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

**Department of Electronics and Instrumentation Engineering**

**Supporting Document for 1.1.2**

# Syllabus Revision carried out in 2016

## Program: B.Tech.- Electronics and Instrumentation Engineering

## Regulations : SVEC-16

*This document details the following:*

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

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

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

| S. No. | Course Code | Name of the course | Percentage of content changed | Page Number in which Details are Highlighted |
|---|---|---|---|---|
| 1. | 16BT31001 | Electrical and Electronic Measurements | 40 | 4 |
| 2. | 16BT31002 | Sensors and Transducers | 20 | 8 |
| 3. | 16BT31031 | Measurements and transducers lab | 15 | 12 |
| 4. | 16BT41001 | Industrial Instrumentation-I | 40 | 15 |
| 5. | 16BT41032 | Control systems Design lab | 100 | 19 |
| 6. | 16BT51002 | Industrial Instrumentation -II | 30 | 21 |
| 7. | 16BT51031 | Industrial Instrumentation -Lab | 100 | 26 |
| 8. | 16BT61001 | ARM Processors and PIC Microcontrollers | 100 | 28 |
| 9. | 16BT61003 | Instrumentation System Design | 100 | 30 |
| 10. | 16BT61031 | ARM processors and PIC Microcontrollers lab | 100 | 32 |
| 11. | 16BT61032 | Process Control lab | 23 | 34 |
| 12. | 16BT71002 | Biomedical Signal Processing | 100 | 37 |
| 13. | 16BT71003 | Industrial Automation | 30 | 39 |
| 14. | 16BT71007 | Instrumentation in petrochemical industries | 100 | 43 |
| 15. | 16BT71008 | Intelligent Control | 70 | 45 |
| 16. | 16BT71010 | System Design using microcontrollers | 100 | 49 |
| 17. | 16BT71032 | Industrial Automation lab | 30 | 53 |
| 18. | 16BT1HS01 | Technical English | 20 | 54 |
| 19. | 16BT1HS31 | English Language Lab | 20 | 58 |
| 20. | 16BT1BS02 | Engineering Physics | 20 | 62 |
| 21. | 16BT2BS01 | Transformation Techniques and Partial Differential Equations | 100 | 67 |
| 22. | 16BT4HS31 | Soft Skills Lab | 100 | 69 |
| 23. | 16BT6HS05 | French Language | 100 | 71 |
| 24. | 16BT6HS06 | German Language | 100 | 73 |
| 25. | 16BT6HS07 | Indian Constitution | 100 | 75 |
| 26. | 16BT6HS08 | Indian Economy | 100 | 77 |
| 27. | 16BT6HS09 | Indian Heritage and Culture | 100 | 79 |
| 28. | 16BT6HS10 | Indian History | 100 | 81 |
| 29. | 16BT6HS11 | Personality Development | 100 | 83 |

| S. No. | Course Code | Name of the course | Percentage of content changed | Page Number in which Details are Highlighted |
|---|---|---|---|---|
| 30. | 16BT6HS13 | Philosophy of Education | 100 | 85 |
| 31. | 16BT6HS13 | Public Administration | 100 | 87 |
| 32. | 16BT60112 | Building Maintenance and Repair | 100 | 89 |
| 33. | 16BT60115 | Environmental Pollution and Control | 40 | 91 |
| 34. | 16BT30431 | Basic Electronics and Digital Design Lab | 100 | 95 |
| 35. | 16BT10232 | Electrical and Electronics Workshop Practice | 100 | 97 |
| 36. | 16BT30251 | Electrical Technology Lab | 36 | 99 |
| 37. | 16BT60305 | Hydraulics and Pneumatics | 100 | 102 |
| 38. | 16BT50308 | Mechatronics | 30 | 104 |
| 39. | 16BT70404 | Advanced Digital Signal Processing | 20 | 109 |
| 40. | 16BT60207 | Advanced Control Systems | 30 | 111 |
| 41. | 16BT70413 | Introduction to Nanoscience and Nanotechnology | 100 | 113 |
| 42. | 16BT60310 | Managing Innovation and Entrepreneurship | 50 | 115 |
| | | Average %**(A)** | 70.57 | - |
| | | Total No. of Courses in the Program **(T)** | 112 | |
| | | No. of Courses where syllabus (more than 20% content) has been changed **(N)** | 42 | |
| | | Percentage of syllabus content change in the courses **(C)=(A x N)/100** | 29.64 | |
| | | **Percentage of Syllabus Content changed in the Program (P)= C/T** | **26.46** | |

**DEAN (Academics)**
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## II B. Tech. – I Semester

## (16BT31001) ELECTRICAL AND ELECTRONIC MEASUREMENTS

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

**PRE-REQUISITES:** Courses on Network Analysis, Engineering Physics.

**COURSE DESCRIPTION:** Construction and principle of operation of Ammeters, Voltmeters, Ohmmeters; Potentiometers; Power meter; Power Factor meter; Energy Meters; Design of Bridges - AC, DC, Frequency and Time measurements.

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

CO1. Demonstrate knowledge in construction and Principle of operation of different instruments used for measurement of
- Voltage
- Current and Resistance
- Power
- Power factor
- Energy measurement
- Frequency and time

CO2. Analyze the performance characteristics of various measuring instruments.

CO3. Design instruments and circuits for measurement of Power, Energy, Power factor, Voltage, Current, Resistance, Capacitance and Inductance.

CO4. Interpret and synthesize data obtained from measuring systems to provide valid conclusions.

CO5. Select appropriate technique to measure Power, Energy, Power factor, Voltage, Current, Resistance, Capacitance and Inductance.

CO6. Apply contextual knowledge to develop measuring instruments used in domestic and industries.

**DETAILED SYLLABUS:**

**UNIT -I: AMMETERS AND VOLTMETERS (12 Periods)**

Classification of analog instruments, Principle of operation of analog instruments, operating forces of electromechanical indicating instruments: deflecting, control and damping; Permanent Magnet Moving Coil (PMMC): Construction, working principle, Expression of torque equation, Errors in PMMC Instruments, Advantage and Disadvantages of PMMC Instruments; Moving Iron Instruments: Classification of Moving Iron Instruments, Construction, working principle and Expression of torque equation; Ammeter: Ammeter shunt, Effect of Temperature Change in Ammeter, Multi-range Ammeters;

Voltmeter: Voltmeter Multipliers, Effect of Temperature Change in Voltmeters, Multi-range Voltmeter, Analog voltmeter: AC voltmeter using rectifiers, true RMS Voltmeter.

**UNIT-II: OHMMETERS, POTENTIOMETERS AND ENERGY METER (9 Periods)**

Ohmmeters: Series type ohmmeter, shunt type ohmmeter, Multimeter. Potentiometers: Standardization, Compton's Potentiometers, Types of AC Potentiometers: Polar types, Coordinate types. Power in D.C Circuits, Power in A.C Circuits. Electrodynamometer wattmeter: Construction, working principle, Torque equation. Single Phase Induction Type Energy Meter: Construction, Working Principle.

**UNIT-III: BRIDGES (9 Periods)**

Measurement of Resistance: Medium Resistance Measurement-Wheatstone bridge, Kelvin Bridge; Low Resistance Measurement-Kelvin double bridge; High Resistance Measurement- Direct deflection methods, Meggar.
Measurement of Inductance: Maxwell Bridge, Hay's Bridge and Anderson Bridge.
Measurement of capacitance: De Sauty's Bridge and Schering bridge, Q-meter.

**UNIT-IV: FREQUENCY AND TIME MEASUREMENTS (8 Periods)**

Digital Frequency Meter - Basic Circuit, Time Base Selector, Start and Stop gate; Circuit for Measurement of Frequency; Simplified Composite Circuit for a Digital Frequency Meter; High Frequency Measurement, Frequency synthesizer; Period Measurement; Ratio and Multiple Ratio Measurements; Time Interval Measurements; Universal Counter Timer.

**UNIT - V: ANALYZERS AND RECORDERS (7 Periods)**

Introduction, Wave analyzers - Frequency selective wave analyzer, Heterodyne wave analyzer; Harmonic Distortion Analyzers, Total Harmonic Distortion; Spectrum analyzers; Recorders - Strip Chart recorders, x-y recorders, Magnetic tape recorders, CD/DVD Recorders; LCD, Digital Storage Oscilloscopes.

**Total Periods: 45**

**TEXT BOOK:**

1. A.K.Sawhney, *A Course in Electrical and Electronics Measurements and Instrumentation*, Dhanpat Rai and Sons, New Delhi, 19th Edition, 2011.

**REFERENCE BOOKS:**

1. E.W. Golding & F.C. Widdis, *Electrical Measurements and Measuring Instruments*, Wheeler Publishing, 5th Edition, 2011.
2. Doeblin, E.O., *Measurement Systems: Applications and Design*, TMH, 4th Edition, 2003.
3. H.S. Kalsi, *Electronic Instrumentation*, TMH, 2002.

# II B.Tech. - I Semester

## 14BT31001: PRINCIPLES OF ELECTRICAL MEASUREMENTS

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

**PREREQUISITES:** Network Analysis, Engineering Physics.

**COURSE DESCRIPTION:** Science of Measurement; Construction and principle of operation of Ammeters, Voltmeters, Ohmmeters; Potentiometers; Power meter; Power Factor meter; Energy Meters; Design of Bridges : AC, DC.

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

CO1. Demonstrate knowledge in
- Construction and Principle of operation of different instruments used for Measurement of Voltage, Current and Resistance.
- The measurement of Power, Power factor, Energy.

CO2. Analyse, Identify and select instruments suitable for various electrical parameter measurements.

CO3. Design instruments and circuits for measurement of Power, Energy, Power factor, Voltage, Current, Resistance, Capacitance and Inductance.

**Detailed Syllabus:**

**UNIT I: SCIENCE OF MEASUREMENT (9 periods)**

Measurement systems, Significance of Measurements, Methods of Measurements: Direct and Indirect Methods; Classification of Instruments, Deflection and Null Type instruments, Elements of a Generalized Measurement System, Types of errors: Gross Error, Systematic Error, Random Error; Units: Fundamental and Derived Units, CGS System of Unit, Practical Units, M.K.S System, S.I Units; Standards and their Classification: Electrical Standards, Resistance Standards, Current Standards, Inductance Standards and Capacitance Standards.

**UNIT-II: AMMETERS AND VOLTMETERS (11 periods)**

Classification of analog instruments, Principle of operation of analog instruments, operating forces of electromechanical indicating instruments: deflecting, control and damping; Permanent Magnet Moving Coil (PMMC): Construction, working principle, Expression of torque equation, Errors in PMMC Instruments, Advantage and Disadvantages of PMMC Instruments; Moving Iron Instruments: Classification of Moving Iron Instruments, Construction, working principle and Expression of torque equation; Ammeter: Ammeter shunt, Effect of Temperature Change in Ammeter, Multi-range Ammeters; Voltmeter: Voltmeter Multipliers, Effect of Temperature Change in Voltmeters, Multi-range Voltmeter.

**UNIT-III: OHMMETERS AND POTENTIOMETERS (9 periods)**

Ohmmeters: Series type ohmmeter, shunt type ohmmeter, Multimeter.
DC Potentiometers: Basic potentiometer circuit, standardization, Compton's Potentiometers, Multiple-range potentiometer, applications: Calibration of Voltmeter, Calibration of Ammeter, Measurement of Resistance.
AC Potentiometers: Standardization, Types of A.C Potentiometers: Polar types, Coordinate types, applications: Voltmeter Calibration, Ammeter Calibration, Measurement of Self reactance of a coil.

**UNIT-IV: POWER & ENERGY METERS (8 periods)**

Power in D.C Circuits, Power in A.C Circuits, Electrodynamometer wattmeter: Construction, working principle, Torque equation, Errors in Electrodynamometer wattmeter, Three Phase Wattmeter.
Electrodynamometer Power Factor Meter: Single Phase, Three Phase.
Energy Meter: Single Phase Induction Type Energy Meter: Construction, Working Principle, Errors in Single Phase energy meter; Polyphase energy meters: Two element energy meter.

**UNIT-V: BRIDGES (8 periods)**

Measurement of Resistance: Medium Resistance Measurement: Wheatstone bridge, Kelvin Bridge; Low Resistance Measurement: Kelvin double bridge; High Resistance Measurement: Direct deflection methods.
Measurement of Inductance: Maxwell Bridge, Hay's Bridge and Anderson Bridge.
Measurement of capacitance: De Sauty's Bridge and Schering bridge, Q-meter.

**Total Periods : 45**

**TEXT BOOK:**


1. A.K. Sawhney, *A Course in Electrical and Electronics Measure ments and Instrumentation*, Dhanpat Rai and Sons, New Delhi, 19th Revised Edition, 2013.


**REFERENCE BOOKS:**


1. E.W. Golding & F.C. Widdis, *Electrical Measurements and Measuring Instruments*, 5th Edition, Wheeler Publishing.
2. Doeblin, E.O., *Measurement Systems: Applications and Design*, 4th Edition, TMH, 2003.
3. H.S. Kalsi, *Electronic Instrumentation*, TMH, 2002.

## II B. Tech. – I Semester

## (16BT31002) SENSORS AND TRANSDUCERS

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

**PRE-REQUISITES:** A course on Engineering Physics.

**COURSE DESCRIPTION:** Units and standards; Static and dynamic characteristics of transducers; Working principle of resistive, inductive, capacitive, self-generating and other sensors; Applications of sensors.

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

CO1. Demonstrate knowledge on principles of sensors and transducers with their characteristics.
CO2. Apply analytical skills to determine the response of sen sors for change in physical parameters.
CO3. Solve the problems pertaining to RTD, Thermistors, piezoelectric, capacitive and inductive sensors.
CO4. Select an appropriate sensor to measure the physical parameter for specific application.
CO5. Apply the principles of resistive, inductive, capacitive, self-generating and other sensors for measuring real time physical parameters in industries.
CO6. Follow the ethical standards while using measuring in struments.

**DETAILED SYLLABUS:**

**UNIT - I: MEASUREMENTS AND STANDARDS (9 Periods)**

Significance of Measurements, Classification of Instruments: Deflection and Null Type instruments, Elements of a Generalized Measurement System, Types of errors: Gross Error, Systematic Error, Random Error, Statistical analysis of measurement data. Units: Fundamental and Derived Units, CGS System of Unit, Practical Units, M.K.S System, S.I. Units; Standards and their Classification: Electrical Standards, Resistance Standards, Current Standards, Inductance Standards and Capacitance Standards.

**UNIT - II: CHARACTERISTICS OF TRANSDUCERS (9 Periods)**

Principle of transducer, Classification of transducer, Static Characteristics: Calibration, accuracy, precision, sensitivity, linearity, threshold, resolution, hysteresis, dead space, reproducibility, span. Dynamic characteristics: Dynamic error, Fidelity, Measuring lag,

Speed of response, Numerical problems on static and Dynamic characteristics. Mathematical model of measuring system, Transfer function of Zero order system, First order system and Second order system, Step response of First order and second order system.

**UNIT - III: RESISTIVE AND CAPACITIVE SENSORS (9 Periods)**

Resistive Sensors: Potentiometers, Metal and Semiconductor Strain gauges, Resistance temperature detectors, Thermistors, Light dependent resistors, Hot-wire resistive transducer.
Capacitive Sensors: Change in overlapping area, dielectric constant and distance between the plates of variable and differential capacitor. Frequency response of capacitive sensors.

**UNIT - IV: INDUCTIVE AND SELF-GENERATING SENSORS (9 Periods)**

Inductive sensors: Variable reluctance sensors, Eddy current sensors, Linear variable differential transformers, Synchros, Hall Effect sensors.
Self-generating sensors: Piezoelectric sensors: piezoelectric effect, deformation modes, equivalent circuit, materials. Thermoelectric effect, photovoltaic effect and its materials. Electrochemical sensors: Ion selective electrodes, Solid state electrodes.

**UNIT – V: DIGITAL AND OTHER SENSORS (9 Periods)**

Digital transducers: Incremental encoder, absolute encoder. Photodiode, Phototransistors, Fiber optic sensors: Basics, sensor technology. Ultrasonic sensors: Basics, sensing methods. Biosensors, Basics of SMART sensors, Microsensor Technology: Thick-film, Thin-film, Micromachining.

