustainability indicators, metrics and assessment tools, Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment

(SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT-III: SUSTAINABLE ENGINEERING PRACTICES (09 Periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT-IV: SUSTAINABLE ENGINEERING APPLICATIONS (09 Periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT-V: SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION (09 Periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: 45

Topics for self study are provided in the lesson plan

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley &Sons, Inc., Hoboken, New Jersey, 2019, 544p (ISBN: 978-1-119-49393-8).
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo, A.O., Maria, P., *Engineering Applications in Sustainable Design and Developmen*t, Cengage Learning, 1st Edition, 2016.
2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.
4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.

2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, https://doi.org/10.1061/9780784407509, 2004.
3. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
4. *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

II B. Tech. - II Semester

(19BT51207) AI IN HEALTHCARE

(Open Elective-1)

(Common to EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Concepts of Artificial Intelligence (AI) in Healthcare; The Present State and Future of AI in Healthcare Specialties; The Role of Major Corporations in AI in Healthcare; Applications of AI in Healthcare.

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

CO1: Understand the fundamental concepts of AI in Healthcare sector.
CO2: Understand the applications of AI in Healthcare specialties.
CO3: Demonstrate AI applications developed by corporate companies.
CO4: Demonstrate knowledge on future applications of Healthcare using AI.
CO5: Understand the principles of AI applications through case studies.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE **(08 Periods)**

Introduction to AI in Healthcare, Benefits and Risks, AI in the health sector, AI versus Human Intelligence, The future of AI in health sector, AI and Neural networks.

UNIT-II: THE PRESENT STATE AND FUTURE OF AI IN HEALTHCARE SPECIALTIES **(10 Periods)**

Artificial Intelligence in: preventive healthcare, Radiology, Pathology, Surgery, Anesthesiology, Psychiatry, Cardiology, Pharmacy, Dermatology, Dentistry, Orthopedics, Ophthalmology.

UNIT-III: THE ROLE OF MAJOR CORPORATIONS IN AI IN HEALTHCARE **(08 Periods)**

IBM Watson, The role of Google and Deep mind in AI in Healthcare, Baidu, Facebook and AI in Healthcare, Microsoft and AI in Healthcare.

UNIT-IV: FUTURE OF HEALTHCARE IN AI **(10 Periods)**

Evidence-based medicine, personalized medicine, Connected medicine, Disease and Condition Management , Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantables, Digital Health and Therapeutics,

Education, Incentivized Wellness. Artificial Intelligence, Block chain, Robots, Robot-Assisted Surgery, Exoskeletons, Inpatient Care, Companions, Drones, Smart Places, Smart Homes, Smart Hospitals, Reductionism, Innovation vs. Deliberation.

UNIT-V: APPLICATIONS OF AI IN HEALTHCARE **(09 Periods)**

Case Study 1: AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality.

Case Study 2: Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management.

Case Study 3: Delivering a Scalable and Engaging Digital Therapy.

Case Study 4: Improving Learning Outcomes for Junior Doctors through the Novel Use of Augmented and Virtual Reality for Epilepsy

Case Study 5: Big Data, Big Impact, Big Ethics-Diagnosing Disease Risk from Patient Data.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Dr. Parag Mahajan, *Artificial Intelligence in Healthcare, Med Manthra Publications*, First Edition 2019.
2. *Arjun Panesar, Machine Learning and AI for Healthcare Big Data for Improved Health*, Apress Publications, 2019.

REFERENCE BOOKS:

1. Michael Matheny, SonooThadaneyIsrani, Mahnoor Ahmed, and Danielle Whicher, *Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril*, National Academy of Medicine Publication, First Edition, 2019.

ADDITIONAL LEARNING RESOURCES:

1. https://www.udacity.com/course/ai-for-healthcare-nanodegree--nd320
   (AI for Healthcare).
2. https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare
   (Surgical robots, new medicines and better care: 32 examples of AI in healthcare).
3. https://healthtechmagazine.net/article/2020/02/future-artificial-intelligence-healthcare
   (Future of Artificial Intelligence in Healthcare).

III B. Tech. – II Semester

(19BT60503) CRYPTOGRAPHY AND NETWORK SECURITY

(Inter Disciplinary Elective- 2)

(Common to CSE & ECE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	-	-	3

PRE-REQUISITES: A Course on "Computer Networks"

COURSE DESCRIPTION: Concepts of cryptographic algorithms, Substitution techniques, Symmetric ciphers, Block cipher operations, Cryptographic data integrity algorithms, Key management and distribution, User authentication, Transport level security, Electronic mail security, IP security.

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

CO1: Apply the knowledge of concepts of network security, symmetric and public key cryptosystems to identify the potential threats in networks.

CO2: Analyze hash functions, message authentication codes, digital signatures for providing data integrity in information security applications.

CO3: Use key management and distribution techniques, user authentication techniques for assuring mutual trust among users.

