DAV UNIVERSITY, JALANDHAR

SCHEME FOR

Instrumentation and Control Engineering (Pass/Hon.)

(Program ID-72,73)

3rd TO 8th SEMESTER

Session 2014 Onwards

Syllabi Applicable For Admissions in 2014

DAV UNIVERSITY

Scheme of Courses B.Tech Pass

Instrumentation and Control Engineering

Semester 3

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	MTH252	Engineering Mathematics-III	4	1	0	4	25	25	25	25	100
2	ELE250	Electromechanical Energy Conversion	4	1	0	4	25	25	25	25	100
3	ICE203	Fundamental Instrumentation and Measurement	4	0	0	4	25	25	25	25	100
4	ICE204	Network Analysis and Synthesis	3	1	0	3	25	25	25	25	75
5	CSE201	Object Oriented Programming	4	0	0	4	25	25	25	25	100
6	ENG251	Advanced Communication Skills	4	1	0	4	25	25	25	25	100
7	ELE251	Electromechanical Energy Conversion Lab	0	0	3	2	20			80	50
8	CSE205	Object Oriented Programming Lab	0	0	4	2	20			80	50
			23	**4**	**7**	**27**					**675**

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks

L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY

Scheme of Courses B.Tech

Instrumentation and Control Engineering
Semester-4

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ECE202	Electronic devices and Circuits	4	0	0	4	25	25	25	25	100
2	ICE205	Telemetry and Data Acquisition	3	1	0	3	25	25	25	25	75
3	ICE206	Electrical and Electronic Measurements	4	1	0	4	25	25	25	25	100
4	ICE207	Engineering Materials	2	1	0	2	25	25	25	25	50
5	ICE208	Linear Control System	4	1	0	4	25	25	25	25	100
6	ECE201	Digital Electronics	4	0	0	4	25	25	25	25	100
7	ECE250	Analog and Digital Electronics Lab	0	0	3	2	20			80	50
8	ICE209	Electrical and Electronic Measurements lab	0	0	3	2	20			80	50
9	ICE210	Seminar 1	0	0	2	1	-				25
			21	**4**	**8**	**26**					**650**

Note: At the end of the examination of 4TH Semester the students will undergo compulsory summer training for a period of 4 weeks. Every student will submit the Summer Training Report within two weeks from the start of teaching for 5TH Semester.

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY

Scheme of Courses B.Tech

Instrumentation and Control Engineering
Semester 5

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ECE209	Signal and Systems	4	0	0	4	25	25	25	25	100
2	ECE301	Microprocessor & Microcontrollers	4	0	0	4	25	25	25	25	100
3	ICE301	Industrial Instrumentation and Safety	4	1	0	4	25	25	25	25	100
4	ICE302	Process Dynamics and Control Engineering	4	1	0	4	25	25	25	25	100
5	ECE304	Linear Integrated Circuits	3	0	0	3	25	25	25	25	75
6	ECE306	Microprocessor & Microcontrollers	0	0	3	2	20			80	50
7	ICE305	Industrial Instrumentation Lab	0	0	3	2	20			80	50
8	ICE306	Process Dynamics and Control Lab	0	0	3	2	20			80	50
9	ICE300	Industrial Training Viva	0	0	0	2	100				50
			19	**2**	**9**	**27**					**675**

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C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY

Scheme of Courses B.Tech

Instrumentation and Control Engineering

Semester-6

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ELE351	Industrial Electronics & Electric Drives	4	0	0	4	25	25	25	25	100
2	ICE304	Bio-Medical Instrumentation	4	1	0	4	25	25	25	25	100
3	ECE311	Digital Signal Processing	4	0	0	4	25	25	25	25	100
4	ELE204	Electromagnetic Field Theory	4	0	0	4	25	25	25	25	100
5	ICE303	Power Plant Instrumentation and protection	3	1	0	3	25	25	25	25	75
6	ICE308	Bio-Medical Instrumentation Lab	0	0	3	2	20			80	50
7	ECE314	Digital Signal Processing Lab	0	0	3	2	20			80	50
8	ELE352	Industrial Electronics & Electric Drives Lab	0	0	3	2	20			80	50
			19	**2**	**9**	**25**					**625**

Note: At the end of the examination of 6TH Semester the students will undergo compulsory summer training for a period of 6weeks. Every student will submit the Summer Training Report within two weeks from the start of teaching for 7TH Semester

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type and Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