**Total Periods: 45**

**TEXT BOOKS:**


1 Ramon Pallas-Areny and John G. Webster, *Sensors and Signal Conditioning*, John Wiley & Sons, Inc., 2nd edition, 2001.

2 A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co., 19th edition, 2013.


**REFERENCE BOOKS:**


1. D. V. S Murty, *Transducers and Instrumentation*, PHI Learning Private Limited, 2nd edition, 2011.
2. D. Patranabis, *Sensors and Transducers*, PHI Learning Private Limited, 2nd edition, 2003.
3. John P. Bentley, *Principles of Measurement Systems*, Pearson Education, 4th edition, 2005.
4. Doebelin E.O, *Measurement Systems - Application and Design*, Tata McGraw-Hill, 4th edition, 2003.

# II B. Tech. - I Semester

## 14BT31002: SENSORS AND TRANSDUCERS

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

**PREREQUISITE:** Engineering Physics, Engineering Mathematics

**COURSE DESCRIPTION**: Performance characteristics of transducers; Working principle of resistive, inductive, capacitive, self-generating and other sensors; Applications of sensors.

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

CO1. Demonstrate the principles of sensors and transducers with their technical characteristics.
CO2. Apply analytical skills to determine the response of sensors for change in physical parameters.
CO3. Identify and choose sensor for the specific problem.

**Detailed Syllabus:**

**UNIT – I: CHARACTERISTICS OF TRANSDUCERS (9 Periods)**

Principle of transducer, Classification of transducer, Static Characteristics: Calibration, accuracy, precision, sensitivity, linearity, threshold, resolution, hysteresis, dead space, reproducibility, span. Dynamic characteristics: Dynamic error, Fidelity, Measuring lag, Speed of response, Mathematical model of measuring system, Transfer function of Zero order system, First order system and Second order system. Step response, impulse response and frequency response of first order system and second order system. Factors influencing the choice of transducers.

**UNIT – II: RESISTIVE SENSORS (9 Periods)**

Potentiometers, Metal and semiconductor strain gauges, Resistance temperature detectors, Thermistors, Magnetoresistors, Light dependent resistors, Hot-wire resistive transducer, Resistive hygrometer.

**UNIT–III: CAPACITIVE AND INDUCTIVE SENSORS (9 Periods)**

Capacitive sensors: Change in overlapping area, dielectric constant and distance between the plates of variable and differential capacitor. Frequency response of capacitive sensors.

Inductive sensors: Variable reluctance sensors, Eddy current sensors, Linear variable differential transformers, Synchros, Resolvers, Electromagnetic sensors based tachogenerator, Hall Effect sensors.

**UNIT – IV: SELF-GENERATING SENSORS (9 Periods)**

Thermoelectric sensors: Thermoelectric effects, Thermocouple laws, common thermocouples. Piezoelectric sensors: Piezoelectric effect, deformation modes, equivalent circuit, materials. Pyroelectric Sensors: Pyroelectric effect, materials. Photoelectric sensors: photovoltaic effect, materials. Magnetostrictive transducers, Electrochemical Sensors: Ion selective electrodes, Solid state electrodes.

**UNIT – V: DIGITAL AND OTHER SENSORS (9 Periods)**

Digital transducers: Tachometer encoder, incremental encoder, absolute encoder. Semiconductor sensors: Basics, techniques. Film sensors: Thin film sensors, Thick film sensors. Fiber optic sensors: Basics, sensor technology. Ultrasonic sensors: Basics, sensing methods. Micromachining concept of MEMS, Basics of SMART sensors.

**Total Periods: 45**

**TEXT BOOKS:**


1. Ramon Pallas-Areny and John G. Webster, Sensors and Signal Coditioning, John Wiley & Sons, Inc., 2nd edition, 2001.
2. A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co., 19th Revised Edition, 2013.


**REFERENCE BOOKS:**


1. D. V. S Murty, Transducers and Instrumentation, PHI Learning Private Limited, 2nd edition, 2011.
2. D. Patranabis, Sensors and Transducers, PHI Learning Private Limited, 2nd edition, 2003.
3. John P. Bentley, Principles of Measurement Systems, Pearson Education, 4th edition, 2005.
4. Doebelin E.0, Measurement Systems - Application and Design, Tata McGraw-Hill, 4th Edition, 2003.

## II B. Tech. – I Semester
## (16BT31031) MEASUREMENTS AND TRANSDUCERS LAB

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

**PRE-REQUISITES:** Courses on Sensors and Transducers, Electrical and Electronic Measurements.

**COURSE DESCRIPTION:** Measurement of parameters like voltage, resistance, inductance, capacitance, displacement, pressure, force, temperature and weight.

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

CO1. Demonstrate knowledge on
- Measuring instruments
- Principles of Sensors and transducers
- AC and DC bridges

CO2. Analyze the operation and performance of measuring instruments and transducers.

CO3. Design circuits for measurement of Voltage, Current, resistance, capacitance and Inductance.

CO4. Interpret and synthesize the data obtained from mea surements and provide valid conclusions.

CO5. Select and apply appropriate sensor and measuring technique to measure the physical parameter.

CO6. Understand the working of various sensors and transducers and provide engineering solutions for societal use.

CO7. Follow ethical principles in designing circuits for measurement of physical parameters.

CO8. Do experiments related to measurement of electrical and physical parameters effectively as an individual and as a member in a group.

CO9. Communicate verbally and in written form in the area of measurements and instrumentation.

**LIST OF EXPERIMENTS:**

Minimum of 11 Experiments to be conducted

1. Calibration of D'Arsonval Galvanometers for measurement of Voltage & Current.
2. Calibration of D'Arsonval Galvanometers for measurement of Resistance (shunt &series).
3. Design of Wheatstone bridge and Kelvin Bridge for measurement of Resistance.

4. Design of Schering Bridge and Desauty Bridge for measurement of Capacitance.
5. Design of Maxwell's bridge and Andersons Bridge for measurement of Inductance.
6. Measurement of resistance, inductance, capacitance and quality factor of the coil using Q meter.
7. Calibration and testing of single phase energy meter.
8. Design and Calibration of LVDT for linear displacement measurement.
9. Study and analyze the characteristics of temperature sensors.
10. Study and analyze the characteristics of strain gauge and load cell.
11. Study and analyze the characteristics of proximity sensors.
12. Study and analyze the characteristics of radiation detectors.
13. Determination of time constant of a RC circuit.

# II B. Tech. – I Semester
# 14BT31021: MEASUREMENTS AND TRANSDUCERS LAB

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

**PRE-REQUISITE:** Sensors and Transducers, Electrical Measurements

**COURSE DESCRIPTION:** Measurement of parameters like voltage, resistance, inductance, capacitance, displacement, pressure, force, temperature and shaft speed.

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

CO1. Carry out analysis of instrument in terms of accuracy, Linearity and Calibration.
CO2. Design and develop measuring circuits for voltage, current and resistance .

**LIST OF EXPERIMENTS:**

Minimum of 11 Experiments to be conducted

1. Measurement of AC parameters (Voltage & Current) using D'Arsonval Galvanometers
2. Conversion of D'Arsonval Galvanometer into ohmmeter (Series & Shunt)
3. Measurement of unknown resistance, inductance and capacitance using bridge circuits
4. Measurement of resistance, inductance, capacitance and quality factor of the coil using Q meter
5. Calibration and testing of single phase energy meter
6. Linear displacement measurement using LVDT
7. Temperature measurement using RTD
8. Strain measurement using Strain Gauges
9. Angular displacement using capacitive transducer
10. Transfer characteristics of thermocouple and Determination of Time Constant
11. Determination of Capacitance of a RC Circuit
12. Study of Piezoelectric Transducer
13. Measurement of shaft speed using stroboscope
14. Pressure measurement using Bourdon tube

# II B. Tech. – II Semester
# (16BT41001) INDUSTRIAL INSTRUMENTATION - I

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

**PRE-REQUISITES:** Courses on Sensors and Transducers, Electrical and Electronic Measurements.

**COURSE DESCRIPTION:** Measurement of Force, Weight, Torque, Pressure, Velocity, Acceleration, Sound and Temperature.

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

CO1. Demonstrate knowledge of construction and working principles of different sensors for use in industrial instruments.
CO2. Identify, formulate and analyze different types of sensors for various industrial applications.
CO3. Design suitable sensors for desired parameter measure ment in industry.
CO4. Solve engineering problems pertaining to measurement of Force, Torque, Velocity, Acceleration, Pressure and Temperature to provide feasible solutions.
CO5. Select appropriate sensor and measuring techniques for the measurement of industrial parameters.

**DETAILED SYLLABUS:**

**UNIT - I: FORCE AND TORQUE MEASUREMENT (8 Periods)**
Force Measurement: Spring Balance, Load cell types, Hydrostatic, Pneumatic, Magnetoelastic, Piezoelectric, Elastic, Analysis and selection of Force sensors.
Torque Measurement: Load Cell method, Strain gauge method, Weidman Magnetostrictive, Relative angular twist, Analysis and selection of torque sensors.

**UNIT - II: VELOCITY AND ACCELERATION MEASUREMENT (9 Periods)**
Velocity Measurement: Electromagnetic Type, Revolution counter, Tachometers – Capacitive type, Drag cup type, Tachogenerators - AC, DC, Stroboscope, Analysis and Selection of Velocity sensors.
Acceleration Measurement: Reluctance type, Potentiometric type, Photo cell type, piezoelectric type, Null Balance, Analysis and selection of Acceleration sensors.
Gyroscopes: Principle, Single axis Restrained Gyro and Two axis free Gyro, Three axis Gyro.

**UNIT - III: PRESSURE MEASUREMENT (10 Periods)**

Dead weight gauges, Manometer and its Types, Elastic transducers – Bourdon tube, Diaphragm, Bellows, Electrical Types, Resistive, Inductive and Capacitive, Force balance & Vibrating Cylinder, High pressure measurement – Very high pressure transducer (Bulk modulus Gage), Low Pressure (Vacuum) measurement – McLeod Gauge, Knudsen Gauge, Momentum transfer gauge, Thermal conductivity gauge, Ionization gauge, Sound level meter, Microphone. Analysis and selection of pressure sensors.

**UNIT - IV: TEMPERATURE MEASUREMENT – I (9 Periods)**

Definition, Temperature vs Heat, Temperature measurement using change in physical properties – Solid expansion type, Fluid expansion type (Filled-in system), Resistance temperature detector (RTD), principle and types, construction requirements for industry, measuring circuits, 3-Lead Method, 4-Lead arrangement. Thermistors, principle and sensor types, manufacturing techniques, measuring circuits, linearization methods and applications. Thermocouples: thermoelectric effects, Laws, Thermoelectric characteristics of thermocouple, types, Processing and preparation, construction, installation and protection, measuring circuits, Cold junction Compensation, thermocouple burn out detection and high temperature measurement methods, thermopiles.

**UNIT – V: TEMPERATURE MEASUREMENT – II (9 Periods)**

Calibrators and simulators, Color Indicators, Crayons, Pellets, Fiber optic thermometers, Integrated circuit transistors & diodes; Radiation measurement: Radiation thermometers, introduction, definition of terms, general form of radiation measurement system, radiation thermometer types, Pyrometric cones, Pneumatic and suction pyrometers, Radiation & Infrared Pyrometers; Quartz crystal thermometry, temperature switches and thermostats, ultrasonic thermometers, Miscellaneous temperature sensors: Fluidic sensors, Johnson noise thermometer, liquid crystals, Paramagnetic salts, spectroscopic temperature measurement, Thermography, Analysis and selection of Temperature sensors.

**Total Periods: 45**

**TEXT BOOKS:**


1. D. Patranabis, *Principles of Industrial Instrumentation*, TMH, 3rd Edition, 2010.
2. Ramon Pallás Areny, John G. Webster, *Sensors and Signal Conditioning*, John Wiley and Sons, 2nd Edition, 2000.


**REFERENCE BOOKS:**


1. Bela G Liptak, *Instrument Engineers' Handbook: Process Measurement and Analysis*, CRC Press - Butterworth Heinemann, 4th Edition, 2003.
2. Jon Wilson, *Sensor Technology Handbook*, Newnes, 2004.
3. B. C. Nakra, K. K. Chaudhry, *Instrumentation Measurement And Analysis*, TMH, 2nd Edition, 2003.
4. Ernest Doebelin, Dhanesh Manik, *Measurement Systems*, McGraw Hill International, 6th Edition, 2011.

# III B. Tech. - I Semester

## 14BT51002: INDUSTRIAL INSTRUMENTATION - I

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

**PRE-REQUISITE**: Sensors and Transducers, Electrical Measurement, Electronic Instruments.

**COURSE DESCRIPTION:** Metrology; Measurement of physical quantities like Force, Weight, Torque, Power, Pressure, Velocity, Acceleration, Moisture, Viscosity, Density and Sound.

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

CO1. Demonstrate knowledge on science of measurement and measurement techniques.

CO2. Identify and formulate instruments to measure Physical parameters, like Torque, Pressure etc.,

CO3. Design and implement suitable setup using instruments to measure force, torque, pressure, speed, density and viscosity.

**Detailed Syllabus:**

**UNIT - I: METROLOGY (8 Periods)**

Measurement of Length - Calipers, Micrometer, Diameter - Keilpart Gage, Ball on wire, Telescopic Internal Gage, Angle Devel Protractor, sine Bar, Area – Graphical, Numerical methods, Planimeter (Mechanical), Comparators, Fundamental requirements of a Comparators, Comparator types – Mechanical comparators, Pneumatic comparators, Electrical comparators, Optical comparators.

**UNIT - II: FORCE, TORQUE AND POWER MEASUREMENT (9 Periods)**

Force Measurement: Analytical balance, Weighing systems and weighers balance, Spring Balance, Load cell types – Hydrostatic, Pneumatic, Magnetoelastic, Piezoelectric, Elastic. Torque Measurement: Load Cell method, Strain gauge method, Wiedmann Magentostrictive, Relative angular twist. Shaft Power Measurement: Electrical Type Dynamometer – Eddy current, Motor generator Dynamometer.

**UNIT - III: PRESSURE MEASUREMENT (10 Periods)**

Dead weight gauges, Manometer and its Type, Elastic transducers - Bourdon tube, Diaphragm, Bellows, Electrical Types – Resistive, Inductive and Capacitive, Force balance & Vibrating Cylinder, High pressure measurement

– Very high pressure transducer (Bulk modulus Gage), Low Pressure (Vacuum) measurement – McLeod Gage, Knudsen Gage, Momentum transfer gage, Thermal conductivity gage, Ionization gage. Sound level meter, Microphone.

**UNIT - IV: VELOCITY & ACCELERATION MEASUREMENT (8 Periods)**

Electromagnetic Type, Revolution counter, Tachometers – Capacitive type, Drag cup type, Tachogenerators - AC, DC, Stroboscope.

Acceleration Measurement: Reluctance type, Potentiometric type, Photo cell type, piezoelectric type, Null Balance, Gyroscopes & its types.

**UNIT - V: HUMIDITY, DENSITY AND VISCOSITY MEASUREMENT (10 Periods)**

**Humidity:** Psychrometer, hygrometer & Types, Dew point device.

**Density:** Introduction, Pressure head type, Displace type, Float type, Buoyancy effect densitometer method, Hot wire gas bridge type, Vibration type, Radioactive method.

**Viscosity:** Introduction, Friction tube viscometer, Saybolt's viscometer, Rotameter viscometer, Searle's rotating cylinder, Cone and Plate viscometer. Consistency meter – Rotating vane type and Oscillating type.

**Total Periods: 45**

**TEXT BOOKS:**


1. Patranabis.D, Principles of Industrial Instrumentation, TMH, 1997.
2. Doeblin E.O., Measurement Systems – Applications & Design, McGraw - Hill International, 4th Edition, 1990.


**REFERENCE BOOKS:**


1. *Bela G Liptak, Instrument Engineers Hand Book - Process Measurement and Analysis, 3rd Edition, Butterworth Heinemann.*
2. RK Jain, *Mechanical & Industrial Measurements*, Khanna Pub lishers, 1986.
3. A. K. Sawhney, *A Course in Electrical and Electronics Measurements and Instrumentation,* Dhanpat Rai and Sons, New Delhi, 1995.
4. Jon Wilson, *Sensor Technology Handbook,* 2004.

