SREE VIDYANIKETHAN ENGINEERING COLLEGE
(AUTONOMOUS)
SreeSainath Nagar, Tirupati

Department of Electronics and Instrumentation Engineering

Supporting Document for 1.1.2

Syllabus Revision carried out in 2019

Program: **B.Tech.- Electronics and Instrumentation 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 has been changed (20% and more)

S. No.	Course Code	Name of the course	Percentage of Syllabus changed	Page Number in which Details are Highlighted
1.	19BT31031	Instrumentation workshop	100	4
2.	19BT41031	Industrial Instrumentation Lab	25	6
3.	19BT30402	Electronic Devices and Circuits	20	11
4.	19BT30432	Electronic Devices and Circuits Lab	50	15
5.	19BT40402	Electronic Circuit Analysis and Design	20	17
6.	19BT40403	Linear and Digital IC Applications	100	19
7.	19BT40432	Electronic Circuit Analysis and Design Lab	50	21
8.	19BT40433	Linear and Digital IC Applications Lab	80	23
9.	19BT50409	Green Technologies	35	25
10.	19BT1AC01	Spoken English	100	27
11.	19BT1BS02	Biology for Engineers	100	29
12.	19BT1HS01	Communicative English	20	31
13.	19BT1BS03	Engineering Physics	40	35
14.	19BT1BS31	Engineering Physics Lab	30	39
15.	19BT1BS04	Engineering Chemistry	50	41
16.	19BT1BS32	Engineering Chemistry Lab	25	46
17.	19BT2BS01	Transformation Techniques and Linear Algebra	20	50
18.	19BT4BS01	Material Science	100	54
19.	19BT4HS05	Gender & Environment	100	56
20.	19BT4HS09	Life Skills	100	58
21.	19BT4HS11	Professional Ethics	100	60
22.	19BT4HS12	Women Empowerment	100	62
23.	19BT40107	Sustainable Engineering	100	64
24.	19BT50502	Artificial Intelligence	100	66
25.	19BT61531	Internet of Things Lab	100	68
26.	19BT51032	Socially Relevant project-1	100	70
27.	19BT503AC	Foundations of Entreprenuership	100	71
28.	19BT61003	Industrial Data Communications	100	73

S. No.	Course Code	Name of the course	Percentage of Syllabus changed	Page Number in which Details are Highlighted
29.	19BT60402	Microcontrollers	100	75
30.	19BT50406	FPGA Architectures and applications	100	77
31.	19BT60405	Digital IC Design	100	79
32.	19BT60502	Machine Learning	100	81
33.	19BT60432	Microcontrollers lab	100	83
34.	19BT61032	Socially Relevant project-2	100	85
35.	19BT5MC01	Universal Human Values	100	86
36.	19BT71002	Programmable Logic Controller	60	90
37.	19BT60410	Wireless Sensor Networks	100	92
38.	19BT71006	Identification and Adaptive Control	100	94
39.	19BT71033	Internship	100	96
40.	19BT710AC	Process Plant Layout and Piping Design	100	97
		Average**%(A)**	78.125	
		Total No. of Courses in the Program**(T)**	119	
		No. of Courses where syllabus (more than 20%) has been changed**(N)**	40	-
		Percentage of Syllabus content change in the courses**(C)=(AxN)/100**	31.25	
		Percentage of Syllabus changed in the program(P)=(C/T)*100	**26.26**	

DEAN (Academics)

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

PRINCIPAL

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(AUTONOMOUS)
Sree Sainath Nagar, A. RANGAMPET
Chittoor (Dist.) - 517 102, A.P., INDIA.

II B. Tech. – I Semester

(19BT31031) **INSTRUMENTATION WORKSHOP**

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

PRE-REQUISITES: Courses on Basics of Electrical and Electronic Engineering, Network Analysis

COURSE DESCRIPTION: Test various instrumentation devices; measure the current, voltage and power; solder and de-solder the components; PCB design and electrical wiring diagram for instrument panel.