DAV UNIVERSITY

Scheme of Courses B.Tech

Instrumentation and Control Engineering

Semester-7

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ICE401	Fuzzy Logic & Neural Networks	3	1	0	3	25	25	25	25	75
2	ICE402	Digital and Non-linear Control System	3	1	0	3	25	25	25	25	75
3	ICE403	Virtual Instrumentation	4	1	0	4	25	25	25	25	100
4	ICE4XX	Departmental Elective 1	4	1	0	4	25	25	25	25	100
5	XXXXXX	Open Elective 3	3	0	0	3	25	25	25	25	75
6	ICE404	Virtual Instrumentation Lab	0	0	3	2	20			80	50
7	ICE405	Seminar 2	0	0	2	1	-				25
8	ICE406	Minor Project	0	0	4	2	20			80	50
9	ICE400	Industrial Training Viva	0	0	0	2	100				50
			17	**4**	**9**	**24**					**600**

Departmental Elective – 1

1	ICE413	Bio-sensors and MEMS	4	1	0	4	25	25	25	25	100
2	ICE414	Opto-electronics instruments	4	1	0	4	25	25	25	25	100
3	ICE415	Non-Conventional Energy Sources	4	1	0	4	25	25	25	25	100
4	ICE416	Mechatronics	4	1	0	4	25	25	25	25	100

Open Elective – 1

1	CSE450	Fundamentals of IT and its application	3	0	0	3	25	25	25	25	75
2	ECE455	Wireless and mobile communication	3	0	0	3	25	25	25	25	75
3	ELE464	Elements of power system	3	0	0	3	25	25	25	25	75
4	CSE202	Computer Architecture and organization	3	0	0	3	25	25	25	25	75

DAV UNIVERSITY

Scheme of Courses B.Tech

Instrumentation and Control Engineering

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C: Mid-Term Test-2: Based on Objective Type and Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
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DAV UNIVERSITY

Scheme of Courses B.Tech

Instrumentation and Control Engineering

Semester 8

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
1	ICE407	Analytical Instrumentation	4	1	0	4	25	25	25	25	100
2	ICE408	Advanced Process Control	4	1	0	4	25	25	25	25	100
3	ICE409	Reliability Engineering	3	1	0	3	25	25	25	25	75
4	ICE4XX	Departmental Elective 2	4	1	0	4	25	25	25	25	100
5	XXXXX X	Open Elective 2	3	0	0	3	25	25	25	25	75
6	ICE410	Major Project	0	0	6	3	20			80	75
7	ICE411	Advanced Process Control Lab	0	0	3	2	20			80	50
8	ICE412	Analytical Instrumentation Lab	0	0	3	2	20			80	50
			18	**4**	**10**	**25**					**625**

Departmental Elective – 2

1	ICE417	Optimal Control System	4	1	0	4	25	25	25	25	
2	ICE418	Environmental Instrumentation and Safety	4	1	0	4	25	25	25	25	100
3	ICE419	Ultrasonic Instruments and Measurements	4	1	0	4	25	25	25	25	100
4	ICE420	Distributed Control System	4	1	0	4	25	25	25	25	100

Open Elective – 2

1	ELE459	Power System Optimization	3	0	0	3	25	25	25	25	75
2	MEC401	Robotics and Automation	3	0	0	3	25	25	25	25	75
3	CSE301	Introduction to Computer Network	3	1	0	3	25	25	25	25	75
4	VLS402	VLSI Technology	3	0	0	3	25	25	25	25	75

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D: End-Term Exam (Final): Based on Objective Type Tests
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DAV UNIVERSITY

Course Tittle: Fundamental Instrumentation and Measurement
Paper Code: ICE203

L	T	P	Credits
4	0	0	4

Course Objective: To enhance the participant's knowledge, skills, and abilities necessary to understand the types, selection, constituting elements, dynamic performance and calibration of measuring devices and systems.

Learning Objective:

- Determine elements of the instrument system.
- Select errors and calibrate measuring instruments.
- Understand the dynamic performance of instrument systems.
- Apply different types of measurements
- Measurement of strain and stress.

UNIT-I

Measurements and measurement Systems: Measurements, significance of measurements, methods of measurements, direct methods, indirect methods, instrument and measurement systems, mechanical, electrical and electronic instruments, classification of instruments, deflection and null type instruments- deflection type, null type, comparison of deflection and null type **instruments**, analog and digital modes of operation, functions of instruments and measurement systems, applications of measurement systems, types of instruments systems, information and signal processing, elements of a generalized measurement system- primary sensing element, variable conversion element, data presentation element, input-output configurations of measuring instruments and measurement systems- desired inputs, inferring inputs, modifying inputs, methods of correction for interfering and modifying inputs.