## II B. Tech. – II Semester
## (16BT41032) CONTROL SYSTEMS DESIGN LAB

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

**PRE-REQUISITES:** A Course on Control Systems.

**COURSE DESCRIPTION:** Open and closed loop systems; DC and AC servo motor; stability analysis electrical systems; P, I, D parameters.

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

CO1. Demonstrate knowledge on the effect of feedback and different controllers.

CO2. Develop skills to analyze

- The characteristics of servomotors
- The stability of the system using root-locus bode and Nyquist plots
- The time domain and frequency specifications of second order system

CO3. Design a transfer function of given model.

CO4. Develop programming skills to solve open and closed loop control systems.

CO5. Select and apply modern tools for solving complex problems in control systems.

CO6. Function effectively as individual and as member in team.

CO7. Communicate effectively both oral and written in relevance to control systems.

**LIST OF EXPERIMENTS:**

**Conduct any TEN experiments:**

1. Transfer function of DC machine.
2. Find Torque transfer function of synchros.
3. Transfer function from the block diagram using MATLAB.
4. Unit step response of given second order transfer function using MATLAB. Determination of peak overshoots, peak time, rise time and delay time.
5. Time response of second order system (hard ware).

6. Stability analysis of a linear time invariant system using Root Locus.
7. Stability analysis of a linear time invariant system using Bode plot and Nyquist plot.
8. Design lead & Lag compensator using Bode plots.
9. Effect of P, PD, PI and PID controllers on a second order system (Hardware/Software).
10. Effect of PID controllers for the given transfer function using MATLAB SIMULINK.
11. Transfer function from state model and Vice-versa.
12. Controllability and observability test using MATLAB.

## III B. Tech. – I Semester

## (16BT51002) INDUSTRIAL INSTRUMENTATION - II

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

**PRE-REQUISITES:** A course on Industrial Instrumentation - I.

**COURSE DESCRIPTION:** Measurement of Flow, Level, Moisture, Viscosity, Density; Electrical and intrinsic safety; Design of signal conditioning circuits.

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

CO1. Demonstrate knowledge of construction and working principles of different instruments used in industry.
CO2. Identify, formulate and analyze different types of instruments for various industrial applications.
CO3. Design suitable sensors and signal conditioning circuits for desired parameter measurement in industrial applications.
CO4. Solve engineering problems pertaining to measurement of Density, Viscosity, Moisture, Flow, Level and signal conditioning circuits to provide feasible solutions.
CO5. Select appropriate sensor and measuring technique for the measurement of industrial parameters.
CO6. Apply the knowledge of safety issues while designing measuring instruments used in industries.

**DETAILED SYLLABUS:**

**UNIT - I: DENSITY, VISCOSITY and HUMIDITY MEASUREMENT (11 Periods)**

**Density:** Introduction, Pressure head type, Float type, Displace type, Buoyancy effect densitometer method, Hot wire gas bridge type, Vibration type, Radioactive method. Analysis and selection of density sensors.

**Viscosity:** Introduction, Friction tube viscometer, Saybolt's viscometer, Rotameter viscometer, Searle's rotating cylinder, Cone and Plate viscometer. Consistency meter – Rotating vane type and Oscillating type. Analysis and selection of viscosity sensors.

**Humidity:** Psychrometer, hygrometer & Types, Dew point device. Analysis and selection of humidity sensors.

**UNIT – II: LEVEL MEASUREMENT (7 Periods)**

Introduction, Gauge Glass technique, Float Types – Float–and–tape method, Float–and–shaft method, Magnetic float types. Displacer types, Hydrostatic types – Air-Purge type, Bubbler type. Thermal effect types, Electrical types – Resistance switch type, Inductive and Capacitance type. Ultrasonic method, bellow element type, Fibre - optic type, level transmitters, Analysis and selection of level sensors.

**UNIT – III: FLOW MEASUREMENT (10 Periods)**

Introduction, Head types – Orifice, Venturi, Flow Nozzle, Dahl Tube, Pitot tube, Area flow meter - Rotameter & types, Mass flow meters – Turbine Mass flow meter, Coriolis flow meter, Gyroscopic flow meter, Liquid bridge mass flow meter, Calorimetric flow meter. Positive displacement type flow meters - Nutating Disc, Rotary Vane, Lobed impeller, Reciprocating Piston type, Fluted Rotor. Electrical type flow meter Turbo magnetic flow meter, Electromagnetic flow meter, Ultrasonic flow meter, Hotwire anemometer type, Vertex shedding type. Flow transmitters, Analysis and selection of flow sensors.

**UNIT - IV: SIGNAL CONDITIONING (9 Periods)**

Voltage Dividers: Potentiometers, Application to thermistors, Dynamic measurements, Amplifiers for voltage dividers; Wheatstone Bridge – Compensation & Sensitivity.

Signal conditioning for Self generating sensors: Chopper and low drift amplifiers Composite amplifier, charge amplifier and electrometer amplifier.

Design of I to V, V to I converters, Range conversion of current, voltage, Design of instrumentation amplifier.

**UNIT – V: SAFETY INSTRUMENTS (8 Periods)**

Proximity Switches Capacitive, Inductive, Magnetic, Hall Effect. Limit switches – Mechanical, Optical, Pneumatic, Ultrasonic, Digital outputs & Encoders.

Electrical & Intrinsic Safety: NEMA types, Fuses & Circuit breakers. Explosion hazards & intrinsic safety – Protection methods, Purging, pressurization, ventilation.

Grounding and Shielding: Introduction - concept of earth ground, examples of current return path symbols, shock hazard protection using Earth Ground, grounding considerations, basic grounding practices and examples. Practical guide lines for shielding and examples.

**Total Periods: 45**

**TEXT BOOKS:**


1. *D. Patranabis, Principles of Industrial Instrumentation*, 3rd Edition, TMH, 2010.
2. A. K. Sawhney, *A Course in Electrical and Electronics Measurements and Instrumentation,* Dhanpat Rai and Sons, 19th Edition, 2011.


**REFERENCE BOOKS:**


1. *Bela G Liptak, Instrument Engineers' Handbook: Process Measurement and Analysis, CRC Press - Butterworth Heinemann, 4th Edition, 2003.*
2. M.M.S.Anand., *Electronic Instruments and Instrumentation Technology*, PHI, 2005.
3. *B. C. Nakra, K. K. Chaudhry, Instrumentation Measurement And Analysis,* 2nd Edition, TMH, 2003.
4. Ramon Pallas-Areny and John G. Webster, *Sensors and Signal Conditioning*, John Wiley & Sons, Inc., 2nd Edition, 2001.

## III B. Tech. - II Semester

## 14BT61001: INDUSTRIAL INSTRUMENTATION - II

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

**PRE-REQUISITE**: Sensors and Transducers, Principles of Electrical Measurements, Electronic Instruments and Industrial Instrumentation - I

**COURSE DESCRIPTION**: Instruments used to measure Temperature, Flow, Level and Environmental pollution. Designing of signal conditioning circuits; Electrical and intrinsic safety.

**COURSE OUTCOME**: After completion of the course the student will be able to

CO1. Demonstrate knowledge on measurement techniques for measurement of Temperature, Flow, Level and environmental pollution.
CO2. Identify and analyse suitable instrument for measurement of Temperature, Flow and Level.
CO3. Design suitable signal conditioning circuits for measuring instruments.

**Detailed Syllabus:**

**UNIT - I: TEMPERATURE MEASUREMENT (9 periods)**

Definition, Temperature measurement using change in physical properties – Solid expansion type, Fluid expansion type (Filled-in system), Electrical types – RTD, Thermistors, Thermo-emf thermometry – Laws, Thermoelectric characteristics of thermocouple, Processing and preparation, Cold junction Compensation, thermopiles, Radiation thermometry – Total radiation type, Optical Pyrometers. IC Temperature Sensor.

**UNIT – II: FLOW MEASUREMENT (10 periods)**

Introduction, Head types – Orifice, Venturi, Flow Nozzle, Dahl Tube, Pitot tube, Area Flow meter - Rotameter & types, Mass flow meters - Turbine Mass flow meter, Coriolis flow meter, Gyroscopic flow meter, Liquid bridge mass flow meter, Calorimetric flow meter. Positive Displacement type flow meters - Nutating Disc, Rotary Vane, Lobed Impeller, Reciprocating Piston type, Fluted Rotor.Electrical type flow meter – Turbo magnetic flow meter Electromagnetic flow meter, Ultrasonic flow meter, Hotwire anemometer type, Vertex Shedding type.

**UNIT – III: LEVEL MEASUREMENT (8 periods)**

Introduction, Gauge Glass technique, Float Types – Float–and– tape method, Float–and–shaft method, Magnetic float types. Displacer types, Hydrostatic types – Air-Purge type, Bubbler type. Thermal effect types, Electrical types – Resistance switch type, Inductive level gauge and Capacitance type level gauge. Ultrasonic Methods, bellow element type level transmitters, Fibre - optic type.

**UNIT – IV: SIGNAL CONDITIONING (9 periods)**

Measurement of Resistance, Voltage Dividers, Wheatstone Bridge: Balance and Deflection Measurements, Measurement of capacitance – Problems and Alternatives, AC Bridge – Sensitivity and Linearity, capacitive bridge analog linearization, electrostatic and driven shields, Chopper amplifier, auto zero amplifier, composite amplifier, charge amplifier.

**UNIT – V: ENVIRONMENTAL POLLUTION INSTRUMENTS & SAFETY (9 periods)**

Proximity sensors & limit switches: Proximity Sensors - Capacitive, Inductive, Magnetic, Hall-Effect, LVDT. Limit switches – Mechanical, Optical, Pneumatic, Ultrasonic, Digital outputs & Encoders.

Leak Detectors: Pressurization or Hydrostatic Tests, Bubble emissions paints & Dies, Combustible or toxic leaks, Ultrasonic Leak detectors, Thermal conductivity leak detectors, Halogen Leak detectors, Underground leakage detection.

Electrical & Intrinsic Safety: NEMA types, Fuses & Circuit breakers, Explosion hazards & intrinsic safety – Protection methods, Purging, pressurization, ventilation.

**Total Periods: 45**

**TEXT BOOKS:**


1. Patranabis.D, Principles of *Industrial Instrumentation*, TMH, 1997.
2. Ramon Pallás, Areny, John G. Webster, *Sensors and Signal Conditioning*, John Wiley and Sons, 2nd Edition 2000.


**REFERENCE BOOKS:**


1. Bela G Liptak, *Instrument Engineers Hand Book - Process Measurement and Analysis,* Butterworth Heinemann, 3rd Edition, .
2. RK Jain, *Mechanical & Industrial Measurements*, Khanna Publishers, 1986.
3. Doeblin E.O, *Measurement Systems – Applications & Design*, McGraw Hill International, 4th Edition, 1990.

## 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.

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

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 understanding the needs of society, safety for sustainable 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 of materials, mechanical design on electrical parameters and vice versa.

**LIST OF EXPERIMENTS:**

**Minimum of Eleven experiments to be conducted.**

1. Measurement & Calibration of liquid level & analysis of different techniques.
2. Measurement of speed & analysis of different techniques.
3. Measurement of Viscosity.
4. Measurement of Density.
5. Measurement of Humidity.
6. Measurement of Torque.
7. Design of V to I converter.
8. Design of I to V converter.
9. Design of circuit to measure resistance and calibrate to respective voltage.
10. Measurement of temperature using Thermocouple.
11. Calibration and verification of discharge coefficient of orifice plate.
12. Calibration & measurement of pressure.
13. Basic Programming in LabVIEW.
14. Data Acquisition, calibration and analysis using LabVIEW.
15. Data logging and analysis.

## III B. Tech. – II Semester

## (16BT61001) ARM PROCESSORS AND PIC MICROCONTROLLERS

(Common to EEE and EIE)

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

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

**COURSE DESCRIPTION:** ARM Processors architecture, Programming, PIC microcontroller architecture, Interrupts and timers of PIC microcontroller, Interfacing.

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

CO1. Demonstrate knowledge in ARM Processors architecture, PIC architecture, Pin out, Instruction set.
CO2. Analyze various design issues regarding usage of on chip resources and Low power modes.
CO3. Design embedded systems using ARM Processors and PIC microcontrollers to suit market requirements.
CO4. Solve engineering problems and arrive at solutions in designing embedded Systems.
CO5. Use on-chip resources to design embedded systems with an understanding of limitations.
CO6. Practice professional engineering to deliver efficient and cost effective microcontroller based products.

**DETAILED SYLLABUS:**

**UNIT I: PIC MICROCONTROLLER ARCHITECTURE** **(10 Periods)**

Microcontrollers vs general purpose microprocessor, Overview of PIC18 family, WREG register in PIC, PIC file register, Default access bank, PIC status register, Data formats and directives, Program counter and program ROM space, Arithmetic, Logic instructions, Branch, call and time delay instructions, I/O port programming, PIC18 pin description, Bit addressability of data RAM, bank switching, Macros and modules.

**UNIT- II: TIMERS, SERIAL PORT AND INTERRUPTS** **(9 Periods)**

Programming timers 0 and 1, Counter programming, Programming timers 2 and 3, Basics of serial communication, PIC18 connection to RS232, Serial port programming in assembly, PIC18 interrupts, Programming timer interrupts, Programming serial interrupts.

**UNIT- III: PERIPHERALS AND INTERFACING (7 Periods)**

7 segment LED and LCD interfacing, keyboard interfacing, interfacing ADC, DAC, Interfacing stepper motor, DC motor interfacing and PWM.

**UNIT- IV: INTRODUCTION TO ARM PROCESSORS (9 Periods)**

Introduction to ARM Cortex M3 processor, Background of ARM and ARM architecture, Cortex M3 Processor applications, Cortex M3 fundamentals, registers, Operation modes, Memory system, memory map, Memory system attributes, ARM Pipeline, Exception types.

**UNIT -V: ARM PROGRAMMING (10 Periods)**

Data transfer instructions, Pseudo Instructions, Data Processing Instructions, Call & unconditional Branch Instructions, Decisions & conditional Branch instructions, Several useful instructions in Cortex M3, ARM Assembly Language Programming, Thumb Instruction Set, ARM Mode & Thumb mode Programming, ARM Programming in C.

**Total Periods: 45**

**TEXT BOOKS:**


1. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny causey, *PIC Microcontroller and Embedded Systems: Using C and PIC18*, Pearson Education, 2008.
2. Joseph Yiu, *The Definitive Guide to the ARM Cortex-M3 & M4*, Elsevier, 3rd Edition, 2013.


**REFERENCE BOOKS:**


1. Andrew Sloss, Dominic Symes, Chris Wright, *ARM System Developer's Guide: Designing and Optimizing System Software (The Morgan Kaufmann Series in Computer Architecture and Design)*, 2004.
2. John.B. Peatman, *Design with PIC Microcontroller*, Pearson Education, 1988.

## III B. Tech. – II Semester

## (16BT61003) INSTRUMENTATION SYSTEM DESIGN

(Interdisciplinary Elective – 2)

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

**PRE-REQUISITES:** A course on Industrial Instrumentation - II.

**COURSE DESCRIPTION:** Field instruments; Switches, Pushbuttons, Keyboards; Control valves: application and selection; Pumps and control elements; Reliability.

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

CO1. Demonstrate knowledge on

- Field Instruments
- Switches and Pushbuttons
- Control valves
- Pumps and control elements
- Flow regulators

CO2. Analyze the functionality of field instruments, control elements & regulators.

CO3. Design field Instruments such as Orifice, Rotameter, Bourdon tube, PID controllers and measuring circuits for RTD, Thermocouple, D/P transmitters.

CO4. Provide solution to problems & design requirements related to instrumentation systems.

CO5. Select appropriate field instrument to furnish an Instrumentation system.

CO6. Provide optimal instrumentation solution for societal and indus trial use.

**DETAILED SYLLABUS:**

**UNIT-I: DESIGN OF FIELD INSTRUMENTS (9 Periods)**

Orifice meter – Flow through the orifice plate, Location of pressure taps, Orifice bore calculations. Rotameters – Sizing, Characteristics, types. Pressure Gauges Cases, Dials and Pointers, Diaphragm Vacuum Gauges, Special features. Differential Pressure Instruments: Measurement Error, Pressure differential detector Dry Force balance, Design variations, Dry Motion balance Torque tube sensors, Low differential Transmitters. Capacitance Level Sensors, Bare capacitance probe, Probe sizing, Selection of probe configurations.