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

CO1. Demonstrate knowledge on testing of various components using measuring instruments.
CO2. Develop printed circuit boards for simple electronic circuits.
CO3. Calibrate voltmeters and ammeters for specified range.
CO4. Apply simulation tool to develop electronic circuits.
CO5. Design electric circuit wiring loop with IEEE Standards for the given application.
CO6. Work independently and in teams to solve problems with effective communication.

LIST OF EXPERIMENTS:

Minimum of TEN experiments are to be conducted.

1. Testing of resistors, capacitors, diode, Transistor, Different SCRs, Relay, and Contactors.
2. Measure voltage, time period and phase difference of a circuit using CRO.
3. Dismantle & assemble CRO and Function generator and identification of components present.
4. Calibration exercise for voltmeter and ammeter.
5. Design a printed circuit board for a given circuit.
6. Solder and de-solder electronic components on PCB as well solder earth connection.

7. Test pressure/flow/level/temperature switch.
8. Test proximity & limit switch.
9. Test assembled instrument loop wiring for various parameters and faults.
10. Introduction to surface mount device.
11. Introduction to an electronic design and simulation package.
12. Electric circuit wiring diagram using IEEE standard symbols for one instrument panel application.
13. Study of flow and level transmitters.

TEXTBOOKS:

1. K. Padmanabhan and P. Swaminathan, *Electronic Components*, Laxmi Publications, 2nd edition, 2006.
2. Thomas Petruzzellis, *Build Your Own Electronics Workshop,* McGraw-Hill, 2005
3. H S Kalsi, *Electronic Instrumentation and Measurements,* McGraw-Hill, 4th edition, 2019.
4. Curtis D. Johnson, *Process Control Instrumentation Technology*, Pearson Education Limited, 8th edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. http://www.instrumentationworld.com/instrumentation_tutorial.htm
2. http://www.pc-education.mcmaster.ca/Instrumentation/go_inst.htm

II B. Tech. – II Semester

(19BT41031)**INDUSTRIAL INSTRUMENTATION LAB**

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

PRE-REQUISITES: Electrical and Electronic Measurements, Transducers in Instrumentation

COURSE DESCRIPTION: LabVIEW basics; Circuit design and simulation in Multisim; Measurement of Torque, Temperature, Viscosity, Humidity, Pressure, Level and Flow.

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

CO1. Apply the LabVIEW functions in programming.

CO2. Simulate electrical circuits using Multisim.

CO3. Analyze the characteristics of measuring instruments by applying the fundamental concepts.

CO4. Develop PC based data logger systems by interfacing hardware devices like myRIO, ELVIS and required sensors for measurement.

CO5. Design and solve problems in the measurement of parameters for required specifications.

CO6. Work independently and in teams to solve problems with effective communication.

LIST OF EXPERIMENTS:

Minimum TEN experiments are to be conducted.

1. LabVIEW Basics : Practice of Virtual Instrumentation Course content

   Numeric, Boolean, Strings, For, While, Case Structures, Arrays, Clusters, Sequence: Flat, Stacked, Formula Node, SubVI's, Local/Global Variables.

2. Data Acquisition and analysis using Graphs, Charts, myRio/ELVIS and LabVIEW.

3. Data Logging and analysis of simulated or acquired signals using File I/O.

4. Design and verification of converters using op-amps in Multisim.

   A) I to V

   B) V to I

5. Design and verification of resistance measurement, conversion in Multsim using

   A) Op-Amp

   B) Wheatstone bridge for improving sensitivity, compensation and linearity.

6. Measurement of Humidity.
7. Measurement of Flow.
8. Measurement of Torque.
9. Measurement of Viscosity.
10. Design and verification of level measurement using LabVIEW & myRIO.
11. Design and verification of Speed measurement using LabVIEW & myRIO.
12. Design and verification of temperature measurement using LabVIEW & ELVIS.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Travis Jeffrey, Jim Kring, *LabVIEW for Everyone*, Pearson Education, 2009.
2. Johnson Jennings, *LabVIEW Graphical Programming*, McGraw Hill, 4th Edition, 2014.
3. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International Pvt. Ltd., 4th Edition, 2010.
4. D. Patranabis, *Principles of Industrial Instrumentation*, TMH, 3rd Edition, 2010.
5. Ramon Pallás Areny, John G. Webster, *Sensors and Signal Conditioning*, John Wiley and Sons, 2nd Edition, 2000.
6. A. K. Sawhney, *A Course in Electrical and Electronics Measurements and Instrumentation*, Dhanpat Rai and Sons, 19th edition, 2011.