15 Hr

UNIT-II

Characteristics of instruments and measurement systems: Measurement system performance, static calibration , static characteristics, errors in measurements, true value, static error, static correction, scale range and scale span, error calibration curve, reproducibility and drift repeatability, noise –signal to noise ratio, source of noise, Johnson noise, power spectrum density, noise factor and noise figure, accuracy and precision, indications of precision, significant figures, range of doubt, possible errors and doubtful figures, static sensitivity, linearity, hysteresis, threshold, dead time, dead zone, resolution of discrimination, loading effects, input and output impedances- input impedances, input admittance, output impedance, output admittance, loading effect due to shunt connected instruments, loading effects due to series connected instruments, generalized impedance and stiffness concepts, static stiffness and static compliance, impedance matching and maximum power transfer.

Dynamic response, dynamic analysis of measurement systems, mathematical models of measurement systems, linear and non-linear systems, analysis of linear systems, linear approximation of non-linear systems, electrical network, mechanical systems, force-voltage and force-current analogies.

Errors in measurements and their statistical analysis: Limiting errors (Guarantee errors), relative (fractional) limiting errors, combination of quantities with limiting errors, known errors,

types of errors, gross errors, systematic errors- instrumental errors, environmental errors, observational errors, random (residual) errors.

15 Hr

UNIT-III

Analog Measuring Instruments: Classification of Analog instruments, operating forces in indicating instruments, T/W ratio, pointers and scales. Working principle, theory, construction and salient features of electromechanical indicating / registering instrument viz. PMMC, Electrodynamometer, Moving iron, Rectifier type, Induction type for the measurement of dc and ac voltage, current, power, energy (1-phase induction type wattmeter), power factor (single phase Electrodynamometer), Volt ohmmeter or multimeter.

15 Hr

UNIT-IV

Display & Recording Methods: Indicating methods, analogue & digital comparison, LED, LCD as display units, 7 segment, 14 segment & dot matrix display, Nixie tube display, difference between integrating & recording methods, recording requirements, various methods of strip chart recording, potentiometer & null balance type of recorders.

Cathode Ray Oscilloscope: CRT, its main parts, electrostatic focusing & deflection, deflection sensitivity, post deflection acceleration, types of screens for CRT, aquadagcolor, CRTs, various time base & amplifiers oscilloscope circuits, method of synchronization, various controls on CRO. Introduction to DSO.

15 Hr

Reference Books:

1. Boyes, *Instrumentation Reference Book*, 3rd ed, CBS, Publishers, 2004, Print
2. Sawhney,A.K, *A Course in Electrical & Electronic Measurement and Instrumentation*, Dhanpat Rai & Co., 2012, Print
3. Helfric, A.D and Cooper, W.D, *Modern Electronic Instrumentation and Measurmnet Techniques*, PHI, 2013, Print
4. A De Sa, *Principles of electronic instrumentation*, 2 ed, Elsevier, 2013, Print.
5. Morris, *Measurment and instrumentation: theory and application* Elsevier, 2012, Print.
6. Bell, D.A, *Electronic instrumentation and measurement*, Oxford University Press, 2012, Print
7. Dally, *Instrumentation for engineering measurement*, 2ed, CBS Publishers, Print
8. Rathore, T.S., *Digital Measurement Techniques*, 2 ed, Narosa Publishers, 2011, Print

DAV UNIVERSITY

Course Tittle: Network Analysis and Synthesis
Paper Code: ICE204

L	T	P	Credits
3	1	0	3

Course Objective: This course providesunderstanding of various circuit elements, circuit laws, coupled circuits and two port networks.

Learning Objective:

- To introduce the concept of circuit elements lumped circuits, circuit laws and reduction.
- To study the transient response of series and parallel A.C. circuits.
- To study the concept of coupled circuits and two port networks.

UNIT-I

Basic of Circuit Analysis : Basic two terminal circuit elements, Linear time invariant passive elements (resistor, capacitor and inductor), Ideal voltage and current source, Energy concepts in two terminal element, Concept of mutual inductance and coupling coefficient, Ideal Transformer, Gyrator.

Network Theorems: Introduction, Kirchoff's Law, Nodal and Loop analysis, Super Matrix method, Position theorem, Reciprocity theorem, Thevenin theorem, Norton theorem, Millman's theorem, Maximum power transfer theorem, Substitution theorem, Compensation theorem, Tellegne's theorem (for both AC and DC excitations.

10 Hr

UNIT-II

Resonance and Magnetically Coupled Circuits: Introduction, Series resonance, Parallel resonance, Magnetically coupled circuits, Simple series and parallel circuits, Dot convention.

Two-port Networks: Introduction to single and two port networks, Parameters of two port networks, z, y, h and A, B, C, D parameters, Relationship among different parameters, Series and parallel connections of two-port networks.

15 Hr

UNIT-III

Laplace Transform and Its Application: Review of Laplace transform, Solution of network problems using Laplace transform.