**UNIT -II: SWITCHES, PUSHBUTTONS, KEYBOARDS (10 Periods)**

Principles of Operation, switching action, Contact arrangements, Switching element and circuits, Types and Grades – Pushbuttons, panel pushbuttons, Industrial Pushbuttons, Keyboard pushbuttons, Hall-Effect Pushbuttons, Membrane Pushbuttons, Toggle switches, Rotary switches, Thumbwheel Switches, Application and Selection Considerations – Human factors, Display movement, Error Prevention, Electrical Rating and Performance, Mechanical Features, Environmental Considerations.

**Annunciators and Alarms:** History and Development, Principles of Operation, Operating Sequences, Audiovisual Annunciators-Integral Annunciator, Remote Annunciator, Semi graphical Annunciator. Annunciator cabinets.

**UNIT-III: CONTROL VALVES: APPLICATION AND SELECTION (9 Periods)**

Introduction, Collecting Process data, Control valve performance-characteristics and gain, Valve rangebility, Control Valve Sizing, Valve Actuator Selection, Positioners, Process Application considerations – High-pressure services, Vacuum Service, High Temperature service, Low temperature service, Corrosion, Small flow valves, Control valve specification form.

**UNIT-IV: PUMPS AND CONTROL ELEMENTS (9 Periods)**

**Pumps:** Introduction, Centrifugal Pumps, Positive Displacement Pumps, Air pimps and Air lifts, Design of Pumping systems: Head requirement, NPSH calculation, Installation considerations; Metering pumps: Plunger pumps, Diaphragm pumps, Pneumatic metering pumps, NPSH and Pulsation Dampening; Opposed Centrifugal Pumps.

**Flow Regulators:** Purge flow regulator, variable orifice flow regulators, water flow regulators for HVAC balancing, Oil flow regulators, Industrial flow regulators and thermal mass flowmeters.

**UNIT -V: RELIABILITY (8 Periods)**

Reliability of Measurement systems: Fundamental Principles of reliability, Practical Reliability definitions, Instantaneous failure rate and its relation to reliability, Failure rate function, Reliability of systems, Failure rate data and models, Design and maintenance for reliability; Choice of measurement systems, Total life time operating cost.

**Total Periods: 45**

**TEXT BOOKS:**


1. Bela G.Liptak, *Instrumentation Engineers' Handbook: Process Control*, Butterworth-Heinemann Ltd., 3rd Edition, 1995.
2. John P.Bentley, *Principles of Measurement Systems*, Pearson Education Ltd., 4th Edition, 2005.


**REFERENCE BOOKS:**


1. D.M.Considine, *Process/Industrial Instruments and Controls Handbook*, McGraw-Hill, Inc., 4th Edition, 1993.
2. N.A.Anderson, *Instrumentation for Process Measurement and Control*, CRC Press, 3rd Edition, 2005.

## III B. Tech. II Semester
## (16BT61031) ARM PROCESSORS AND PIC MICROCONTROLLERS LAB

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

**PRE-REQUISITES:** A course on ARM Processors and PIC Microcontrollers.

**COURSE DESCRIPTION:** Assembly language Programming using ARM processors; Interfacing standard peripherals & Programming-DAC, Stepper Motor, ADC, DAC, Keyboard, Seven Segment Display.

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

CO1. Demonstrate knowledge on instruction set, addressing modes, of ARM processors and PIC microcontrollers.
CO2. Analyze various programming alternatives, interfacing methods & usage of various on-chip resources like Timers, Interrupts, ADC, DAC, and Stepper Motor to build stand alone systems.
CO3. Design and develop microcomputer and microcontroller based system to suit market requirements.
CO4. Solve engineering problems and arrive at solutions in designing embedded Systems.
CO5. Apply resources, and tools for modeling microcomputer and microcontroller based systems with understanding of limitations.
CO6. Follow professional ethics in the design of embedded products.
CO7. Function effectively as an individual, and as a member in developing embedded products.
CO8. Communicate effectively in both written and verbal form in the area of processors and microcontrollers.

**LIST OF EXPERIMENTS:**

**I. Programs using PIC Microcontrollers (Minimum of FIVE experiments)**

1. Arithmetic operations.
2. Logical operations.
3. Bit manipulation operations.
4. Macros & Modular programming.
5. Bank Switching.
6. Branch/Time Delay programs.

**II. Interfacing with PIC microcontrollers (Minimum of THREE experiments)**

1. Interface an LED array, 7-segment display and LCD.
2. Interfacing of PIC18 with Keyboard and logic controllers.
3. Interfacing of PIC18 with ADC and DAC.
4. Interfacing DC Motors and Stepper Motors.

**III. Programs using ARM Processors (Minimum of THREE experiments)**

1. Arithmetic operations.
2. Logic operations.
3. Branch/Time Delay Programs.
4. Arm Mode & Thumb mode Programming.

## III B. Tech. II Semester
## (16BT61032) PROCESS CONTROL LAB

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

**PRE-REQUISITES:** A course on Process Control Instrumentation.

**COURSE DESCRIPTION**: Tuning methods, Characteristics of control valve, Response of controllers for different processes like flow, temperature, level etc., Design of controllers.

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

CO1. Demonstrate knowledge on process equipments.

CO2. Develop the transfer function of the process and analyze the performance of the process in terms of time domain specifications.

CO3. Design electronic PID controller and tune its controller parameters using various tuning methods.

CO4. Give valid conclusions by analyzing the response of flow, temperature, level process.

CO5. Use appropriate hardware/software tools to conduct the process control experiments to measure process parameters.

CO6. Apply concepts of process control for solving real-time issues.

CO7. Execute the experiment individually or in a team in the area of process control.

CO8. Communicate effectively in verbal and written forms in the field of process control.

**LIST OF EXPERIMENTS:**

**PART A: Only for viva-voce examination (2 lab sessions)**

Study and demonstration of Piping and Instrumentation diagrams: Symbols, connecting lines, General instruments or functions, Actuator and process elements.

**PART B: Minimum of TEN experiments to be conducted**

1. Obtain the characteristics of electro-pneumatic converter.
2. Obtain the valve flow-lift characteristics of Linear, Quick Opening and equal percentage control valve.
3. Design Electronic PID controller and verify the output using any simulation software.
4. Determine the PID controller parameters using process reaction curve method for a process.
5. Determine the PID controller parameters using continuous oscillation method for a process.
6. Study the response of ON-OFF controller for temperature process.
7. Obtain the performance for liquid level process with and without controller.
8. Compute the transfer function of a tank for a liquid level process with different flow rates.
9. Measure the flow-rate and to control flow-rate using PID controller for flow process.
10. Analyze the servo and regulatory response for pressure control process.
11. Study the response of ratio controller.
12. Study the closed loop performance of cascade controller.
13. Obtain the transfer function model for Interacting Systems.

## III - B.Tech. - II Semester

# 14BT61021: PROCESS CONTROL LAB

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

**PRE-REQUISITES:** Process Control Instrumentation.

**COURSE DESCRIPTION:** Tuning methods, Characteristics of control valve, Response of controllers for different processes like flow, temperature, level etc.

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

CO1. Analyze the characteristics of control valve and evaluate the performance of controllers for different process like flow, temperature, level etc.

CO2. Tune the controller parameters using various tuning methods

**LIST OF EXPERIMENTS:**

**PART A :** Only for viva-voce examination

LabVIEW practice (2 lab sessions)

1. Study of Functional blocks in LabVIEW.
2. Creation of Arrays and Loops in LabVIEW.

**PART B :** Minimum 10 experiments to be conducted

1. Response of Interacting Systems using LabVIEW.
2. Response of Non-interacting Systems using LabVIEW.
3. Response of Level Process using LabVIEW.
4. Response of Pressure Process using LabVIEW.
5. Response of flow process using LabVIEW.
6. Multi loop control systems – Ratio Control using LabVIEW.
7. Multi loop control systems – Cascade Control using LabVIEW.
8. Response of Temperature Process.
9. Current to pressure converter.
10. Realization of control actions: Electronic controllers.
11. Control valve characteristics.
12. Process tuning – Process reaction curve method.
13. Process tuning – continuous oscillation method.

## IV B. Tech. – I Semester

## (16BT71002) BIOMEDICAL SIGNAL PROCESSING

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

**PRE-REQUISITES:** Courses on Digital Signal Processing, Biomedical Instrumentation.

**COURSE DESCRIPTION:** Analysis of Non Stationary signals, noise & artifact removal, Advanced Signal processing techniques, Event Detection, Spectral Analysis.

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

CO1. Demonstrate an understanding of biomedical signals and identify the need for Biomedical signal analysis.

CO2. Identify physiological interferences and artifacts affecting the biomedical signals and apply various filtering mechanisms for the enhancement of signals.

CO3. Apply advanced signal processing techniques for the analysis of biomedical signals

CO4. To analyze and detect various events and waveform complexities involved in EEG & ECG signals

CO5. Choose appropriate hardware and IT tools to program the devices to solve Biomedical Engineering Problems.

CO6. Perform the spectral analysis of biomedical signals as per societal needs.

**DETAILED SYLLABUS:**

**UNIT-I: NATURE OF BIOMEDICAL SIGNALS AND ANALYSIS OF NON STATIONARY SIGNALS (9 Periods)**

The nature of Biomedical Signals: Need for biomedical signal processing, sources of Biomedical Signals(ECG, EEG, PCG, EMG, Carotid Pulse), objectives of Signal analysis, Difficulties in signal analysis, signal modelling framework, computer aided diagnosis, Heart sounds and murmurs, EEG Rhythms and Waves.

**UNIT-II: FILTERING FOR NOISE AND ARTIFACT REMOVAL (9 Periods)**

Physiological interference, noise, Data Functions and Transforms, Convolution, Correlation and Covariance, Sampling Theory and Finite Data Considerations, Edge Effects, Illustration of noise removal with case studies, time and frequency domain filtering, homomorphic filtering, Problems.

**UNIT –III: ADVANCED SIGNAL PROCESSING TECHNIQUES (9 Periods)**

Optimal and Adaptive Filters, Optimal Signal Processing: Wiener Filters, Adaptive Signal Processing, Adaptive Noise Cancellation, Phase Sensitive Detection, Phase Sensitive Detectors, Problems.

**UNIT –IV: EVENT DETECTION (9 Periods)**

Detection of events & waves-Derivative Based methods for QRS detection, Pan–Tompkins algorithm for QRS detection, Detection of Dicrotic notch, Correlation Analysis of EEG channels, Data Reduction techniques-Turning point algorithm, Huffman Coding, problems.

**UNIT –V: SPECTRAL ANALYSIS (9 Periods)**

Classical Methods, Review of Fourier series for Periodic and Aperiodic Functions, Frequency Resolution, Truncated Fourier Analysis: Data Windowing, Power Spectrum, Direct FFT and Windowing, The Welch Method for Power Spectral Density Determination, Window Functions, Problems.

**Total Periods: 45**

**TEXT BOOKS:**


1. John L Semmlow, *Biosignal & Biomedical Image Processing* – Dekker Media Publishing, 2004.
2. Rangaraj M Rangayyan, *Biomedical Signal Analysis*, IEEE Press, 2001.


**REFERENCE BOOK:**


1. Willis J Tomkins, *Biomedical Digital Signal Processing,* PHI, 1993.

## 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

## 14BT71003: LOGIC AND DISTRIBUTED CONTROL SYSTEMS

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

**PRE-REQUISITE**: Switching Theory and Logical Design

**COURSE DESCRIPTION:** Basics of Programmable Logic Controller (PLC); PLC Programming Languages; I/O Processing; Concepts of DCS; Communication networks for DCS; Industrial Data Networks.

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

CO1. Demonstrate knowledge on Programmable Logic Controller (PLC) and their Programming Languages, DCS and their communication networks, Communication Standards.
CO2. Design and developsolutions to automate the given process.
CO3. Analyze the information to provide effective solution for real time problems in Automation Industries.

**Detailed Syllabus:**

**UNIT – I: PROGRAMMABLE LOGIC CONTROLLER (PLC) BASICS (7 Periods)**

Controllers, 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: I/O PROCESSING (9 Periods)**

Input/output Units: Input units, Output units. Signal Conditioning: Changing voltage levels, Op-amp Comparator, Output Protection. Remote Connections: Serial and parallel Communication, Serial Standards, Parallel Standards. Examples of Commercial Systems. Processing inputs. I/O addresses.

**UNIT – III: PLC INTERMEDIATE FUNCTIONS (11 Periods)**

Ladder and functional block programming, Logic functions, Functional blocks, Jump and call, timer functions, counter functions, Register basics. Design of interlocks and alarms using a PLC, Arithmetic functions, Number Comparison Functions, Skip and MCR functions, Data Move Systems. Sequencer functions, PID functions.

**UNIT – IV: DISTRIBUTED CONTROL SYSTEM (7 Periods)**

Overview of Distributed Control System (DCS), 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.

**UNIT – V: INDUSTRIAL DATA NETWORKS (11 Periods)**

HART protocol: Introduction, Method of operation, structure, operating conditions. Foundation Fieldbus: Introduction, OSI model of Foundation Field bus, troubleshooting. MODBUS: Overview, protocol structure. ProfiBus: Introduction, protocol stack, communication model, Relationship between application process and communication, Operation. Interface and backplane bus standards for instrumentation systems – VXI, VME, IEEE 1451 protocol, IEEE – 488 GPIB – Talkers, Listeners and Controllers.

**Total Periods: 45**

**TEXT BOOKS:**


1. Bolton. W, *Programmable Logic Controllers*", 5th Edition, 2009.
2. S.K. Singh, *Computer Aided Process Control*, PHI, 2009.


**REFERENCE BOOKS:**


1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, *Practical Industrial Data Networks Design, Installation and Trouble shooting*' Newnes Publication, Elsevier First Edition, 2004.
2. M. Chidambaram, *Computer Control of Processes*, 2nd Edition, Narosa Publications, 2003.
3. John W. Webb and Ronald A. Reis, *Programmable Logic Controllers-Principles and Applications*, Pearson Education 5th Edition.
4. Frank D. Petruzella, *Programmable Logic Controllers*, 2nd Edition, McGraw - Hill, New york, 1997.

## IV B. Tech. – I Semester

## (16BT71007) INSTRUMENTATION IN PETRO-CHEMICAL INDUSTRIES

(Program Elective-4)

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

**PRE-REQUISITES:** Courses on Process control Instrumentation, Engineering Chemistry.

**COURSE DESCRIPTION:** Petroleum Processing; Measurement and unit operations; Control Loops of Petroleum Industry and Chemicals from Petroleum Industry.

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

CO1. Demonstrate knowledge on different oil recovery methods, oil gas separation and its Processing.
CO2. Analyze different extracts from petroleum refineries.
CO3. Provide valid conclusions of different real time petroleum products by interpreting data from various distillation techniques.
CO4. Use modern instruments for analysis and processing of petro chemical products.
CO5. Practice petrochemical Engineering in such a way to protect environment from Pollution.
CO6. Follow ethical procedures while practicing petrochemical engineering.

**DETAILED SYLLABUS:**

**UNIT-I: PETROLEUM PROCESSING AND PETROLEUM PRODUCTS (9 Periods)**

Petroleum exploration, characteristics of petroleum, chemicals manufacture, sources of refinery gases, applications of refinery gases, raw materials. Chemicals from petroleum, methane derivatives, acetylene derivatives, ethylene derivatives, Propylene derivatives, derivatives of higher olefins.

**UNIT-II: UNIT OPERATIONS IN PETROLEUM INDUSTRY (9 Periods)**

Unit Operations in Petroleum Industry: Thermal cracking, Catalytic cracking, Catalytic reforming, Chemical oxidation, Chemical reduction, Precipitation, Polymerization, Alkylation, Isomerization, Production of ethylene, Acetylene and Propylene from petroleum, Processing of Plastic, Rubber and Fibre.

**UNIT-III: HEAT EXCHANGERS AND PIPE-STILL FURNACES (9 Periods)**

Heat Exchangers, Theory of Heat Exchange, Plate Type Heat Exchanger, Extended Surface Exchanger, Scraped Surface Exchanger, Heat Exchanger Train, Pipe-Still Furnace, Pipe-Still Furnace Elements, Operation of a Furnace, Draught in a Furnace, Furnace Design by the Wilson, Lobo and Hottel Method.