CO4: Demonstrate knowledge on network and Internet security techniques for addressing the security threats.

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION **(9 Periods)**

Computer security concepts, Security attacks, Security services, Security mechanisms, Model for network security, Symmetric cipher model, Substitution techniques - Monoalphabetic ciphers and Polyalphabetic ciphers.

UNIT-II: SYMMETRIC CIPHERS **(7 Periods)**

Stream ciphers and block ciphers, Data Encryption Standard(DES), Advanced Encryption Standard (AES) - Structure, Transformation Functions; Block Cipher Operation - Multiple encryption and triple DES, Cipher block chaining mode, Cipher feedback mode, Output feedback mode, Counter mode.

UNIT-III: PUBLICKEY CRYPTOGRAPHY AND CRYPTOGRAPHIC DATA INTEGRITYALGORITHMS **(9 Periods)**

Public Key Cryptography: RSA, Diffie-Hellman key exchange, Elgamalcryptographic system.

Cryptographic Data Integrity Algorithms: Hash Functions - Simple hash functions, Secure Hash Algorithm SHA-512;Message Authentication Codes– Requirements, Functions, Security of MACs, HMAC; Digital signatures- Schnorr Digital signature scheme;

UNIT-IV: MUTUAL TRUST **(10 Periods)**

Key Management and Distribution: Symmetric key distribution using symmetric and asymmetric encryption, Distribution of public keys, X.509 certificates, Public key infrastructure.

User Authentication: Remote user authentication principles, Kerberos, Personal identity verification.

UNIT-V: NETWORK AND INTERNET SECURITY **(10 Periods)**

Transport Level Security: Web security considerations, Transport layer security, HTTPS.

Electronic Mail Security: S/MIME, Pretty Good Privacy, DNSSEC.

IP Security: Overview, Policy, Encapsulating security payload.

Total Periods: 45

Topics for self study are provided in lesson plan

TEXT BOOK:

1. William Stallings, *Cryptography and Network Security: Principles and Practice*, 8th Edition, Pearson, 2020.

REFERENCE BOOKS:

1. William Stallings, *Network Security Essentials: Applications and Standards*, 6th Edition, Pearson, 2018.
2. Douglas R. Stinson, Maura B. Paterson, *Cryptography: Theory and Practice*, 4th Edition, CRC Press, 2018.
3. Atul Kahate, Cryptography and Network Security, 3rd Edition, McGraw Hill, 2017.

ADDITIONAL RESOURCES

- https://nptel.ac.in/courses/106105031/
- https://www.udemy.com/introduction-to-cryptography-online-course-rahsoft-crypto-certificate/
- https://www.coursera.org/learn/asymmetric-cryptography
- https://www.khanacademy.org/computing/computer-science/cryptography

III B.Tech. - II semester

(16BT71205) CRYPTOGRAPHY AND NETWORK SECURITY

(Interdisciplinary Elective-2)

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

PREREQUISITES:--

COURSE DESCRIPTION: Principles and Practice of Cryptography and Network Security; Classical Systems; Symmetric Block Ciphers; Public-key Cryptography; Hash Functions; Authentication; Key Management; Key Exchange; Signature Schemes; E-mail; Web Security; Malicious Software; Intrusion Detection; Phishing and Identity Theft.

COURSE OUTCOMES:

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

CO1. Demonstrate knowledge on:
- Cryptographic algorithms and their mathematical models
- Message Authentication
- Digital Signatures
- Malicious Software
- Intrusion Detection
- Phishing and Identity Theft

CO2. Analyze vulnerabilities and threats on information systems based on various security parameters

CO3. Apply security and privacy methods to protect and prevent cyber crimes

CO4. Solve information privacy issues using encryption and digital signatures

CO5. Use firewall and PGP to protect network and e-mail respectively

CO6. Follow standards in implementation of network security

DETAILED SYLLABUS:

UNIT-I: CLASSICAL ENCRYPTION TECHNIQUES (08 Periods)

Introduction: Services, Mechanisms, and Attacks Concepts, The OSI Security Architecture, Model for Network Security.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques-Ceaser Cipher, Hill Cipher, Poly and Mono Alphabetic Cipher, Transposition Techniques.

UNIT-II: BLOCK CIPHERS AND PUBLIC-KEY CRYPTOGRAPHY (09 Periods)

Block Ciphers and the Data Encryption Standard: Block Cipher Principles, The Data Encryption Standard (DES), The Strength of DES, Block Cipher Design Principles, Block Cipher Modes of Operation.

Public-Key Cryptography: Principles of Public-Key Cryptosystems, the RSA Algorithm, Diffie-Hellman Key Exchange.

UNIT-III: MESSAGE AUTHENTICATION CODES, HASH FUNCTIONS, AND DIGITAL SIGNATURES (09 Periods)

Message authentication codes: Message Authentication Requirements, Message Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs, Hash algorithms-SHA, HMAC.