Network Functions And Synthesis: Network functions for one-port networks and two-port networks, Procedure for finding network functions for two-port networks, Poles and zeros of network functions, Restrictions on locations of poles and zeros in driving point functions and transfer functions, Positive real functions, Synthesis of dissipative networks, Foster and Cover form realization.

10 Hr

UNIT-IV

Attenuator And Filters: Introduction, Types of attenuators: t-type, pi-type, L-type, ladder type, balanced type, Insertion loss, Concept of Neper and decibel, Characteristic impedance of symmetrical networks, Propagation constants, Hyperbolic symmetry, properties of symmetrical

networks, Filter fundamentals, Pass and stop band, Behavior of characteristic impedance, Constant K-low and high pass filters, m-derived T-section, M-derived P-section, Variation of characteristic impedance over the high and low pass band filters, Band pass filters, band elimination filters, filter circuit design and filter performance.

10 Hr

Reference Books:

1. Ghosh, S., *Network theory: Analysis and Synthesis*, PHI, 2013, Print
2. Kaduskar, R.G, *Network fundamentals and analysis*, Whiley, Print
3. Valkenburg, Van, *Networks and Analysis*, 3ed, PHI, 2013, Print
4. Ramkalyan, *Linear Circuits: Analysis and Synthesis*, Oxford Press, 2004, Print
5. Nagsarkar, T.K. and Sukhija, M.S., *Circuits and Networks: Analysis, design and Synthesis, Oxford Press*, 2010, Print
6. Salam, M.A, *Circuit Analysis*, Narosa Publishers, 2011, Print
7. Jairath, *Problem s and solution of networks and systems*, CBS Publishers, 2013, Print
8. Chandrashekharaiah, P.M., *Electric circuits and network analysis*, CBS Publishers, 2012, Print
9. Mehta, R.K., & Mal, A.K., *CBS problems and solution series:problems and solutions in electric circuit analysis*, CBS Publishers, 2011, Print

DAV UNIVERSITY

Course Tittle: Telemetry and Data Acquisition
Paper Code: ICE205

L	T	P	Credits
3	1	0	3

Course Objective: To have knowledge regarding Data acquisition Systems and analog and digital data transmission.

Learning Objective:

- Generalized data transmission systems
- Analog& digital acquisition systems
- Methods of data transmission
- Various classes of telemetry systems

UNIT-I

Introduction: Generalized data transmission systems, analog& digital data Transmission and their comparison, block diagram of data acquisition System & its applications, introduction to electrical telemetry, its needs & block diagram.

5 Hr

UNIT-II

Data Acquisition Systems: Analog& digital acquisition systems, signal conditioning of the inputs ratio metric conversion & logarithm compression, single channel data acquisition, multi-channel DAS, computer based DAS, digital to analog converters, analog to digital converters, electromechanical ADC, uses of data acquisition systems, use of recorders in digital systems & block diagram of digital data recording system, data logging system, compact data logger , modem digital data acquisition, sensors based computer data system, digital transducer.

15 Hr

UNIT-III

Data Conversion & Transmission: Methods of data transmission, transmission channels & media, Modulation & demodulation, amplitude, frequency &phase modulation, Comparison between frequency & amplitude, pulse modulation (PAM, PDM, PFM, POM), delta modulation, adaptive data modulation &Companding, digital data codes, error correcting & error detecting codes, Asynchronous & synchronous data transmission, pulse code formats used in data transmission, radio link, frequency division &time division multiplexing, time division multiplexing using mechanical commutator, electronic time division multiplexing system, block diagram of AM frequency division multiplexing system.

15 Hr

UNIT-IV

Telemetry & Remote Control: Various classes of telemetry systems, land-line & radio telemetry, dc Telemetry , voltage current & position telemetry, land-line telemetry feedback systems, ac telemetry, frequency modulation telemetry systems, complete telemetry package including telemetry transmitting & receiving systems, case studies of remote control &telemetry applied to communication based processing control systems (pipeline control & power system control) & biomedical engineering.

10 Hr

Reference Books:

1. Sawhney,A.K, *A Course in Electrical & Electronic Measurement and Instrumentation*, Dhanpat Rai & Co., 2012, Print
2. Patranabis.D,*Telemetry Principles*, TMH,1st ed, 1999, Print
3. Munez-Ruiz, Angel; Vromans, Herman, *Data Acquisition and Measurement Techniques* CRC Press, 1998, Print
4. Gruenberg. Elliot L *Handbook of Telemetry & Remote Control*, McGraw-Hill Inc.,US, 1967, Print
5. Kalsi. H S, *Electronic Instrumentation*,TMH, 3rd ed, 2010 Print

DAV UNIVERSITY

Course Tittle: Electrical and Electronics Measurements
Paper Code: ICE206

L	T	P	Credits
4	1	0	4

Course Objective: To create participant's interest and knowledge, skills, and abilities necessary to understand Analog measurement and AC bridges.