**UNIT-IV INSTRUMENTATION AND CONTROL IN A REFINERY (9 Periods)**

Control Hardware, Control Loops, The Process Piping and Instrumentation Diagram, Control Software, Distributed Control System, The Control Room, Crude Throughput Control, Desalter Control, Atmospheric Distillation Column Control, Vacuum Distillation Control, Reformer Unit Control, Fluid Catalytic Cracking Unit Control, Fail-Safe Devices.

**UNIT-V: DYNAMIC MODELING AND SIMULATION (9 Periods)**

Pairing and Interaction in distillation, Proper pairing in single and dual composition control, Relative Gain Analysis, Decoupling for non-interacting control.

**Case studies:** Development of mathematical models for Heat exchangers, Derivation of interaction and pairing of variables in multivariable systems, Mathematical model of Crystallization process.

**Total Periods: 45**

**TEXT BOOKS:**


1. Uttam Ray Chaudhuri, *Fundamentals of Petroleum and petrochemical Engineering*, CRC press, 2011.
2. Balchan .J.G. and Mumme K.I., Van *Process Control Structures and applications,* No strand Reinhold Company, New York, 1988.


**REFERENCE BOOKS:**


1. Austin G.T. Shreeves, *Chemical Process Industries,* McGraw-Hill International student Edition, 1985.
2. Liptak B.G. *Instrumentation in process Industries,* Chilton book Company, 1994.
3. Liptak B.G., *Process measurement and analysis,* Chilton book Company, 3rd Edition, 1996.

# IV B. Tech. – I Semester
## (16BT71008) INTELLIGENT CONTROL
## (Program Elective-4)

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

**PRE-REQUISITES**:—

**COURSE DESCRIPTION:** Neural Networks for Modeling and Control; ANN Structures and Online Training Algorithms; Fuzzy Logic for Modeling and Control; Hybrid Control Schemes; Applications of intelligent systems.

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

CO1. Demonstrate knowledge on the Computer simulation of intelligent control systems to evaluate the performance.

CO2. Analyze neural network, fuzzy logic and hybrid control schemes.

CO3. Design neural network, fuzzy logic and hybrid control for engineering applications.

CO4. Solve the problems pertaining to neural network, fuzzy logic and hybrid control schemes and provide valid conclusions for real time applications.

CO5. Select appropriate neural network and fuzzy logic control techniques for modeling real time applications with an understanding of the limitations.

CO6. Follow ethical standards while using the algorithms to train the systems for industries.

**DETAILED SYLLABUS:**

**UNIT- I: INTRODUCTION TO ANN AND FUZZY (9 Periods)**

Introduction, McCulloch-Pitts Model, Types of Neuron Activation Function, ANN Architectures, Supervised, Unsupervised, Reinforced Learning, Potential applications to ANN.

Introduction to classical sets, properties, Fuzzy sets, Membership functions, Classical Relations and Fuzzy Relations.

**UNIT- II: NEURAL NETWORKS FOR MODELING AND CONTROL (9 Periods)**

Modeling of nonlinear systems using ANN, NARX, NNSS. Generation of training data, optimal architecture, Model validation, Control of nonlinear system using ANN, Direct and Indirect neuro control schemes.

**UNIT- III: ANN STRUCTURES AND ONLINE TRAINING ALGORITHMS (9 Periods)**

Recurrent neural network (RNN), Adaptive resonance theory (ART) based network, Radial basis function network, Online learning algorithms: BP through time, RTRL algorithms, Least Mean square algorithm, Reinforcement learning, case study of DC servo motor.

**UNIT- IV: FUZZY LOGIC FOR MODELING AND CONTROL (9 Periods)**

Modeling of nonlinear systems using fuzzy models, TSK model, Fuzzy Logic controller Fuzzification, Knowledge base, Decision making logic, Defuzzification, Adaptive fuzzy systems, case study of DC servo motor.

**UNIT- V: HYBRID CONTROL SCHEMES (9 Periods)**

ANFIS: Neuro fuzzy systems, Fuzzy Neuro systems, Introduction to GA, Optimization of membership function and rule base using Genetic Algorithm, Introduction to Support Vector Machine, Particle Swarm Optimization.

**Total Periods: 45**

**TEXT BOOKS:**


1. Laurence Fausett, *Fundamentals of Neural Networks*, Prentice Hall, Englewood cliffs, N.J.,1992.
2. Timothy J.Ross, *Fuzzy Logic with Engineering Applications*, McGraw Hill Inc., 1997.


**REFERENCE BOOK:**


1. Goldberg, *Genetic Algorithm in Search, Optimization and Machine Learning*, Addison Wesley Publishing Company, Inc. 1989.

# IV B. Tech. - I Semester
## 14BT70205: SOFT COMPUTING TECHNIQUES
## (PROFESSIONAL ELECTIVE - II)

(Common to EEE and EIE)

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

**PRE-REQUISITES:**

**COURSE DESCRIPTION:** Architectures of artificial neural networks: feed forward and feedback networks, Learning strategies: Supervised; Un supervised and reinforced; Fuzzy set theory; Fuzzy systems design; applications of neural networks and fuzzy systems, Terminologies and Operators of Genetic Algorithm; Encoding; Selection; Crossover; Mutation; Replacement.

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

CO1. Demonstrate the knowledge on learning strategies of an artificial neural network, components of fuzzy logic system and operators of genetic algorithm.

CO2. Design fuzzy systems, neural networks and genetic algorithm for real time problems.

CO3. Exhibit problem solving skills in fuzzy set theory and learning methods of neural networks.

CO4. Apply various configurations of neural networks, fuzzy systems and genetic algorithm to different engineering applications.

**Detailed Syllabus:**

### UNIT – I: FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS (10 periods)

Neural networks-introduction, artificial neural network, advantages, biological neural network, architectures of artificial neural networks- activation functions, important terminologies of ANN, Mcculloch-pitts neuron model, learning strategies-supervised, un supervised, reinforced, learning rules-Hebbian learning rule, perceptron learning rule, delta learning rule, widrow-hoff learning rule, correlation learning rule, winner–take-all learning rule, out star learning rule, concept of linear separability with AND & XOR examples.

### UNIT – II: SUPERVISED, UN SUPERVISED NETWORKS & ASSOCIATIVE MEMORIES (10 periods)

Supervised networks: back propagation neural network-architecture, training algorithm, learning factors- initial weights, steepness of the activation function, leaning constant, momentum method and necessary number of hidden neurons.Un-supervised networks: Kohonen self-organizing map-competitive process, cooperation process, adaptive process, training algorithm. Counter propagation Networks- full counter propagation network-architecture, training algorithm.

Associative memories: concepts, Bidirectional Associative Memory (BAM)-architecture, discrete BAM-testing algorithm, analysis of hamming distance, energy function and storage capacity. Discrete Hopfield network - architecture and training algorithm. Applications of artificial neural networks - short term electrical load forecasting, process identification.

**UNIT – III: CLASSICAL AND FUZZY SETS (10 periods)**

Introduction- classical sets - operations, properties. Fuzzy sets - operations, properties. Crisp relations - cardinality, operations, properties, cartesian product, composition. Fuzzy relations - cardinality, operations, properties, fuzzy cartesian product, composition. Linguistic hedges, membership functions - features, methods of membership value assignments – intuition, inference, rank ordering, neural networks, inductive reasoning.

**UNIT – IV: FUZZY LOGIC SYSTEMS (9 periods)**

Defuzzification: lamda - cuts for fuzzy sets and fuzzy relations, defuzzification methods-max membership principle, weighted average, centroid, center of sums. Fuzzy rule base - formation of rules, decomposition of rules, aggregation of rules, design procedure. Applications of fuzzy logic - speed control of a dc motor, air conditioner control.

**UNIT – V: GENETIC ALGORITHM ( 7 periods)**

Introduction to evolutionary computing – GA, biological back ground of GA, terminologies and operators of GA – search space, individuals, genes, fitness function, population, encoding – binary encoding, breading, selection – roulette wheel, rank selection, tournament, crossover – single point and two point crossovers, mutation – flipping, interchanging, reversing. Probabilities of cross over & mutation. Replacement – random, weak parent replacement. Termination criteria, flow chart, advantages, limitations and applications.

**Total Periods: 45**

**TEXT BOOKS:**


1. S.N. Sivanandam, S.N. Deepa, *Principles of Soft computing*, Wiley India private Ltd., 2nd edition, 2013.
2. Timothy J Ross, *Fuzzy Logic with Engineering Application*, McGraw Hill Inc.1997.


**REFERENCE BOOKS:**


1. Jacek M. Zurada, *Introduction to Artificial Neural Networks*, Jaico Publishing House.
2. Simon Haykin, *Neural Networks – A Comprehensive Foundation*, Prentice-Hall Inc, 1999.

# IV B. Tech. – I Semester
## (16BT71010) SYSTEM DESIGN USING MICROCONTROLLERS
## (Program Elective-4)

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

**PRE-REQUISITES:** A course on ARM Processors and PIC Microcontrollers.

**COURSE DESCRIPTION:** System design approaches; MSP430 Architecture; Instruction Set; Programming; Communication interfaces, Arduino, Interfacing using Arduino.

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

CO1. Demonstrate knowledge in Arduino, MSP430 Architecture, Pin out, Instruction set.
CO2. Analyze various design issues regarding usage of on chip resources, Low power modes.
CO3. Design embedded systems using Arduino microcontrollers to suit market requirements.
CO4. Solve engineering problems and arrive at solutions in designing Embedded Systems to support interconnectivity.
CO5. Use on-chip resources and appropriate software tools to design networked embedded systems with an understanding of limitations.
CO6. Follow ethics by applying standards and protocols in embedded product development.

**DETAILED SYLLABUS:**

**UNIT - I: ARDUINO OVERVIEW, PROGRAMMING AND INTERFACING (10 Periods)**

**Arduino Overview:** Arduino Family Overview, Arduino Uno features, Arduino Uno Pin functionality. Arduino Mega2560 features, Arduino Mega 2560 Pin functionality, Timer Interrupts.

**Basic Arduino Programming:** Data types, Characters, bits & Bytes, Structures, Digital I/O Read/Write, Analog I/O Read/Write, Serial functions, Functions and Modules-Tabs.

**Arduino Interfacing:** Interfacing LEDs, Switches, Potentiometers, 4x4 Keypad, 16x2 LCD, Motors, HC-SR04 - Ultra Sonic Sensor.

**UNIT - II: COMMUNICATION INTERFACES (9 Periods)**

USB, RS 485, IEEE1394 Firewire, SPI – Serial Peripheral Interface, TWI (I2C) - Two Wire Interface, CAN – Controller Area Networks, Bluetooth, Ethernet, Zigbee, Wi-Fi.

**UNIT - III: ARDUINO INTERFACING: ADVANCED (10 Periods)**

Data logging using Micro SD Card Module, DS-1307 Real Time Clock Module, Communication using Software Serial, I2C, MCP2515-CAN, Sim900A Module, NEO-6M GPS Module, HC-05 Bluetooth and ESP8266-Wifi.

**UNIT - IV: INTRODUCTION TO MSP430 (8 Periods)**

MSP 430 Family overview, Features of MSP430, Architecture of MSP430, Pin out, Functional Block diagram, Memory, CPU, Memory mapped input and output, Clock generator; Exceptions-Interrupts, Low-Power Modes.

**UNIT - V: MSP430 PROGRAMMING (8 Periods)**

Instruction Set, Addressing Modes, Reflections on CPU and Instruction set. Development Environment, Sample programs in C and Assembly.

**Total Periods: 45**

**TEXT BOOKS:**


1. Jeremy Blum, *Exploring Arduino: Tools and Techniques for Engineering Wizardry*, Wiley, 2013.
2. John H. Davies, *MSP430 Microcontroller Basics*, Newnes Publications, 2008.


**REFERENCE BOOKS:**


1. Chris Nagy, *Embedded Systems Design using the TI MSP30 Series*, Newnes Publications, 2003.
2. Michael Margolis, *Arduino Cookbook*, O'Reilly, 2011.
3. Santanu Chattopadyay, *Embedded System Design*, PHI, 2010.

## IV B. Tech. – I Semester
## (16BT71032) INDUSTRIAL AUTOMATION LAB

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

**PRE-REQUISITES:** Courses on Process Control Instrumentation, Industrial Automation.

**COURSE DESCRIPTION:** Automatic control of motors; liquid level; temperature; pressure; processes using PLC based control systems and SCADA systems. P&I diagram of Feedback Control system, Cascade control system and Ratio control system.

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

CO1. Demonstrate knowledge on
- P& I diagrams
- PLC and SCADA
- Pneumatic and Hydraulic

CO2. Analyze operation and performance of automation process made for Level Process, Bottle filling sys tem, Temperature and DC motor speed control.

CO3. Design an algorithm to automate Level Process, Bottle filling system, Temperature and DC motor speed control.

CO4. Interpret and synthesis the data obtained from various industrial processes to provide valid conclusions.

CO5. Select and apply appropriate techniques to make industrial process automation.

CO6. Follow professional ethics and practices to provide automation solutions for the society.

CO7. Commit to ethical principle in the design of process and algorithms.

CO8. Function effectively as individual and as member in team in the field of industriala utomation.

CO9. Communicate effectively both oral and written forms in the area of industrial automation.

**LIST OF EXPERIMENTS:**

**Minimum of ELEVEN experiments to be conducted**

1. Study of various symbols and abbreviations used in P&I diagram.
2. Draw the P&I diagram of Feedback Control System and Cascade Control System.
3. Implementation of Ladder Diagrams for Logic gates, timer and counters.
4. Programming a PLC to demonstrate control of a level Process.
5. Programming a PLC to demonstrate DC Motor speed control.
6. Programming a PLC to demonstrate Bottle filling system.
7. Programming a PLC to demonstrate Temperature control.
8. Implementation of PLC programming through SCADA.
9. Programming a PLC to demonstrate control of flow process trough SCADA.
10. Study of hydraulic components and hydraulic circuits.
11. Design of pressure and flow control valves using hydraulics.
12. Study of pneumatic components and technology.
13. Design of the interaction between cylinders & valves using pneumatics.

# IV - B. Tech. - I Semester
# 14BT71022: INDUSTRIAL AUTOMATION LAB

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

**PRE-REQUISITES**: Process Control Instrumentation, Logical and Distributed Control Systems.

**COURSE DESCRIPTION:** Automatic control of motors; liquid level; temperature; pressure; processes using PLC based control systems and SCADA systems. P&I diagram of Feedback Control system and Cascade control system; Ratio control system; Drum type Boiler with only measurement points.

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

CO1. Identify and analyze the problems of various real time processes in Automation Industries.

CO2. Design and develop solutions for various real time processes in Automation Industries.

CO3. Use modern technologies to Analyze and synthesize the informa tion to provide effectivesolutions for real time problems.

**LIST OF EXPERIMENTS: Minimum 11 experiments to be conducted**

**P&I DRAWINGS USING CAD**

1. Study of various symbols and abbreviations used in P&ID diagram
2. Draw the P&I diagram of Feedback Control System and Cascade Control System.
3. Draw the P&I diagram of Feed forward Control system and Ratio Control System.
4. Draw the P&I diagram of Feedback and Cascade Control System for Evaporators.
5. Draw the P&I diagram of a Drum type Boiler with only measure ment points.

**PLC**

1. Implementation of Ladder Diagrams for Logic gates, timer and counters.
2. Programming a PLC to demonstrate control of a level Process.
3. Programming a PLC to demonstrate control of Pressure.
4. Programming a PLC to demonstrate DC Motor speed control.
5. Programming a PLC to demonstrate Bottle filling system.
6. Programming a PLC to demonstrate Temperature control.
7. Implementation of PLC programming through SCADA.
8. Programming a PLC to demonstrate control of flow process trough SCADA.