Digital Signatures: Digital Signatures and The Indian IT Act, Digital Signature Standard (DSS), Authentication applications- Kerberos.

UNIT-IV: ELECTRONIC MAIL SECURITY, **IP SECURITY AND WEB SECURITY** **(09 Periods)**

Electronic Mail Security: Pretty Good Privacy (PGP).
IP Security: IP Security Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations.
Web Security: Web security Considerations**,** Secure Sockets Layer (SSL),Transport Layer Security (TLS), Secure Electronic Transaction.

UNIT-V: MALICIOUS SOFTWARE, INTRUSION DETECTION, PHISHING AND IDENTITY THEFT (10 Periods)

Malicious Software: Spywares, Viruses and Worms, DoS and DDoS attacks and Countermeasures.
Intrusion Detection: Key loggers,Intrusion Detection, Password Management-Password Protection, Password selection; Firewall Design Principles, Trusted Systems.
Phishing and Identity Theft: Proxy Servers, Anonymizers, Phishing and Identity Theft (ID Theft).

Total Periods: 45

TEXT BOOKS:

1. William Stallings, *Cryptography and Network Security Principles and Practice,*Pearson Education, 4th Edition, 2010.
2. Nina Gobole, Sunit Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India, 2011.

REFERENCE BOOK:

1. Behrouz A Forouzan and Debdeed Mukhopadhyay*, Cryptography and Network Security*, McGraw Hill Education, 2ndEdition, 2010.

III B. Tech. – II Semester

(19BT50207) COMPUTER ORGANIZATION AND ARCHITECTURE

(Inter Disciplinary Elective-1)

(Common to ECE, EEE & EIE)

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

PRE-REQUISITES: A course on Digital Electronics.

COURSE DESCRIPTION: Concepts of computer structure, architecture and organization, Memory systems, Computer Arithmetic, 8085 Architecture, programming and Peripherals interfacing, Register transfer Hardwired control unit and Microprogrammed control unit.

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

CO1: Understand the functional aspects of various functional units of a computer and also develop memory architecture of primary storage devices of required capacity.

CO2: Understand the architecture and pin description of 8085 microprocessor and analyze the instruction cycle of various instructions using timing diagram.

CO3: Develop optimized programs using 8085 assembly instructions for simple programs, memory and IO peripheral interface.

CO4: Design of hardwired and microprogrammed control using by understanding the concept of computer arithmetic and organization.

DETAILED SYLLABUS:

UNIT-I: STRUCTURE OF COMPUTERS AND MEMORY SYSTEMS (07 Periods)

Structure of Computers: Computer Types, Functional Units, Basic Operational concepts, Bus Structures, Software and Performance.Memory System: Internal organization of memory chips—S SRAM, DRAM, ROM and cache memory, Memory hierarchy—speed, size and cost. Auxiliary memory—Magnetic disk, Flash memory.

UNIT-II: 8085 ARCHITECTURE (11 Periods)

Microprocessor evolution and types, introduction to 8085 architecture, Pin description, Register Organization, Timing Diagram, Instruction Set: Data transfer, arithmetic and logic, branch control, I/O and machine control instructions.

UNIT-III: 8085 PROGRAMMING AND INTERFACING (10 Periods)

Addressing modes, Interrupts of 8085, Simple programs, Interfacing– Memory interfacing, memory mapped I/O and I/O mapped I/O, Programble peripheral interface IC 8255: Internal architecture and Modes of operation.

UNIT-IV: COMPUTER ORGANISATION **(08 Periods)**

Organization—Register Transfer, Bus and memory transfers, Instruction Codes, Stored Program Organization, Indirect Address, Computer registers, Common Bus System, Computer Instructions, Instruction Set Completeness, RISC Vs CISC processors, Timing and control and Instruction cycle.

UNIT-V: MICRO-PROGRAMMED CONTROL AND PIPELINING HAZARDS

(09 Periods)

Microprogrammed Control: Control memory, address sequencing, Microprogram Example, design of control unit; Pipelining: Basic concepts, Data Hazards, Instruction Hazards, Out of order execution.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. M. Moris Mano, *Computer System Architecture*, Pearson/PHI, 3rd edition, 2008.
2. Ramesh S Gaonkar, *Microprocessor - Architecture, Programming and Applications with the 8085*, Penram International Publishing Private Limited, 5th edition, 2007.

REFERENCE BOOKS:

1. Carl Hamacher, ZvonksVranesic, SafeaZaky, *Computer Organization*, Mc Graw Hill, 5thedition, 2002.
2. William Stallings, *Computer Organization and Architecture*, Pearson/PHI, 6th edition, 2003.

ADDITIONAL LEARNING RESOURCES:

1. NPTEL_CAO: https://nptel.ac.in/courses/106/105/106105163/.
2. Coursera: https://www.coursera.org/learn/comparch
3. EDX : https://www.edx.org/learn/computer-architecture