SOFTWARE/Tools used:

1. NI Labview 2018
2. NI Circuit Design Suite – Multisim 2019
3. NI myRIO
4. NI ELVIS

ADDITIONAL LEARNING RESOURCES:

1. https://www.ni.com/pdf/manuals/320999e.pdf
2. https://ieeexplore.ieee.org/document/8960023/
   A Different way of Level measurement for PBL in Education of Students using NI-
   LabVIEW, Multisim and MyRIO
3. http://www.ni.com/pdf/manuals/376047c.pdf

4. https://www.clemson.edu/cecas/departments/ece/document_resource/undergrad/lab_manuals/NI_ELIVS_II_Orientation_Manual.pdf
5. http://www.ni.com/pdf/manuals/374629c.pdf
6. http://www.ni.com/pdf/manuals/373363f.pdf

III B. Tech. – I Semester

(16BT51031) **INDUSTRIAL INSTRUMENTATION LAB**

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

PRE-REQUISITES: A Course on Industrial Instrumentation -II.

COURSE DESCRIPTION: Measurement of Force, Torque, Velocity, Acceleration, Pressure, Temperature, Flow Level, Moisture, Viscosity, Density; Electrical and intrinsic safety.

COURSEOUTCOME: Onsuccessfulcompletionofthecourse, students will be ableto

CO1. Demonstrate knowledge for measurement of different industrial process parameters.

CO2. Analyze the functionality of different types of instruments used for various industrial applications.

CO3.Design suitable signal conditioning circuits for measuring instruments.

CO4. Solve engineering problems pertaining to measurement of industrial process parameters to provide feasible solutions.

CO5. Select appropriate sensor and measuring technique for the measurement of industrial parameters.

CO6. Practice professionalism in engineering and deliver efficient & cost effective, maintainable products by understandingtheneedsofsociety,safetyforsustainable development.

CO7. Follow ethics while developing industrial instruments.

CO8.Function effectively as an individual and work as part of a group in developing industrial instruments.

CO9.Communicate effectively among people about the effects ofmaterials,mechanicaldesignonelectricalparameters and viceversa.

LIST OF EXPERIMENTS:

Minimum of Eleven experiments to be conducted.

1. Measurement&Calibrationofliquidlevel&analysisof differenttechniques.
2. Measurementofspeed&analysisofdifferent techniques.
3. Measurement ofViscosity.
4. Measurement ofDensity.
5. Measurement ofHumidity.
6. Measurement ofTorque.
7. Design of V to Iconverter.
8. Design of I to Vconverter.
9. Designofcircuittomeasureresistanceandcalibrate to respective voltage.
10. MeasurementoftemperatureusingThermocouple.
11. Calibrationandverificationofdischargecoefficientof orificeplate.
12. Calibration&measurementofpressure.
13. BasicProgramminginLabVIEW.
14. DataAcquisition,calibrationandanalysisusing LabVIEW.
15. Dataloggingandanalysis.

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

(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 Baseconfiguration 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. – 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. – 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

(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

(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

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.

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:

- Tointroduce 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 introducethetechniquesused 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 writingskills 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 followingexperiments.

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.

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 (10Periods)

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.

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.

III B. Tech. – I Semester

(19BT50502) **ARTIFICIAL INTELLIGENCE**

(Inter Disciplinary Elective-1)

(Common to CSE, CSSE and EIE)

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

PRE-REQUISITES: A Course on Discrete Mathematical Structures.

COURSE DESCRIPTION: Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, Probabilistic reasoning, Represent knowledge and reason under uncertainty, Robotics, Ethics and safety in AI.