Learning Objective:

- PMMC, Electrodynamometer, Moving iron, Rectifier type, Induction type for the measurement of dc and ac voltage, current
- General theory of ac bridge
- Theory and construction of current and potential transformers

UNIT-I

Measurement of Resistances: Classification of resistances, measurement of medium resistance, Measurement of low resistance (Kelvin double bridge, Ammeter -Voltmeter) and Measurement of high resistance including loss of charge method and Mega ohm bridge method.

AC Bridges: General theory of ac bridge, Measurement of self inductance, Measurement of capacitance, Measurement of mutual inductance, Measurement of frequency, Sources of error in ac bridges and their minimization.

15 Hr

UNIT-II

Potentiometer: Introduction to basic principle, Laboratory type Crompton's potentiometer, Dual range potentiometer, Volt ratio box, application of dc potentiometer, self balancing potentiometer

Magnetic Measurement: Working principle and theory of Ballistic galvanometer, Measurement of flux density, Determination of B-H curve, hystereris loop, Ewing Double bar permeameter, Hopkinson permeameter, separation of iron losses by wattmeter and Bridge methods.

15 Hr

UNIT-III

Transducers :- Introduction, electric transducers, advantage of electric transducers, classification, characteristics and choice of transducers, input characteristics, transfer characteristics, output characteristics Resistive traducers Resistive transducers, loading effect, power and rating potentiometer applications Strain gauge theory of strain gauge, types of strain gauge, applications. Thermistors Resistance temperature characteristics of Thermistors, voltage- current & current- time characteristics of Thermistors, application of Thermistors, integrated circuit temperature, transducer applications. Linear variable differential transformer (LVDT) Introduction advantages & disadvantages of LVDT. Uses of LVDT, rotary variable differential transformer (RVDT), applications. Capacitive transducers, transducers using change in area of plates and change in distance between plates, advantages and disadvantages, uses. Hall effect transducers applications. Piezoelectric crystal, properties of piezo electric crystals, equivalent circuit, uses of piezo electric transducers, applications.

15 Hr

UNIT-IV

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square

and Pulse generator, Sweep frequency generator, Frequency synthesizer, Block diagram of pulse generators, signal generators, function generators, wave analysers, distortion analysers, spectrum analyser, Harmonic analyser, FFT analyser, Introduction to FREQUENCY & TIME MEASUREMENT, Study of decade counting Assembly (DCA), frequency measurements, period measurements, universal counter

15 Hr

Reference Books:

1. Patranabis.D, *Instrumentation and control*, PHI, 2011 Print.
2. Murti . D.V.S, *Transducer and instrumentation*, 2nd ed, PHI 2013 Print
3. Sawhney,A.K, *A Course in Electrical & Electronic Measurement and Instrumentation*, Dhanpat Rai & Co., 2012, Print
4. Boyes, *Instrumentation Reference Book*, 3rd ed, CBS, Publishers, 2004, Print
5. Reissland Martin V, *Electrical Measurements Fundamentals*, Concepts, Applications , New age international, Print
6. Webster John G. & Eren Halit, *Measurement, Instrumentation, and Sensors Handbook*, Second Edition: Electromagnetic, Optical, Radiation, Chemical, and Biomedical Measurement, CRC Press, 2014, Print

DAV UNIVERSITY

Course Title: Engineering Materials
Paper Code: ICE207

L	T	P	Credits
2	1	0	2

Course Objective:

- To develop and learn about fundamental knowledge in engineering materials
- To expose students to the conductivity and properties of different materials

Learning Objective:

By the end of this course participants will have enough knowledge related to

- Dielectric materials
- Ohm's Law and relaxation time of electrons
- Ferromagnetic Domains and coercive force

UNIT-I

Dielectric Materials: Static dielectric constant, Polarization, atomic interpretation of the dielectric constant of mono-atomic and poly atomic gases, internal fields in the solids and liquids, static dielectric constants of solids.

Ferroelectric materials: introduction, spontaneous polarization, piezo- electricity. frequency dependence of electronics, ionic and orientational polarization, complex dielectric constant and dielectric losses.

8 Hr

UNIT-II

Conductivity of Metals: Ohm's Law and relaxation time of electrons, collision time and mean free path. Electron scattering and resistivity of metals. Heat developed in current carrying conductor, thermal conductivity of metals, superconductivity.