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

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

**(16BT1HS01) TECHNICAL ENGLISH**

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

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

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

**COURSE OBJECTIVES:**

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

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

**CO1:** Demonstrate knowledge in

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

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

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

**CO4:** Apply writing skills in preparing and presenting documents

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

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

**DETAILED SYLLABUS:**

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

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

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

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

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

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

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

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

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

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

**Total Periods: *45***

**TEXT BOOKS**:


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


**REFERENCE BOOKS**:


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

**14BT1HS01**: **TECHNICAL ENGLISH**

**I -Year B.Tech.**

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

**COURSE OBJECTIVES:**

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

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

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

**DETAILED SYLLABUS:**

**UNIT – I : (10 periods)**

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

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

**UNIT – II : (10 periods)**

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

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

**UNIT – III : (10 periods)**

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

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

**UNIT – IV : (10 periods)**

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

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

**UNIT – V : (10 periods)**

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

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

**Total periods: 50**

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

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

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

**(16BT1HS31) ENGLISH LANGUAGE LAB**

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

**PRE-REQUISITES:** English at intermediate or equivalent level.

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

**COURSE OBJECTIVES:**

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

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

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

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

**CO1:**Demonstrate knowledge in
- Phonetics
- Information Transfer

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

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

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

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

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

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

**LIST OF EXERCISES:**

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

**Total Lab Slots: 10**

**TEXT BOOK**:

1. Department Lab Manual

**REFERENCE BOOKS**:


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

## (14BT1HS02) ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

**B. Tech. – I year**

(Common to All branches of Engineering)

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

**COURSE OBJECTIVES:**

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

**COURSE OUTCOMES:**

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

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

**DETAILED LIST OF EXPERIMENTS / LAB PRACTICE SESSIONS:**

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

**REFERENCES :**

**1.** Departmental Lab Manual

**I B. Tech. – I/II Semester**

**(16BT1BS02) ENGINEERING PHYSICS**

(Common to all branches)

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

**PRE-REQUISITES:** Intermediate / senior secondary Physics

**COURSE DESCRIPTION:**

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

**COURSE OBJECTIVES:**

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

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

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

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

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

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

CO4: Develop problem solving skills in engineering context.

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

**DETAILED SYLLABUS:**

**UNIT I – LASERS AND FIBER OPTICS (11 periods)**

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

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

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

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

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

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

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

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

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

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

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

**UNIT V – CRYSTALLOGRAPHY AND NANOMATERIALS (07 periods)**

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

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

**Total Periods: 45**

**TEXT BOOKS**:

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

**REFERENCE BOOKS**:

1. Dr. S. Mani Naidu, ***Engineering Physics***, Pearson Education, 1st Edition, 2013.
2. M.N. Avadhanulu, P.G.Kshirsagar, ***A textbook of Engineering Physics***, S.Chand & Company Ltd. Revised edition 2014.

3. K. Thyagarajan***, Engineering Physics-I***, McGraw-Hill Education (India) Pvt.Ltd. 2015

## (14BT1BS01) ENGINEERING PHYSICS

(Common to All Branches of Engineering)

**I Year B. Tech.**

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

**Pre requisite: --**

**COURSE OBJECTIVES:**

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

**COURSE OUTCOMES:**

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

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

**DETAILED SYLLABI:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Total : 85 periods**

**TEXT BOOKS :**


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


**REFERENCE BOOKS:**


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

**I B. Tech. – II Semester**

## (16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

**(Common to all Branches of Engineering)**

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

**PRE REQUISITE**: Intermediate /Senior secondary mathematics

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

**COURSE OBJECTIVES:**

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

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

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

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

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

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

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

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

**DETAILED SYLLABUS:**

**UNIT- I : FOURIER SERIES (7 periods)**

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

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

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

**UNIT-III:LAPLACE TRANSFORMS (12 periods)**

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

**UNIT-IV : Z- TRANSFORMS (9 periods)**

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

**UNIT – V : PARTIAL DIFFERENTIAL EQUATIONS (9 periods)**

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

**Total no. of periods: 45**

**TEXT BOOK:**


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


**REFERENCE BOOKS:**


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

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

## (16BT4HS31) SOFT SKILLS LABORATORY

(Common to all Branches)

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

**PRE-REQUISITES:**

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

**COURSE DESCRIPTION:**

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

**COURSE OBJECTIVES:**

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

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

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

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

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

**CO2:** Analyse the functional knowledge in

- Body Language
- Interpersonal Skills
- Stress Management

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

**LIST OF EXERCISES:**

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

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

**Total Lab Slots: 10**

**TEXT BOOKS:**

1. Department Lab Manual.

**REFERENCE BOOKS:**


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


**SUGGESTED SOFTWARE:**

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

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

## (16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

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

**PRE-REQUISITES**

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

**COURSE OBJECTIVES:**

**CEO1.** To impart knowledge of the nuances of communication.
**CEO2.** To develop Speaking and Writing skills in order to use French language effectively in distinct situations.

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

**CO1:**Demonstrate knowledge in

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

**CO2:** Analyze the possibilities and limitations of language, understanding

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

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

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

**CO5:** Understand French culture and civilization.

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

**DETAILED SYLLABUS**

**UNIT I –ORAL COMMUNICATION: (9 periods)**

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

**UNIT II –BASIC GRAMMAR: (9 periods)**

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

**UNIT III –ADVANCED GRAMMAR: (9 periods)**

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

**UNIT IV –BASIC WRITING: (9 periods)**

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

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

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

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

**Total Periods: 45**

**TEXT BOOKS**:

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

**REFERENCE BOOKS**:

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

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

## (16BT6HS06) GERMAN LANGUAGE

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

**PRE-REQUISITES**

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

**COURSE OBJECTIVES:**

**CEO3.** To impart knowledge of the nuances of communication.
**CEO4.** To develop Speaking and Writing skills in order to use German language effectively in distinct situations.
**COURSE OUTCOMES:** On successful completion of this course, the students will be able to

**CO1:** Demonstrate knowledge in

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

**CO2:** Analyze the possibilities and limitations of language, understanding

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

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

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

**CO5:** Understand German culture and civilization.

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

**DETAILED SYLLABUS**

**UNIT I –ORAL COMMUNICATION: (9 periods)**

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

**UNIT II –BASIC GRAMMAR: (9 periods)**

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

**UNIT III –ADVANCED GRAMMAR: (9 periods)**

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

**UNIT IV –BASIC WRITING**: **(9 periods)**

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

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

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

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

**Total Periods: 45**

**TEXT BOOKS**:

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

**REFERENCE BOOKS:**

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

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

## (16BT6HS07) INDIAN CONSTITUTION

(Open Elective)

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

**PRE-REQUISITES: ---**

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

**COURSE OBJECTIVES:**

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

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

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

**CO1:**Gain knowledge in

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

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

**DETAILED SYLLABUS :**

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

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

**UNIT- II :UNION GOVERNMENT (8 periods)**

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

**UNIT-III :FEDERAL SYSTEM (14 periods)**

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

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

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

**UNIT-V : INTERNATIONAL POLITICS (5 periods)**

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

**Total periods : 45**

**TEXT BOOK:**


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


**REFERENCE BOOKS:**


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

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

## (16BT6HS08) INDIAN ECONOMY

(Open Elective)

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

**PRE-REQUISITES: --**

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

**COURSE OBJECTIVES:**

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

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

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

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

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

**DETAILED SYLLABUS:**

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

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

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

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

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

**UNIT- V: ECONOMIC PLANNING (9 Periods)**

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

**Total Periods: 45**

**TEXT BOOKS**


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


**REFERENCE BOOKS**


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

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

## (16BT6HS09) INDIAN HERITAGE AND CULTURE

(Open Elective)

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

**PRE-REQUISITES:** ---

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

**COURSE OBJECTIVES:**

**CEO5.** To impart the knowledge on history of India and process of evaluation of Indian Culture and its importance.
**CEO6.** To develop analytical mind on the administrative hierarchies through the study of ancestral administration and study its relevance to the existing administrative set up
**CEO7.** To imbibe an attitude of having harmonious relations within society.

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

**CO1:** Acquaint knowledge in

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

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

**DETAILED SYLLABUS:**

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

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

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

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

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

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

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

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

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

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

**Total Periods: *45***

**TEXT BOOKS**:


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


**REFERENCE BOOKS**:


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

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

## (16BT6HS10) INDIAN HISTORY

(Open Elective)

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

**PRE-REQUISITES: ----**

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

**COURSE OBJECTIVES:**

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

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

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

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

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

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

**DETAILED SYLLABUS:**

**UNIT-I : INTRODUCTION (8 periods)**

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

**UNIT-II : ANCIENT INDIA (9 periods)**

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

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

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

**UNIT-IV: MODERN INDIA (6 periods)**

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

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

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

**Total periods : 45**

**TEXT BOOK:**

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

**REFERENCE BOOKS:**

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

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

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

## (16BT6HS11) PERSONALITY DEVELOPMENT

(Open Elective)

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

**PRE-REQUISITES:** Soft Skills Lab

**COURSE DESCRIPTION:**

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

**COURSE OBJECTIVES:**

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

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

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

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

**CO1:** Demonstrate knowledge in

- Self-Management
- Planning Career

**CO2:** Analyze the situations based on

- Attitudes
- Thinking strategies

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

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

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

**DETAILED SYLLABUS:**

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

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

**Case study**: 1

**UNIT – II: DEVELOPING POSITIVE ATTITUDES (9 Periods)**

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

**Case study**: 2

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

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

**Case study**: 3

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

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

**Case study**: 4

**UNIT - V: WORKPLACE SUCCESS (9 Periods)**

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

**Case study**: 5

**Total Periods: 45**

**TEXT BOOK:**


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


**REFERENCE BOOKS:**


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

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

## (16BT6HS12) PHILOSOPHY OF EDUCATION

(Open Elective)

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

**PRE-REQUISITES: ---**

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

**COURSE OBJECTIVES:**

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

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

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

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

**CO1:** Acquire knowledge in

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

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

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

**DETAILED SYLLABUS :**

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

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

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

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

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

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

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

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

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

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

**Total periods: 45**

**TEXT BOOKS :**


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


**REFERENCE BOOKS :**


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

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

## (16BT6HS13) PUBLIC ADMINISTRATION

(Open Elective)

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

**PRE-REQUISITES:** Nil

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

**COURSE OBJECTIVES:**

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

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

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

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

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

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

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

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

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

**DETAILED SYLLABUS :**

**UNIT – I: INTRODUCTION (9 Periods)**

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

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

**UNIT – II: PUBLIC POLICY (9 Periods)**

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

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

**UNIT – III: GOOD GOVERNANCE (9 Periods)**

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

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

**UNIT – IV: E-GOVERNANCE (9 Periods)**

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

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

**UNIT - V: DEVELOPMENT ADMINISTRATION (9 Periods)**

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

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

**Case Study:** TPDDL of Delhi and Odisha.

**Total Periods: 45**

**TEXT BOOKS**


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


**REFERENCE BOOKS**


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

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

# (16BT60112) BUILDING MAINTENANCE AND REPAIR

(Open Elective)
(Common to EEE, ECE & EIE)

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

**PREREQUISITES:** --

**COURSE DESCRIPTION:**
Durability of buildings, Failure and repair of buildings, Material Techniques for repair, Maintenance of buildings, Conservation and recycling.

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

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

**DETAILED SYLLABUS:**

**UNIT-I: DURABILITY AND SERVICEABILITY OF BUILDINGS (10 Periods)**
Life expectancy of different types of buildings; Effect of environmental elements such as heat, dampness, frost and precipitation on buildings; Effect of chemical agents on building materials, Effect of pollution on buildings, Effect of fire on building; Damage by biological agents like plants, trees, algae, fungus, moss, insects, etc.; Preventive measures on various aspects, Inspection, Assessment procedure for evaluating for damaged structures, Causes of deterioration, Testing techniques.

**UNIT-II:FAILURE AND REPAIR OF BUILDINGS (10 Periods)**
Building failure – Types, Methodology for investigation; Diagnostic testing methods and equipment, Repair of cracks in concrete and masonry, Materials for Repair, Methods of repair, Repair and strengthening of concrete buildings, Foundation repair and strengthening, Underpinning, Leakage of roofs and repair methods.

**UNIT-III: TECHNIQUES FOR REPAIR (08 Periods)**
Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete, Gunite and shotcrete, Epoxy injection, Mortar repairs for cracks, Shoring and underpinning.

**UNIT-IV: MAINTENANCE OF BUILDINGS (09 Periods)**
Reliability principles and its applications in selection of systems for building, Routine maintenance of building, Maintenance cost, Specifications for maintenance works, Dampness-Damp proof courses, Construction details for prevention of dampness; Termite proofing, Fire protection, Corrosion protection.

**UNIT-V: CONSERVATION AND RECYCLING (08 Periods)**

Performance of construction materials and components in service, Rehabilitation of constructed facilities, Conservation movement, Materials and methods for conservation work, Recycling of old buildings and its advantages, Examples.

**Total Periods: 45**

**TEXT BOOKS:**


1. Dennison Campbell, Allen and Harold Roper, *Concrete Structures – Materials, Maintenance and Repair*, Longman Scientific and Technical, UK, 1991.
2. Allen, R.T. L., Edwards, S.C. and J. D. N. Shaw, *The Repair of Concrete Structures*, Blackie Academic & Professional, UK, 1993.


**REFERENCE BOOKS:**


1. Peter H. Emmons, *Concrete Repair and Maintenance*, John Wiley and Sons Publications, 2002.
2. Building Construction under Seismic Conditions in the Balkan Region, UNDP/UNIDO Project Rer/79/015,Volume 5, *Repair and Strengthening of Reinforced Concrete, Stone and Brick Masonry Buildings*, United Nations Industrial Development Organisation, Vienna.
3. Shetty, M. S., *Concrete Technology*, S. Chand and Company.
4. Smith, P. and Julian, W., *Building Services*, Applied Science Publications, London, 1976.
5. SP: 25, BIS; *Causes and Prevention of Cracks in Buildings*.
6. Champion, S., *Failure and Repair of Concrete Structures*, John Wiley and Sons Publications, 1961.
7. Perkins, P. H., Repair, Protection and Water Proofing of Concrete Structures, E& FN Spon, UK, 3rd Edition, 1997.

IV B.Tech - I Semester

## (16BT60115)ENVIRONMENTAL POLLUTION AND CONTROL

(Open Elective)

(Common to EEE, ECE & EIE)

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

**PREREQUISITES:** --

**COURSE DESCRIPTION:**

Fundamentals ofair pollution;Dispersion of pollutants; Effects and control of air pollution; Water pollution;Soil pollution and control; Municipal solid waste management.

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

CO1. Demonstrateknowledge on air, water, soil pollution and their control and solid waste management.
CO2. Analyze causes and effects of air, water and soilpollution and their remedial measures.
CO3. Recommend suitable solutionsto complex environmental pollution problems.
CO4. Use appropriate remedial technique to solve environmental pollution problems.
CO5. Understand the effects of environmental pollutionon human health and vegetation.
CO6. Encourage sustainable development through implementation of pollution control measures.
CO7. Maintain IS Codes for environmental quality control.

**DETAILED SYLLABUS:**

**UNIT-I: AIR AND NOISE POLLUTION (08 Periods)**

**Air Pollution:** Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern; Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

**Noise Pollution:** Sound pressure, Power and intensity, Impacts of noise, permissible limits of noise pollution, measurement of noise.

**UNIT-II: AIR AND NOISE POLLUTIONCONTROL (10 Periods)**

Self-cleansing properties of the environment, Dilution method, Control at source, Process changes and equipment modifications, Control of particulates–Types of equipment, Design and operation –Settling chambers, Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseous pollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution.

**UNIT-III: WATER POLLUTIONAND CONTROL (10 Periods)**

Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, Engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment and disposal – Primary, Secondary, Tertiary; Case studies.

**UNIT-IV: SOIL POLLUTION AND CONTROL (08 Periods)**

Soil pollutants, Sources of soil pollution, Causes, Effects and control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Case studies.

**UNIT-V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)**

Types of solid waste, Composition of solid waste, Collection and transportation of solid waste, Methods of disposal – Open dumping, Sanitary landfill, Composting, Incineration, Utilization - Recovery and recycling, Energy Recovery.

**Total Periods: 45**

**TEXT BOOKS:**


1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.
2. C.S.Rao, *Environmental Pollution Control Engineering*, New Age International Pvt. Ltd., 2nd Edition, 2007.
3. Ibrahim A. Mirsa, *Soil Pollution: Origin, Monitoring & Remediation*, Springer, UK, 2nd Edition, 2008.


**REFERENCE BOOKS:**


1. M.N. Rao and H.V.N. Rao, *Air Pollution,* Tata McGraw–Hill Education Pvt. Ltd., 19th Edition, 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* Academic Press (Elsevier), 5th Edition, 2014.
3. S.M.Khopkar,*Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd Edition, 2007.
4. V. M. Domkundwar, Environmental Engineering, DhanpatRai& Co. Pvt. Ltd., New Delhi, 2014.