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

CO1. Architect intelligent agents using artificial intelligence techniques and principles.

CO2. Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.

CO3. Select and apply appropriate knowledge representation to build Bayesian network models to reason under uncertainty.

CO4. Investigate robot hardware and frameworks for intelligent robotic perception.

CO5. Demonstrate knowledge on ethicalimplications of intelligent machines for providing privacy, trust, security and safety.

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE (10 Periods)

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agentsand environments, The concept of rationality, Structure of agents.

UNIT–II: PROBLEM SOLVING BY SEARCHING (9 Periods)

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

UNIT–III: SEARCH IN COMPLEX ENVIRONMENTS (9 Periods)

Local search algorithms and optimization problems – Hill-climbing search, Simulated annealing, Local beam search, Evolutionary algorithms; Optimal decisions in games – Theminimax search algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

UNIT–IV: PROBABILISTIC REASONING (9 Periods)

Representing Knowledge in an uncertain domain, Semantics of Bayesian networks, Probabilistic reasoning over time – Timeand uncertainty, Inference in temporal models, Hidden Markov models, Kalman Filter.

UNIT–V: ROBOTICS, ETHICS AND SAFETY IN AI **(8 Periods)**

Robotics: Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

Ethics and Safety in AI: Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOK:

1. Stuart Russell, Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 4thEdition, 2020.

REFERENCE BOOKS:

1. Stephen Lucci, Danny Kopec, *Artificial Intelligence in the 21st Century*, Mercury Learning and Information, 3rd Edition,2018.
2. Rich, Knight, Nair,*Artificial intelligence*, Tata McGraw Hill, 3rdEdition, 2009.
3. Deepak Khemani, *A First Course in Artificial Intelligence*, McGraw Hill, 2017.
4. Saroj Kaushik,*Artificial Intelligence,* Cengage Learning, 2011.

ADDITIONAL RESOURCES:

1. https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence
2. http://aima.cs.berkeley.edu/
3. https://ai.google/education/
4. https://www.coursera.org/courses?query=artificial%20intelligence
5. https://www.edureka.co/blog/artificial-intelligence-with-python/

III B. Tech. – I Semester

(19BT61531) INTERNET OF THINGS LAB

(Common to ECE, EEE and 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 HakinCassimally, *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

(19BT51032) SOCIALLY RELEVANT PROJECT-1

(Common to ECE, EEE and EIE)

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.

OURSE OUTCOMES: After successful completion of the 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

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

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

PRE-REQUISITES: -

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 **(6 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 **(6 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 **(6 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 **(6 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 **(6 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

(19BT61003) INDUSTRIAL DATA COMMUNICATIONS

(Professional Elective-2)
(Common to EEE and EIE)

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

PRE-REQUISITES: A course on Computer Networks

COURSE DESCRIPTION: Data networks, inter-networking and serial communications, HART and Field buses, MODBUS, PROFIBUS, Communication protocol, industrial Ethernet and wireless communication.

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

CO1. Demonstrate knowledge on fundamentals of industrial data communication.

CO2. Analyze interfacing standards EIA-232 and EIA-485.

CO3. Select a communication protocol for particular application.

CO4. Demonstrate knowledge on foundation field bus.

DETAILED SYLLABUS:

UNIT-I: INDUSTRIAL DATA COMMUNICATION METHODOLOGY **(9 Periods)**

Modern instrumentation and control systems, Open systems interconnection (OSI) model, Protocols, Standards Common problems and solutions, General comments on troubleshooting, a specific methodology, Grounding/shielding and noise, Sources of electrical noise, Electrical coupling of noise, Shielding, Cable ducting or raceways, Cable spacing, earthing and grounding requirements, Suppression techniques, Filtering.

UNIT-II: EIA-232 & EIA-485 INTERFACE STANDARD **(9 Periods)**

EIA-232 interface standard: the major elements of EIA-232, Half-duplex operation of the EIA-232 interface, EIA/TIA-232 revisions, Limitations of EIA-232, troubleshooting: Introduction, Typical approach, Test equipment, Typical EIA-232 problems.EIA-485 interface standard, Troubleshooting. Introduction, EIA-485 vs EIA-422, EIA-485 installation, Noise problems, Test equipment.