7 Hr

UNIT-III

Magnetic Materials : Magnetisation from microscopic view point, orbital magnetic dipole movement and angular momentum materials, diamagnetism, origin of permanent magnetic dipoles in material. paramagnetic spin systems.

15 Hr

UNIT-IV

Properties of ferromagnetic materials: Spontaneous magnetisation and the curie-Weils Law. Ferromagnetic Domains and coercive force, antiferromagnetic and ferromagnetic materials. magnetic materials for electrical devices, introduction to permanent magnets.

15 Hr

Reference Books:

1. Johens, L., *Materials Science for Electrical and Electronics Engineers*, Oxford, May 2007, Print
2. Solymar, L. *Electrical properties of materials* , 8 ed, Oxford, June 2010, Print
3. Tyagi, M.S., *Intriduction to semi-conductor materials and devices*, Wiley, Print
4. Kothari, D.P.& Jain, M.,& Jagwani,S., *Electrical and Electronics Materials*, Narosa Publishers, 2013, Print
5. Pokharel, B.P., & Karki, N.R., *Electrical engineering materials*, Narosa Publishers, 2007, Print
6. Dekker A.J., *Electrical Engineering Materials*, PHI, Print

DAV UNIVERSITY

Course Tittle: Linear Control System
Paper Code: ICE208

L	T	P	Credits
4	1	0	4

Course Objective:

- To teach the fundamental concepts of Control systems and mathematical modeling of the System
- To study the concept of time response and frequency response of the system
- To teach the basics of stability analysis of the system

Learning Objective:

- Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies
- Typical test – input signals
- Necessity of compensation
- Control components.

UNIT-I

Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control system, closed loop control systems, linear and non-linear systems, time variant and invariant, continuous and sampled-data control systems, Block diagrams, some illustrative examples.

Modeling: Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies. Use of Laplace transforms, Transfer function, concepts of state variable modeling. Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

15 Hr

UNIT-II

Time Domain Analysis: Typical test – input signals, Transient response of the first and second order systems, Time domain specifications, and Dominant closed loop poles of higher order systems, Steady state error and coefficients, pole-zero location and stability, Routh-Hurwitz Criterion.

Frequency Domain Analysis: Frequency response specifications, Closed loop frequency response, Relation between time and frequency response for second order systems, Log, Magnitude versus Phase angle plot.

15 Hr

UNIT-III

Stability Analysis: Absolute and relative stability, Polar plots and Nyquist stability criterion, Bode plots-gain margin & phase margin, M and N loci.

Root Locus Technique: The extreme points of the root loci for positive gain, Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain and sketch of the root locus plot, criterion for stability.

15 Hr

UNIT-IV

Compensation: Necessity of compensation, series and parallel compensation, compensating networks, applications of lag and lead-compensation.

Control Components: Error detectors – potentiometers and synchros, servo motors, a.c. and d.c. techno generators, Magnetic amplifiers.

15 Hr

Reference Books:

1. Ogata.K, *Modern Control Engineering*, 5TH ed.PHI, 2013 Print.
2. Prasad, *Problems and solution in control systems*, CBS Publishers, 2013, Print
3. Kuo.C.B *Automatic Control Systems,* 7th ed. PHI, 2013. Print.
4. Choudhury. D. Roy, *Modern control engineering*, PHI, 2013. Print
5. Kumarawadu, S., *Control system: theory and implementation*, Narosa Publishers, 2010, Print
6. Murthy, *Fundamentals of Linear Control System*, Elsevier, 2012, Print.
7. Bolton, *Control systems*, Elsevier(Yes dee Publishing), 2012, Print.
8. Krishnamurthi, *control system*, CBS Publishers, 2014, Print
9. Jairath, *Problems and Solution of Control system:with essential theory* , 5 ed , CBS Publishers, 2011, Print
10. Srinivas, J., *Control Systems and Mechatronics*, Narosa Publishers, 2011, Print

DAV UNIVERSITY

Course Tittle: Electrical/ Electronics Measurement and Instrumentation Lab **Paper Code: ICE209**	**L**	**T**	**P**	**Credits**
	0	0	3	2

1. To measure the value of unknown resistance with the help of Wheatstone bridge.
2. To measure the inductance of a given Coil by Anderson Bridge method.
3. To study the working of a De-Sauty Bridge and to compare the capacitance of two capacitors.
4. To measure the capacitance by Wien Series Bridge & Schering Bridge.
5. To study Maxwell's L/C Bridge for measurement of unknown Inductance and Capacitance.
6. To Study the Characteristics of LVDT.
7. To Study the Characteristics of Strain Gauge.
8. To Study the Characteristics of RTD.
9. To Study the Characteristics of Thermocouple, Thermistor.
10. To Study the Characteristics of Phototransistor & Photo diode.
11. To Study the Piezoelectric Transducer.
12. To study the characteristics of Inductive Transducer.
13. To study the characteristics of Hall Effect Transducer.