**IV B.Tech - I Semester**
**14BT70106: ENVIRONMENTAL POLLUTION AND CONTROL**
**(Open Elective)**
**(Common to ECE, EEE, EIE & CE)**

| Internal Marks | External Marks | Total | L | T | P | C |
|---|---|---|---|---|---|---|
| 30 | 70 | 100 | 3 | 1 | – | 3 |

**PREREQUISITES:** Environmental Sciences

**COURSE DESCRIPTION:** Introduction, Sources and Effects of Air Pollution – Dispersion of Pollutants and their control – Surface and Ground Water Pollution and control–Soil Pollution and remediation–Management of Municipal Solid Wastes.

**COURSE OUTCOMES:**
On successful completion of the courses, the students will be able to:
CO1. Explain various pollutants, characteristics and their dispersion
CO2. Analyze the major pollutants that causes environmental pollution.
CO3. Conduct research and select suitable techniques to control pollution.
CO4. Understand the effects of environmental pollutions on human beings and vegetation.
CO5. Communicate the methods of management and control of environmental pollution.

**DETAILED SYLLABUS:**

**UNIT-I: INTRODUCTION TO AIR POLLUTION AND DISPERSION OF POLLUTANTS (08 Periods)**
Scope – Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, Point and Non–Point, Line and Area Sources of Air Pollution – Stationary and Mobile Sources – Dispersion of Pollutants – Dispersion Models – Applications.

**UNIT-II: EFFECTS AND CONTROL OF PARTICULATES (09 Periods)**
Effects of Air Pollutants on Man, Material and Vegetation – Global Effects of Air Pollution – Green House Effect, Heat Island, Acid Rains, Ozone Holes – Control of Particulates – Control at Sources – Process Changes – Equipment Modifications – Design and Operation of Control Equipment – Settling Chambers – Centrifugal Separators – Bag Filters, Dry and Wet Scrubbers – Electrostatic Precipitators.

**UNIT-III: WATER POLLUTION (10 Periods)**
Introduction–Water Quality in Surface Waters – Nutrients – Controlling Factors in Eutrophication–Effects of Eutrophication – Ground Water Pollution – Thermal Pollution – Marine Pollution – Sewage Disposal in Ocean – Types of Marine Oil Pollution – Cleanup of Marine Oil Pollution – Control of Water Pollution – Case Study on Tanneries – Drinking Water Quality Standards.

**UNIT-IV: SOIL POLLUTION (09 Periods)**
Soil Pollutants – Sources of Soil Pollution – Causes of Soil Pollution and their Control – Effects of Soil Pollution–Diseases Caused by Soil Pollution – Methods to Minimize Soil Pollution – Effective Measures to Control Soil Pollution – Case Study on Fertilizer.

**UNIT-V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)**
Introduction – Types of Solid Wastes – Principles of Excreta Disposal – Domestic Solid Waste Production – Collection of Solid Wastes – Transport of Solid Wastes – Management of Solid Wastes – Methods of Land Disposal – Sanitary Landfill – Composting – Incineration.

**Total Periods: 45**

**TEXT BOOKS:**
1. C.S.Rao, *Environmental Pollution Control Engineering*, 2nd Edition, New Age International Pvt Ltd., 2007.
2. Y.Anjaneyulu, *Introduction to Environmental Science,* 1st Edition, BS Publications*.,* 2009.

**REFERENCE BOOKS:**


1. M.N. Rao and H.V.N. Rao, *Air Pollution,* 19th Edition, Tata McGraw–Hill Education Pvt. Ltd., 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* 5th Edition, Academic Press (Elsevier)*,* 2014.
3. S.M.Khopkar , *Environmental Pollution Monitoring and Control,* 2nd Edition, New Age International Pvt Ltd., 2007.
4. S.Deswal and K.Deswal, *Environmental Science,* 2nd Edition, Dhanpat Rai & Co, 2011.

II B.Tech. - I semester

## (16BT30431) BASIC ELECTRONICS AND DIGITAL DESIGN LAB

(Common to ECE & EIE)

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

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

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

**COURSE OUTCOMES:**

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

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

CO2. Analyze the characteristics of different electronic devices and circuits like

- Diodes-PN Junction Diodes, Zener Diodes, SCR
- Transistors-BJT,FET,UJT
- Combinational Circuits-HA, FA
- Flip Flops-JK FF, D FF
- Sequential Circuits -Counters

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

CO4. Solve engineering problems with better Electronic circuits.

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

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

**LIST OF EXERCISES:**

**PART A**

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

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

**PART B**

**DIGITAL CIRCUITS (Minimum FOUR experiments to be conducted)**

**Design and Realization of**

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

**Demonstration of**

7. VHDL Programme

## I B. Tech. - I Semester

## (16BT10232) ELECTRICAL AND ELECTRONICS WORKSHOP PRACTICE

(Common to ECE, EEE & EIE)

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

**PRE-REQUISITES:** NIL

**COURSE DESCRIPTION:** Identification and specifications of various Electric and Electronic devices; analysis of various series, parallel and series-parallel electrical circuits; develop various electrical circuits for domestic and industrial applications.

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

CO1: Demonstrate knowledge on various Electrical and Electronic Devices.
CO2: Analyze various series and parallel electrical circuits.
CO3: Design and develop various electrical circuits for domestic and industrial applications.
CO4: Function effectively as individual and as a member in a team.
CO5: Communicate effectively both oral and written forms

**DETAILED SYLLABUS:**

**PART A**: (Demonstration)

1. Identification and Specifications of R, L, C Components (Colour Codes), Potentiometers, Switches (SPST, DPST and DPI), Gang Condensers, Relays, Bread Boards, PCBs, Fuses, MCBs, Earthing and Electrical Wiring accessories.
2. Identification and Specifications of Active Devices: Diodes, BJTs, Low-power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs, Linear and Digital ICs.
3. Study the operation of
   - Multimeter (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO.

**PART-B:**

1. Measurement of Electrical Quantities (AC & DC) using: Voltmeter, Ammeter and Wattmeter.
2. Measurement of Resistivity of a conducting wire.
3. Circuit with one lamp controlled by one switch and provision of 2-pin or 3-pin socket PVC surface conduit system.
4. Circuit with two lamps controlled by two switches with PVC surface conduit system.
5. Circuit for Stair case wiring and Godown wiring.
6. Circuit connection for a Fluorescent tube
7. Solder simple electronic circuits.
8. B-H curve of a Magnetic material
9. I-V and P-V characteristics of a Solar panel
10. Design and Fabrication of a single-phase transformer
11. PCB preparation and design of a circuit on a PCB

## II B.Tech. - I semester

## (16BT30251) ELECTRICAL TECHNOLOGY LAB

(Common to ECE & EIE)

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

**PREREQUISITES:** Courses onNetwork Analysis and Network Analysis lab.

**COURSE DESCRIPTION:**

Construction,operation,types, performance evaluation of DC& ACmachines and transformers;Necessity of starter for DC motors; Three phase power measurement.

**COURSE OUTCOMES:**

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

CO1. Demonstrate knowledge on
- Construction, operation of DC& ACmachines and transformers.
- Starting and speed control of DC motors.
- Testing of DC& ACmachines and transformers.
- Characteristics of DC& ACmachines and transformers.
- Measurement of three phase power.
- Applications of DC& ACmachines and transformers.

CO2. Analyzethe operation and performance of DC& ACmachines, transformers and three phase system for various operating conditions.

CO3. Design the circuit with suitable accessories / controllers for desired operation conditions of DC & AC machines.

CO4. Interpret and synthesize the data obtained from experimentation on DC& ACmachines, transformers and three phase system and provide valid conclusions.

CO5. Select and apply appropriate technique for testing and control of DC& ACmachines and transformers useful in industry.

CO6. Apply the conceptual knowledge of electrical machines in relevance to industry and society.

CO7. Commit to ethical principles and standards while exercising the practical investigations on electrical machines.

CO8. Work individually or in a group while exercising practical investigationsin the field of electrical machines.

CO9. Communicate effectively in verbal and written form in relevance to electrical machines.

**DETAILED SYLLABUS:**

**PART -A**

1. Construction of DC machines, transformers, synchronous machines, induction motorsand DC motor starters.

**PART – B**

**Any NINE experiments are to be conducted**

1. Magnetization characteristic of a DC generator.
2. Load characteristics of DC shunt generator.
3. Swinburne's test on a DC shunt machine.
4. Brake test on a DC shunt motor.
5. Speed control of DC shunt motor by
    a. Field flux control method
    b. Armature voltage control method.
6. OC and SC tests on a singlephase transformer.
7. Load test on a single phase transformer.
8. Measurement of power using two wattmeter method
9. Brake test on a threephase induction motor.
10. Regulation of a three phase alternator by synchronous impedance method.
11. Brake test on single phase induction motor.

**II B. Tech -I Semester**
**14BT30222: ELECTRICAL TECHNOLOGY LAB**

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

**PRE-REQUISITES:**
Courses on Network Analysis and Electrical Technology.

**COURSE DESCRIPTION:**
Determination of Two port network parameters, verification of network theorems; Response of RLC circuits; Performance characteristics of AC and DC Machines.

**COURSE OUTCOMES:**
On successful completion of course, the students will be able to:
CO1. Analyze the performance of electrical machines.
CO2. Design various types of passive filters and resonant circuits.
CO3. Solve complex problems in electrical circuits and machines.

**LIST OF EXPERIMENTS:**

**Any SIX experiments from each part to be conducted**

**Part-A**
1. Series and parallel resonant circuits.
2. TimeresponseoffirstorderRL/RCnetworkforperiodicnon-sinusoidalinputs.
3. Determination of Z and Y parameters for a given Two-port network
4. Determination of ABCD and h-parameters for a given Two-port network
5. Verification of Superposition and Reciprocity theorems
6. Verification of maximum power transfer theorem for both DC and AC excitation.
7. Verification of Thevenin's and Norton's theorems
8. Design of low pass and high pass filters.

**Part-B**
1. Magnetization characteristic of a DC generator.
2. Swinburne's test on a DC shunt machine.
3. Brake test on a DC shunt motor.
4. Speed control of DC shunt motor by
    a. Field flux control method
    b. Armature voltage control method.
5. OC and SC tests on a single-phase transformer.
6. Load test on a single phase transformer.
7. Brake test on a three-phase induction motor.
8. External characteristics of DC shunt generator.

## III B. Tech. – II Semester

## (16BT60305) HYDRAULICS AND PNEUMATICS

(Common to ME & EIE)

(Program Elective-1)

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

**PRE-REQUISITES:** Courses on Fluid Mechanics and Basic Electrical and Electronics Engineering

**COURSE DESCRIPTION:** Basic fluid power system; Hydraulic components and its use; Hydraulic circuits and its application; Fundamentals of pneumatics; Pneumatic components and its use; Pneumatic circuits; Application; Design of hydraulic and pneumatic systems for various applications; Electro Pneumatics; Logic gates.

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

CO1. Demonstrate the basic mechanism of fluid power systems and automation.

CO2. Identify and analyze engineering problems in automated environment.

CO3. Design the pneumatic and hydraulic circuits for domestic and industrial problems.

CO4. Investigate the issues related to the design and manufacture of pneumatic and hydraulic systems.

CO5. Use modern tools available in automation to enhance the productivity.

CO6. Deploy the best way of implementing the automation to have eco-friendly environment and sustainable development.

**DETAILED SYLLABUS:**

**UNIT - I: FUNDAMENTALS OF HYDRAULIC POWER SYSTEMS. (08 Periods)**

Fluid Power Fundamentals, Advantages and Application. Pascal's law, Viscous oils, properties. Components of hydraulic systems- Pumps, Gear pump, Vane pump, and Piston pump; Pumping theory, Actuators –Single acting, Double acting, Tandem, Rod less; Accumulators, Intensifiers.

**UNIT - II: HYDRAULIC CONTROL COMPONENTS AND DESIGN OF CIRCUITS (09 Periods)**

Directional control valves (DCVs), Pressure control valves, Flow control valves, Shuttle valve, Check valve, Sequence valve, Solenoid valve, and Relay, ISO/ANSI symbols, Simple hydraulic circuits, ladder diagram.

**UNIT - III: FUNDAMENTALS OF PNEUMATICS (09 Periods)**

Pneumatic system components, Compressors, Filters, Regulator, Lubricator unit (FRL UNIT), Driers, Valves, Pressure control valve, Flow control valve, Quick exhaust valve, direct control valves, Time delay valve, Memory valve, Shuttle valve, Twin pressure valve, Solenoid valves and Pneumatic cylinders, ISO/ANSI symbols.

**UNIT - IV: DESIGN OF PNEUMATIC CIRCUITS (10 Periods)**

Pneumatic circuits, Speed control circuits, Multi- Cylinder Application by Coordinated and sequential motion control, Motion and control diagrams, Cascading method- principle, and Practical application (up to two cylinders)

**UNIT - V: ELECTRO PNEUMATICS AND LOGIC GATES (09 Periods)**

**Electro- Pneumatic:** Principles - Signal input and output, Pilot assisted solenoid control of directional control valves, Use of relay and contactors.

**Logic Gates:** Introduction and use of Logic gates in pneumatic applications, Practical Examples.

**Total Periods: 45**

**TEXT BOOKS:**


1. Srinivasan.R, *Hydraulic and Pneumatic controls*, McGraw Hill Education, 2nd Edition, 2006.
2. Shanmugasundaram. K, *Hydraulic and Pneumatic Controls*, S. Chand & Co, 1st Edition, 2006


**REFERENCE BOOKS:**


1. Majumdar S.R., *Oil Hydraulics Systems Principles and Maintenance,* McGrawHill Education, 1st Edition, 2000.
2. Majumdar S.R., Pneumatic systems – Principles and Maintenance, McGraw Hill Education, 2nd Edition, 2001.

# IV B.Tech - II Semester
## 14BT80302: MECHATRONICS
**(Common to ME & EIE)**

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

**PRE-REQUISITES:**
Engineering mathematics, Basics of Electrical and Electronic Engineering, Kinematics of Machines, Design of Machine Elements.

**COURSE DESCRIPTION:**
Mechatronic system; Signal Conditioning; Actuating systems; sensors; Transducers; Linear Motion Guides; Electronic interface systems; Solenoids; PWM; DC Motor; Micro controller; AD converter; DA converter; PLC; PMC.

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

**CO1:** Employ the knowledge of Mathematics, Electronics and Mechanical engineering to design a system or component with respect to Mechatronic specifications.

**CO2:** Analyze and interpret the performance of a Mechatronic component, a system, or a process with relevance to simulation techniques.

**CO3:** Provide system level design involving interfacing and actuation used in industries.

**CO4:** Independently plan and design and define a Mechatronic problem by utilizing relevant engineering principles and techniques.

**Detailed Syllabus:**

**UNIT-I: SCOPE OF MECHATRONICS (8 Periods)**
Definitions of Traditional and Mechatronics design; Mechatronics in manufacturing and production; Examples of Mechatronics systems; Fundamentals of electronics; and Data conversion devices.

**UNIT-II: PRECISION MECHANICAL SYSTEMS (9 Periods)**
**Pneumatic and Hydraulic actuation system:** Electro-pneumatic actuator; Electro-hydraulic actuator; timing belts; control valves; LVDT; linear motion guides; piezoelectric actuators.
**Electro-mechanical drives:** Electric motor; LVDT; DC motor; AC motor; DC brushless motor; DC servo motor; 4-Quadrant servo drives, and Pulse Width Modulation-Variable

**UNIT-III: SIGNAL PROCESSING AND CONDITIONING (9 Periods)**
Discrete Time signals: sequences; representation of signals on orthogonal basis; discrete systems; Z-transformation; frequency analysis; inverse systems; discrete Fourier transformations (DFT); frequency selective filters; ideal filter characteristics; low pass; high pass-bandpass and bandstop filters, and notch filters.

**Electronic interface systems:** sensors; transducers; solenoids; transistors; MOSFET isolation scheme; opto coupling; buffer ICs; protection schemes; circuit breakers; over current sensing; resettable fuses; thermal dissipation, and power supply.