UNIT-III: HART PROTOCOL & AS-INTERFACE (AS-I) **(7 Periods)**

Introduction to HART and smart instrumentation, HART protocol: Physical layer, Data link layer, Application layer, troubleshooting. Introduction to AS-interface, Layer 1 – the physical layer, Layer 2 – the data link layer, Operating characteristics, Troubleshooting: Introduction, Tools of the trade.

UNIT-IV: PROFIBUS PA/DP/FMS PROTOCOL **(11 Periods)**

Introduction, ProfiBus protocol stack: Physical layer (layer 1), Data link layer (layer 2), Application layer, Fieldbus message specification (FMS), Lower layer interface (LLI), Fieldbus management layer (FMA 7), The ProfiBus communication model, Relationship between application process and communication, Communication objects, Performance, System operation: Configuration, Data transfer between DPM1 and the DP-slaves,

Synchronization and freeze modes, Safety and protection of stations, Mixed operation of FMS and DP stations, Troubleshooting: Introduction, Troubleshooting tools.

UNIT-V: FOUNDATION FIELDBUS **(9 Periods)**

Introduction to Foundation Fieldbus, The physical layer and wiring rules, The data link layer, The application layer, The user layer, Error detection and diagnostics, High-speed Ethernet (HSE), Good wiring and installation practice with Fieldbus: Termination preparation, Installation of the complete system, Troubleshooting: Introduction, Power problems, Communication problems, Foundation Fieldbus test equipment.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOK:

1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, Practical Industrial Data Networks Design, Installation and Troubleshooting' Newnes Publication, Elsevier First Edition, 2004.

REFERENCE BOOKS:

1. Sunit Kumar Sen, Fieldbus and Networking in Process Automation, CRC Press.,1st edition, 2014.
2. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall of India Pvt. Ltd., 5th Edition. 2011.
3. Theodore S Rappaport, Wireless Communication: Principles and Practice, Prentice Hall of India 2nd Edition, 2001.
4. William Stallings, Wireless Communication & Networks, Prentice Hall of India, 2nd Edition, 2005.

ADDITIONAL LEARNING RESOURCES:

1. http://gtu-info.com/Subject/171703/IDC/Industrial_Data_Communication/Syllabus
2. https://www.gtu.ac.in/syllabus/NEW_Diploma/Sem6/3361704.pdf
3. https://rmd.ac.in/dept/eie/notes/7/IDN/syllabus.pdf
4. https://www.inspirenignite.com/anna-university/anna-university-b-tech-ic-r13-7th-sem-industrial-data-networks-syllabus/

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. – 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. – 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

(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

(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: -

III B. Tech. – II Semester

(19BT61032) SOCIALLY RELEVANT PROJECT-2

(Common to ECE and EIE)

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 the 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.

IV B. Tech. – I Semester
(16BT71003) INDUSTRIAL AUTOMATION

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

PRE-REQUISITES: A course on Switching Theory and Logical Design.

COURSE DESCRIPTION: Basics of Programmable Logic Controller (PLC); PLC Programming Languages; PLC intermediate Functions ; Concepts of SCADA; Concepts of DCS; Communication networks for DCS; Industrial Data Networks.

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

CO1. Demonstrate knowledge on Programmable Logic Controller Architecture, DCS and SCADA.
CO2. Analyze various methods of developing algorithms for PLC, SCADA and DCS.
CO3. Design suitable accessories in process automation.
CO4. Analyze the information to provide effective solution for real time problems in automation of process industries.
CO5. Select appropriate techniques/tools for providing Automation.
CO6. To follow ethics while selecting the standards and protocols in industrial automation.