DAV UNIVERSITY

Course Tittle: Industrial Instrumentation and Safety
Paper Code: ICE301

L	T	P	Credits
4	1	0	4

Course Objective: To create knowledge and skills in temperature, pressure, flow and level measurement using transducers.
Learning Objective: By the end of this course students will be able to learn Transducers used for temperature measurement, Transducers used for pressure measurement, Transducers used for flow measurement, Safety in High Pressure Operations, Safety Management.

UNIT-I

Temperature Measurement: Transducers used for temperature measurement, Temperature scale and conversion, principle of operation, construction, characteristics of vapor, gas, liquid filled thermo meters, thermocouple and its configuration, extension wires, bimetallic thermo meter, resistance temperature detector & compensation techniques, Thermistor, pressure spring thermometer, radiation and optical pyrometer.
Pressure Measurement: Transducers used for pressure measurement, Introduction to static and dynamic pressure, unit of pressure and conversions, pressure standards, principle of working, material of Construction, advantages and limitations of various instruments based upon elastic transducers like ordinary and diaphragm, bourdan tube, bellows, capsules etc. sealed pressure gauges, pressure transmitters, pressure switches and strain gauge pressure pickups, methods for measurement of vacuum and high pressure. Pirani Gauge, calibration of pressure measurement, Mclead Gauge, K Gauge.

15 Hr

UNIT-II

Flow Measurement: Transducers used for flow measurement, Basic properties of fluids, principle of operation. construction, classification, characteristics of various measurement methods, variable headmeters, orifice plate & its types, venturi tube, flow nozzle, pitot tube, rotameter and its types, magnetic meter, turbine meter, vortex meter, mass flow meter. ultrasonic meter, thermal flow meter. Positive displacement meters.

11 Hr

UNIT-III

Level Measurement: Transducers used for level measurement, Importance of level measurement, principle of working, material of construction, advantage and limitation of various instruments such as visual level indicators, ordinary float type using string and pulley, purge method of measuring level Buoyancy method, resistance probes for level measurement, capacitive level meter, ultrasonic level measurement, Gamma rays level measurement, level limit switches, level measurement of closed vessel.

11 Hr

UNIT-IV

Industrial Safety: Fire Prevention and Control, Handling of Fire Accidents, Electrical Safety, Environmental Safety, Various safety equipments and their constructional features, Maintenance and repair of safety equipments, Safety in High Pressure Operations, Safety Management.

8 Hr

Reference Books:

1. Johnson.Curtis D, *Process Control Instrument*, 8th ed, PHI 2013, Print.
2. Turner, J.D., *Instrumentation for Engineers and Scientist*, Oxford, May 2009, Print
3. Liptak
4. Sheel, S., *Instrumentation theory and application*, Narosa Publishers, 2013, Print
5. Kutz, *handbook of measurement in science and engineering*, CBS Publishers, 2013, Print
6. Sinclair, *Sensors and transducers*, Elsevier(Yes Dee Publisher), 2012, Print.
7. Nakara, B.C & Chaudhry,M.M. *Instrument Measurement & Analysis*, 3d ed, TMH, 2009, Print
8. Murti . D.V.S, *Transducer and instrumentation*, 2nd ed, PHI 2013 Print
9. Boyes, *Instrumentation Reference Book*, 3rd ed, CBS, Publishers, 2004, Print
10. E O Deoblin, *Measurement Systems Applications*, McGraw Hill U.S, 1975, Print

DAV UNIVERSITY

Course Tittle: Process Dynamics and Control
Paper Code: ICE302

L	T	P	Credits
4	1	0	4

Course Objective:

- To develop and learn about fundamental knowledge of automatic control
- To expose students to the controller characteristics and computerized process controls

Learning Objective:

- Linearizing techniques
- Control modes
- Tuning of controllers

UNIT-I

Basic Considerations: Introduction, Basic components, diagrammatic representation, symbol and Terminology, changes at arbitrary points in the loop, offset and its analysis.
Process Characteristics: Process variables, mathematical modelling of liquid, gas, and thermal, mechanical and chemical systems, Linearizing techniques, Liquid level control in a tank, Dynamics of manometer, response of non-interacting and interacting first-order elements in series, Mixing process, Heat transfer process, Distillation column.

15 Hr.

UNIT-II

Controller Characteristics: Control modes, characteristics and comparison of on-off, proportional, integral, derivative modes and their combinations (PI, PD and PID), Introduction to Digital controllers.
Introduction to Computerized Process Controls: Control algorithm, PID Control action with Dead time.