**UNIT -IV: MICROCONTROLLERS (9 Periods)**

8051 Microcontroller; Microprocessor structures; DA interfacing; DA convertors; AD convertors, and applications.

**UNIT -V: LOGIC AND MOTION CONTROLLERS (10 Periods)**

**Programmable Logic Controllers:** Basic structure; ladder diagram; timers; internal relays and counters; shift registers; PLC selection, and applications.

**Programmable Motion Controller:** Introduction, system transfer function, Control system performance and tuning, Digital Controllers, proportional P, proportional PI, proportional integral derivative PID control modes, position, velocity, torque, velocity profiles, controlled velocity profiles and applications.

**Total Periods: 45**

**TEXT BOOKS:**


1. K.P.Ramachandran, Mechatronics Integrated Mechanical Electronic Systems,Wiley, 1stedition, 2008.
2. Devdas Shetty, Richard, Mechatronic system design, Cengage learning, 1st edition, 2012.


**REFERENCE BOOKS:**


1. W. Bolton, Mechatronics Electronics Control systems in mechanical and electrical engineering, Pearson, 3rd Edition, 2005.
2. N.P. Mahalik, Mechatronics Principles concepts and applications, McGraw Hill Education (India) Private Limited, 1st Edition, 2012.
3. Dr. J.S. Chitode, Digital Signal Processing,Technical Publication, 1st Edition,2008.

# IV B. Tech. – I Semester
## (16BT70309) INDUSTRIAL ROBOTICS
(Program Elective-3)

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

**PRE-REQUISITES:** Courses on Matrices and Numerical Methods and Dynamics of Machinery.

**COURSE DESCRIPTION:** Introduction of Robots classifications; Components; Robot drive mechanisms; Mechanical transmission methods aided in functioning of robots; Forward kinematics; inverse kinematics; Manipulator dynamics; Trajectory planning and avoidance of obstacles; Robot programming; Robot Application in Industry; Future Application and Challenges and Case Studies.

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

CO1. Demonstrate the knowledge on concepts of robot, Kinematics and dynamics, Trajectory planning and programming of robot.

CO2. Identify, analyze and interpret various methods and review the contemporary problems of robotics.

CO3. Optimize various robotic configuration parameters to analyze the reverse and forward kinematics.

CO4. Investigate the performance parameters on the complex robotic designs.

CO5. Apply appropriate functional techniques, resources, and programming tools to robotic engineering activities.

CO6. Consider safety issues in designing robots for societal applications.

**DETAILED SYLLABUS:**

**UNIT - I: INTRODUCTION (09 Periods)**

Robot, Brief History, Classifications, Joint notation schemes, Work volume, Degrees of freedom, Components, End effectors - Classification of End effectors, Tools as end effectors; Drive system for grippers - Mechanical, Adhesive, Vacuum, Magnetic; Hooks & scoops, Gripper force analysis and gripper design, Active and Passive grippers.

**UNIT - II: ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS** **(08 Periods)**

Robot Drive Mechanisms - Hydraulic, Electric Servomotor, Stepper Motor; Pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives; Cables, Roller chains, Link Rod systems, Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws.

**UNIT - III: MANIPULATOR KINEMATICS & DYNAMICS**
**(10 Periods)**

**Manipulator kinematics:** Mathematical Preliminaries on Vectors & Matrices, Homogeneous transformations as applicable to rotation and translation, (D-H) notation, Forward kinematics, Inverse kinematics, Manipulators with two, Three degrees of freedom.

**Manipulator dynamics:** Introduction, Inertia of a Link, Lagrangian formulation for a planar 2R manipulator.

**UNIT - IV: TRAJECTORY PLANNING & SENSORS**
**(10 Periods)**

**Trajectory planning:** Trajectory planning and avoidance of obstacles, Path planning, Skew motion, Joint integrated motion, straight line motion.

**Sensors:** Position sensors, Velocity sensors, Tactile sensors, Proximity sensors, Machine vision sensors, Fail safe hazard sensor systems and Compliance mechanism

**UNIT - V: ROBOT PROGRAMMING AND APPLICATIONS**
**(08 Periods)**

**Robot programming:** Types, Features of languages and Software packages.

**Robot application:** Robot Application in Industry, Task programming, Goals of AI Research, AI Techniques, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges, and Case Studies.

**Total Periods: 45**

**TEXT BOOKS:**


1. M.P.Groover, *Industrial Robotics: Technology, Programming, and Applications*, Tata McGraw-Hill, 2008.
2. John. J. Craig, *Introduction to Robotics: Mechanics and Control*, Pearson/Prentice Hall, 3rd Edition, 2005.


**REFERENCE BOOKS:**


1. Richard. D.Klafter, *Robotics Engineering: an integrated approach*, Prentice-Hall publisher, 1st Edition, 1988.
2. K. S. Fu., R. C. Gonzalez, C. S. G. Lee, *Robotics: Control Sensing*, Vision and Intelligence, International Edition, Tata McGraw Hill, 2008.
3. Ashitav Ghosal, *Robotics, Fundamental Concepts and Analysis*, Oxford Press, 2006.
4. Mittal R.K & Nagrath IJ, *Robotics and Control*, Tata McGraw Hill, 6th Edition, 2007.

IV B.Tech. - I semester

## (16BT70404) ADVANCED DIGITAL SIGNAL PROCESSING

(Program Elective - 3)

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

**PREREQUISITES:**ACourse on Digital Signal Processing

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

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

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

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

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

CO4. Solve Engineering problems pertaining to Digital Signal Processing.

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

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

**DETAILED SYLLABUS:**

**UNIT-I: MULTIRATE FILTER BANKS (10 Periods)**

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

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

**UNIT-II: POWERSPECTRALESTIMATIONS (09 Periods)**

Estimation of spectra from finite duration observation of signals.

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

**Parametric Methods of Power Spectral Estimation:**

Autocorrelation & Its Properties, Relationship between autocorrelation &model parameters, Yule-walker &Burg Methods, MA &ARMA models for power spectrum estimation.

**UNIT-III: LINEAR PREDICTION (09 Periods)**

Forward and Backward Linear Prediction – Forward Linear Prediction, Backward Linear Prediction, Optimum reflection coefficients for the Lattice Forward and Backward Predictors. Solution of the

Normal Equations: Levinson Durbin Algorithm, Schur Algorithm. Properties of Linear Prediction Filters.

**UNIT-IV: DSP ALGORITHMS (08 Periods)**

Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z-Transform.

**UNIT-V: APPLICATIONS OF DIGITAL SIGNAL PROCESSING (09 Periods)**

Digital cellular mobile telephony, Adaptive telephone echo cancellation, High quality A/D conversion for digital Audio, Efficient D/A conversion in compact hi-fi systems, Acquisition of high quality data, Multirate narrow band digital filtering, High resolution narrowband spectral analysis.

**Total Periods: 45**

**TEXT BOOKS:**


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


**REFERENCE BOOKS:**


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

III B.Tech.- II Semester

**(16BT60207) ADVANCED CONTROL SYSTEMS**

**(Common to EEE & EIE) (Program Elective-2)**

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

**PREREQUISITES**:Course on Control systems

COURSE DESCRIPTION:
Designofcompensatorsandcontrollers,statespace,canonical forms,controllabilityandobservability,describingfunction,phase planeanalysis,Lyapunov'sstabilityanalysis,Fullorderobserver and reduced orderobserver.

**COURSEOUTCOMES**:Onsuccessfulcompletionofthecourse, students will be ableto

CO1. demonstrateknowledgeon
- state spaceanalysis.
- various compensators andcontrollers.
- stability in the sense ofLyapunov.
- fullandreducedorderobserversinstatespaceanalysis.

CO2. analyze the stability of nonlinear system using
- describing functionapproach.
- phase planeanalysis.
- Lyapunov'smethod.

CO3. designsuitablecompensatorandcontrollersusingroot locus and Bodeplot.

CO4. evaluate stability of systems using pole placementand Lyopunovmethodtoprovidevalidsolutions.

CO5. selectappropriatetechniquesforanalyzingthestability of thesystem.

CO6. applythe conceptual knowledge of advanced control systems in relevance to industry andsociety.

DETAILED SYLLABUS:

**UNIT-I:LINEARCONTROLSYSTEMDESIGN** **(10periods)**

Introductiontocontrolsystemdesign,typesofcompensators, design of compensators using root locus technique. Types of controllers,designofPI,PDandPIDcontrollersusingBodeplot and root locustechnique.

UNIT-II: STATESPACEANALYSIS (08periods)
Review of state space analysis. Canonical forms -Controllable canonical form, observable canonical form, Jordan canonical form. Tests for controllability and observability for continuous timesystems-Timevaryingcase,timeinvariantcase,principle ofduality,controllabilityandobservabilityformJordancanonical form.

UNIT-III: ANALYSIS OF NONLINEAR SYSTEMS

**(13 periods)** Introduction to non-linear systems, different types of physical nonlinearities,describingfunctions,derivationofdescribingfunc- tionsfordeadzone,saturation,backlash,relayandhysteresis.
Stabilityanalysisofnonlinearsystemsthroughdescribingfunc- tions, phase-plane analysis, singular points, methods for con- structingtrajectories-Isoclines'method,deltamethod.

UNIT-IV:STABILITYANALYSIS (06periods)
Stability in the sense of Lyapunov.Lyapunov's stability and Lypanov'sinstabilitytheorems.DirectmethodofLypanovforthe l inear and nonlinear continuous time autonomous systems.Generation of Lyapunov functions - Variable

gradient method,Krasooviski'smethodandPopov'scriterion.

UNIT-V:DESIGN OF CONTROL SYSTEMS IN STATE SPACE **(08periods)**

Necessityofpoleplacement,designbypoleplacement,neces- saryandsufficientconditionsforarbitrarypoleplacement.De- termination of feedback gain matrix using direct substitution methodandAckermann'sformula.Fullorderobserverandre- duced orderobserver.

**Total Periods: 45**

TEXT BOOKS:


1. M.Gopal,*ModernControlSystemTheory*,NewAgeInterna- tional (P) Ltd., 2nd edition,2000.
2. K.Ogata,*ModernControlEngineering*,PrenticeHallofIndia, 4th edition,2006.


REFERENCE BOOKS:


1. A. Nagoorkani, Advanced control theory, RBA publications, 2nd edition,1999.
2. I.J.NagrathandM.Gopal,*ControlSystemsEngineering*,New Age International (P) Ltd.,2007.

IV B.Tech. - I Semester

# (16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

(Open Elective)

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

**PREREQUISITES:**--

**COURSE DESCRIPTION:**

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

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

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

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

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

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

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

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

**DETAILED SYLLABUS:**

**UNIT-I: FUNDAMENTALS OF NANOTECHNOLOGY(08 Periods)**

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

**UNIT-II:IDENTIFICATION AND CHARACTERIZATION TOOLS FOR NANOMATERIALS AND NANOSTRUCTURE(10 Periods)**

Field Emission Scanning Electron Microscopy (FESEM), Environmental Scanning ElectronMicroscopy (ESEM) High Resolution, Transmission Electron Microscope (HRTEM), Scanning Tunneling Microscope(STM), Surface enhanced Raman spectroscopy (SERS), Secondary Ion Mass Spectroscopy, Focused Ion Beam Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy (XPS), Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), X-Ray Diffraction, Intensities in X-Ray Scattering Particle Size Effect.

**UNIT-III:CLASSIFICATION OF NANOMATERIALS(10 Periods)**

Classification based on dimensionality, Quantum Dots,Wells and Wires-III-V Nanoparticles, Electronic Structure of Nanosemiconductor, Carbon based nanomaterials (buckyballs, nanotubes, graphene), Metal based nano materials (nanogold, nanosilver and metal oxides),

Nanocomposites,Nanopolymers,Nanoglasses, Nano ceramics, Biological nanomaterials, Fulrene-discovery and early years,.

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

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

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

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

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

**Total Periods: 45**

**TEXT BOOKS:**


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


**REFERENCE BOOKS:**


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

## III B. Tech. – II Semester

## (16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

(Common to CE, ME, CSE, IT & CSSE)
(Open Elective)

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

**PRE-REQUISITES: —**

**COURSE DESCRIPTION:** Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

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

CO1. Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.

CO2. Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.

CO3. Develop a comprehensive and well planned business structure for a new venture.

CO4. Conduct investigation on complex problems, towards the development of Project.

CO5. Apply modern statistical and mathematical tools to design projects and subsequent work procedures.

CO6. Apply ethics in constructive innovation framework.

CO7. Exhibit professionalism by employing modern project management and financial tools.

**DETAILED SYLLABUS:**

**UNIT - I: Creativity and Innovation (07 Periods)**

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

**UNIT - II: Paradigms of Innovation (11 Periods)**

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and its application, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

**UNIT - III: Sources of finance and venture capital (07 Periods)**

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process, Advantages and disadvantages of venture capital, Venture capital developments in India.

**UNIT - IV: Intellectual property innovation and Entrepreneurship (11 Periods)**

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

**UNIT - V: Open Innovation framework & Problem solving (09 Periods)**

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and

Opportunities of open innovation framework, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification.

**Total Periods: 45**

**TEXT BOOKS:**


1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.


**REFERENCE BOOKS:**


1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship*, Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, *Managing Technology and Innovation for Competitive Advantage*, Pearson India, 1st Edition, 2002.

# III B.Tech - II Semester
# 14BT60308:MANAGING INNOVATION AND ENTREPRENEURSHIP
## (OPEN ELECTIVE)
(Common to CSE, IT, CSSE, CE & ME)

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

**PRE-REQUISITES:** Nil

**Course Description:**

Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts Shifting Composition of the Economy Purposeful Innovation & 7 Sources of Innovative Opportunity The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

**Course Outcomes:**

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

**CO1:** Define, explain and illustrate theories of business innovation and entrepreneurship, the evolution of industries and economies, and the roles of Entrepreneurs.

**CO2:** Develop a comprehensive and well structured business plan for a new venture.

**CO3:** Present a persuasive business plan to potential investors or to internal stakeholders and effectively answer probing questions on the substance of the plan; and,

**CO4:** Work effectively in multidisciplinary, cross-cultural teams, towards the development of a Team Project.

**Unit-I: ENTREPRENEURSHIP (7 Periods)**

**Introduction to Entrepreneurship:** Evolution of entrepreneurship from economic theory; Managerial and entrepreneurial competencies, entrepreneurial growth and development.

**UNIT II: CREATIVITY AND INNOVATION (11Periods)**

**Creativity and Innovation:** Concepts Shifting Composition of the Economy; Purposeful Innovation & the 7 Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies: Strategies that aim at introducing an innovation, innovation & entrepreneurship, planning -incompatible with Innovation & entrepreneurship.

**Unit-III: THE INDIVIDUAL ENTREPRENEUR (7 Periods)**

**Entrepreneurial Motivation:** Need for continuous learning & relearning; AcquiringTechnological Innovation Entrepreneurial motivation (nach story); Achievement Motivation in Real life- Case Study. Entrepreneurs versus inventors

**Unit-IV: INTERNATIONAL ENTREPRENEURSHIP OPPORTUNITIES (11 Periods)**

**International Entrepreneurship:** Concepts and Nature of International Entrepreneurship. The changing International environment. Ethics and International Entrepreneurship. Entrepreneurial entry in to international business, strategic Issues in International Entrepreneurship.

**Unit-V: Creative Problem Solving (9 Periods)**

Problem Identification and Problem Solving: Problem Identification. Problem solving Innovation and Diversification.

**Total Periods: 45**

**TEXT BOOKS:**


1: Martin, M.J. "Managing Innovation and Entrepreneurship in Technology based Firm", John Wiley Interscience, 1994.

2: Ettlie, J.E. "Managing Technology Innovation", John Wiley & Sons, 2000.

3: Robert D Hisrich., Michael P Peters., Dean A Shepherd,"Entrepreneurship"The McGraw-Hill Companies, 6th Edition, 2011


**REFERENCE BOOKS:**


1: Christensen, C. M. and Raynor, M. E. The Innovators Solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press, (2003).

2: Drucker, P. F., Innovation and Entrepreneurship, New York: Harper, 1985.

3: Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press (2001).

4: Harvard Business Review on Entrepreneurship (Collection of articles), Harvard Business School Press (1999)

5: Rogers, E.M., "Diffusion of Innovations", New York: Simon and Schuster, 5th Edition, 2003.

6: Drucker, P. F. "The Discipline of Innovation," Harvard Business Review, May2000. (Originally published 1985, May-June)