DETAILED SYLLABUS:

UNIT –I: PROGRAMMABLE LOGIC CONTROLLER (8 Periods)
Programmable Logical Controller, Hardware, Architecture of PLC system, Power supplies and Isolators, Selection of PLC Systems- Allen Bradley, Omron, Mitsubishi. IEC Standard, Programming PLC's, Networking of PLC's, Advantages and Disadvantages of PLC.

UNIT –II: PLC INTERMEDIATE FUNCTIONS (10 Periods)
Ladder and functional block programming, Logic functions, Functional blocks, Timer functions, Counter functions, Register basics, Arithmetic functions, Number Comparison Functions, Skip and MCR functions, Sequencer functions, PID functions.

UNIT –III: DISTRIBUTED CONTROL SYSTEM (9 Periods)

Overview of Distributed Control System, DCS Software configuration, DCS Communication, DCS Supervisory Computer tasks, DCS Integration with PLCs and Computers. Communications in Distributed Control Systems – CSMA/CD Protocol, Token ring, Token Bus Communication Topology. Selection of DCS - Mitsubishi, ABB, Emerson Electric.

UNIT –IV: SUPERVISORY CONTROL AND DATA ACQUISITION (8 Periods)

Overview of SCADA, Elements of SCADA system, Remote terminal unit: Communication Interface, Discrete control, Analog control. Master terminal unit, Operator interface. Selection of SCADA Systems- Siemens, Schneider.

UNIT –V: HART AND FIELD DATA NETWORKS (10 Periods)

HART protocol: Introduction, Method of operation, structure, operating conditions, HART communication protocol, communication modes, HART networks, FBIO interface, HART commands, HART field controller implementation, HART OSI model. Field bus: Introduction, General field bus architecture, Basic requirements of field bus standard, Field bus topology, interoperability, interchangeability.

Total Periods: 45

TEXT BOOKS:

1. John W. Webb and Ronald A. Reis, *Programmable Logic Controllers-Principles and Applications*, Pearson Education, 5th Edition, 2002.
2. S.K. Singh, *Computer Aided Process Control*, PHI, 2009.
3. Stuart Boyer A, *Supervisory control and data Acquisition*, ISA, 4th Edition, 2009.

REFERENCE BOOKS:

1. Bolton. W, *Programmable Logic Controllers*, 5th edition, 2009.
2. Romily Bowden, *HART application guide and the OSI communication foundation*, 1999.
3. M. Chidambaram, *Computer Control of Processes*, Narosa Publications, 2nd Edition, 2003.

IV B. Tech. – I Semester

(19BT71002) PROGRAMMABLE LOGIC CONTROLLER

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 PLC, timers, counters and sequences used in PLC, data handling functions, bit Patterns, advanced PLC functions.

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

CO1. Demonstrate knowledge on programmable logic controllers, various functions of PLCs.

CO2. Analyse the process of automation using PLC functions.

CO3. Develop programs for industrial applications to automate the process using PLC functions.

CO4. Solve real time problems in industries using PLCs.

DETAILED SYLLABUS:

UNIT-I: PLC BASICS AND PROGRAMMING (9 Periods)

Introduction, PLC advantages, disadvantages, 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, Programming examples using contacts and coils, Fail-Safe Circuits, Drill press operation.

UNIT-II: LADDER DIAGRAMS, REGISTERS AND TIMER FUNCTIONS (9 Periods)

Digital logic gates, Boolean algebra PLC programming, Conversion examples. Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system. Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers. Timer function & Industrial applications, Counter functions& industrial applications.

UNIT-III: INTERMEDIATE AND DATA HANDLING FUNCTIONS (9 Periods)

Intermediate functions: Arithmetic functions, Number comparison functions, Number conversion functions. Skip, Master control relay, Jump functions. PLC data move systems: Move function, FIFO, FAL, & Sweep functions and their applications.

UNIT-IV: PLC FUNCTIONS WORKING WITH BITS (8 Periods)

Bit Pattern, Changing a register bit status, Shift register functions and applications, Sequencer functions and applications, Controlling of two-axis & three axis Robots with PLC, Matrix functions.

UNIT-V: ADVANCED PLC FUNCTIONS **(10 Periods)**

Analog modules & systems, Analog signal processing, Multi-bit Data Processing, Analog output application examples, PID principle, position indicator with PID control, PID Modules, PID tuning, PID functions, Networking of PLCs, Alternative Programming languages.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK:

1. John W. Webb & Ronald A. Reiss, *Programmable Logic Controllers Principles and Applications*, 5th edition, PHI 2009.

REFERENCE BOOKS:

1. Frank D. Petruzella, *Programmable Logic Controller*, 3rd edition, Tata Mc-Graw Hill, 2010.
2. M.Chidambaram, *Computer Control of Process*, Narosa 2003.

ADDITIONAL LEARNING RESOURCES:

1. https//openautomationsoftware.com/use cases /allen bradley wpf scada/
2. https//new.siemens.com/global/en/products/automation/industrysoftware/automationsoftware/scada.html
3. https//ab.rockwellautomation.com/Programmable Controllers

IV B. Tech. – I Semester

(19BT60410) WIRELESS SENSOR NETWORKS

(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 and Computer Networks.

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 (7 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 **(9 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 **(9 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.

IV B. Tech. – I Semester

(19BT71006) IDENTIFICATION AND ADAPTIVE CONTROL

(Professional Elective–5)

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

PREREQUISITE: A course on Control Systems.

COURSE DESCRIPTION: Nonparametric identification methods for based on system response, frequency response and correlation, Time-invariant system identification for linear and nonlinear static and dynamic systems, Time-varying system identification for linear and nonlinear systems, Schemes of adaptive control.

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

CO1. Apply the system identification concepts to analyze the response of systems.

CO2. Apply the identification methods to model Time-Invariant static and dynamic systems.

CO3. Apply the identification methods to model Time-Variant static and dynamic systems.

CO4. Demonstrate the concepts of adaptive control

DETAILED SYLLABUS:

UNIT-I: NONPARAMETRIC IDENTIFICATION **(9 Periods)**

Impulse response identification, step response identification, impulse response identification using step responses, sine-wave response identification, empirical transfer function identification, frequency analysis using correlation techniques.

UNIT-II: TIME-INVARIANT SYSTEM IDENTIFICATION-STATIC SYSTEM

(9 Periods)

Linear static system: Linear regression, least-squares estimation, bias, accuracy, identifiability, errors-in-variables problem.

Nonlinear static system: nonlinear regression, nonlinear least-squares estimation, iterative solutions, accuracy, model reparameterization (static case), maximum likelihood estimation.

UNIT-III: TIME-INVARIANT SYSTEM IDENTIFICATION–DYNAMIC SYSTEM

(9 Periods)

Linear dynamic system: transfer function models, equation error identification, output error identification, prediction error identification, model structure identification, subspace identification, linear parameter-varying model identification, orthogonal basis functions.

Nonlinear dynamic systems: simulation model, parameter sensitivity, nonlinear regressions, iterative solution, model reparameterization (dynamic case).

5.

UNIT-IV: TIME-VARYING SYSTEM IDENTIFICATION **(9 Periods)**

Linear regression models: Recursive estimation, time-varying parameters, multi output case, resemblance with Kalman filter. Nonlinear static system: State-space representation extended Kalman filter.

Linear dynamic systems: Recursive least-squares estimation, recursive prediction error estimation, smoothing.

UNIT-V: ADAPTIVE CONTROL **(9 Periods)**

Indirect adaptive control structure, direct adaptive control structure, model reference adaptive control- MIT rule, MRAC using Lyapunov theory, direct and indirect deterministic self tuning regulator, stochastic self tuning regulators.

Total: 45 Periods

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Karel J Keesman, *System Identification: An Introduction*, Springer-Verlag London Limited, 2011
2. K.J.Astrom and B. Writtenmark, *Adaptive Control*, 2nd edition, Pearson Education, 2001.

REFERENCE BOOKS:

1. Shankar Sastry and Marc Bodson, *Adaptive Control: Stability, Convergence and Robustness*, PHI, New Jersey, 1989.
2. I.J. Nagrath and M. Gopal, *Control System Engineering*, 4th edition, New Age International Publishers, 2006.
3. Kannan M. Moudgalya, *Digital Control*, John Wiley & Sons, Ltd., 2007.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108102113/
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-435-system-identification-spring-2005/lecture-notes/
3. https://ocw.tudelft.nl/courses/system-identification-and-parameter-estimation/subjects/1-introduction-course-system-identification-parameter-estimation/

IV B. Tech. – I Semester

(19BT71033) 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

(19BT710AC) PROCESS PLANT LAYOUT AND PIPING DESIGN

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

PRE-REQUISITES: A Course on Process Control Instrumentation.

COURSE DESCRIPTION: Piping and Instrumentation Diagrams, Standards, Symbols, Pipes, Fittings, ASME codes.

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

CO1. Demonstrate piping and instrumentation diagrams, standards involved and its preparation.

CO2. Design pipes to industry requirements by applying ASME codes

CO3. Select different fittings for instruments installation used for the preparation of piping and instrumentation diagrams.

CO4. Sketch piping and instrumentation diagrams per ASME codes to industry requirements.

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF PROCESS PLANT LAYOUT **(6 Periods)**

Plant layout fundamentals, procedures and workflow methods used in process plant layout, Specifications, Physical quantities and units in plant layout.

Equipment Used in Process Plants: Introduction, Process equipment, Mechanical equipment (Towers and Reactors).

UNIT-II: FUNDAMENTALS OF PIPING SYSTEM **(6 Periods)**

Introduction to piping systems, Evolution of piping Manufacturing methods, Piping materials and selection, Pipe dimensioning, Schedule numbers, Common piping abbreviations, Major organizations for standards, Commonly American code in piping ASME/ANSI, Common abbreviations etc.

UNIT-III: TYPE OF FITTINGS, FLANGES & MAJOR VALVES **(6 Periods)**

Type of Fittings: Elbows, weld tee, stub in, couplings, reducers, weld cap, screwed and socket welded fittings, Pipe nipples, flanged fittings and use of fittings.

Type Flange: Types, P-T ratings and facings, Gaskets, bolts and nuts.

Major Valves: Types, valve symbols, Materials operations, applicability, codes and specifications.

UNIT-IV: PIPING ENGINEERING FLOW DIAGRAM AND ITS CONCEPT (6 Periods)

Uses of flow diagrams, process flow diagrams, mechanical flow diagrams, utility, piping symbols, line symbols, piping isometrics general arrangement drawings-sections/elevations/ detail drawings plot plan procedures.

UNIT-V: PIPING AND INSTRUMENTATION DIAGRAM (P&ID) (6 Periods)

Fundamentals of P&ID, study of P&ID, stages of development of P&ID, process and instrumentation diagrams, process equipments, symbols usage according to industrial practices, Purpose of P&ID in process industrial/plants.

Total Periods: 30

Topics for self-study are provided in the lesson plan

TEXTBOOKS:

1. Ernest E.Ludwig, Applied Process Design for Chemical and Petrochemical Plants Vol-1, Gulf Publishing Company, Hoston, 1989.
2. Max. S. Peters and K.D.Timmerhaus, Plant Design and Economics for Chemical Engineers, McGraw Hill Inc., New York, 1991.

REFERENCES BOOKS:

1. Ed Bausbacher and Roger Hunt, "*Process Plant Layout and Piping Design*", Prentice Hall, 1st Edition, 1993.
2. "Process Piping: *The Complete Guide to ASME B31.3*", American Society of Mechanical Engineers, U.S., Third edition,2009.
3. Brownell, L.E. and Young, E.H., "*Process Equipment Design*", Wiley Eastern India Limited, 1991.
4. Peter Smith, "*The Fundamentals of Piping Design*", Gulf Publishing Company, 2013.
5. Stanley M Wales, "*Chemical Process equipment, selection and design*", Butterworths, series in Chemical Engineering, 1988.
6. Sean Moran, "*Process Plant Layout*", 2nd Edition, Butterworth-Heinemann, November 2016.