15 Hr.

UNIT-III

Process Control: Types and Description of Processes, Blending, batch processes, compressor & chiller controls, distillation control, steam turbine & water treatment controls, boiler controls, reactor controls.
Conventional Controllers: On-off Controllers, Cascade and Feed forward Controllers, Split Range Controllers, ratio controls, Single loop, multi loop &self tuning controllers, set point control (SPC), discrete digital control (DDC)

15 Hr.

UNIT-IV

Automatic Control: Single and combined modes in closed loop, static error, velocity error. Dynamic behaviour of feedback control processes for different modes, IAE, ISE, IATE criteria, Tuning of controllers, process reaction curve.
Controller Hardware: Electronic pneumatic and hydraulic controller's implementation, single and composite modes of controllers.

15 Hr.

Reference Books:

1. Johnson .C.D, *Process Control Instrumentation Technology*, 8th ed. PHI, 2013, Print.
2. Bhagade & Nageshwar, *Process Dynamics and Control* , PHI, Print
3. Stephanopouls.G, *Chemical Process Control: An Introduction to Theory and Practice* PHI,Print
4. Singh.S.K, *Process control : Concepts, Dynamics and Applications*, PHI, 2008, Print.
5. Bhanot, S., *Process Control: Principles and Applications*, Oxford, March 2008, Print
6. Mikles, *Process modelling identification and Controls*, CBS Publishers, 2007, Print
7. R Coughanowr Donald,& Steven E.L., *Process Systems Analysis & Control*, TMH, 2008, Print

DAV UNIVERSITY

Course Tittle: Industrial Instrumentation Lab
Paper Code: ICE305

L	T	P	Credits
0	0	3	2

1. Study a Thermal process & measurement of Temperature using Thermocouple/RTD also transfer data using USB based data acquisition card.
2. Study Measurement of Level using capacitive transducer, also transfer data using USB based data acquisition card.
3. To Study Flow rate Using Rotameter.
4. To determine the Viscosity of unknown solution with the help of Oswald Viscometer.
5. Flow measurement using Venturi and Orifice plate.
6. Level measurement by measuring water column height using pressure sensor by Air bubbler method
7. To determine the specific gravity of battery acid with the help of Hydrometer.
8. Pressure measurement using LVDT

DAV UNIVERSITY

Course Tittle: Process Dynamics & Control Lab
Paper Code: ICE306

L	T	P	Credits
0	0	3	2

1. To observe first , second and third order control system for different values of damping ratio and different values of resistance.
2. To find the time constant of Level control system.
3. To study temperature control of an oven using P, PI, PID controller.
4. To identify the various elements of a Control Loop.
5. To study the calibration of the Electronic PID Controller.
6. To study the calibration of I/P (Current to Pneumatic) converter.
7. To study the calibration of Differential Pressure Transmitter
8. To study the calibration of Control Valve.
9. To study the tank level control loop (PI control)
10. To study the pressure control loop on Process Simulation kit.

DAV UNIVERSITY

Course Tittle: Bio-Medical Instrumentation
Paper Code: ICE304

L	T	P	Credits
4	1	0	4

Course Objective To teach students that medical field is based on instrumentation and to enhance their skills in different biomedical instruments.

Learning Objective:

- Origin of bio-electric signals
- Physiological parameters adaptable to bio-telemetry
- security in medical methods

UNIT-I

Physiological Transducers: Introduction to physiological systems, Pressure transducers, Transducer for body temperature measurement. Pulse sensors, Respiration sensors.

Bio-Electric Signals and Electrodes: Origin of bio-electric signals, Recording electrodes, Polarization Skin contact impendence, Electrodes for ECG, EEG, Electrical conductivity of electrode jellies and creams, Microelectrodes.

15 Hr

UNIT-II

Measurement And Analysis Techniques: Blood flow meters, Cardiac Output measurement, Pulmonary function analyzers, Spiro-meter, Respiratory gas analyzers, Blood gas analyzers Blood pH, PCO2, PO2 measurement, Blood cell counters, Audio meter, Pure tone audio meters, Speech audiometers Evoked response audio-metric systems, Oxy-meters.

X-Ray And Ultrasonic Diagnosis: Soft & Hard X-Rays. X-Ray generators for diagnosis. Radiography, Angiography, Fluoroscopy, X-Ray computed tomography, Ultrasonic principles, Application of ultrasonic for diagnosis.

15 Hr

UNIT-III

Physical Medicine And Assist Devices: Diathermy-Short wave, ultrasonic and Microwave, Range and area of irritation of each type, Nerve and muscle simulators, Pace makers external and implantable pacemakers, DC defibrillators, Defibrillator with synchronizer, Implantable defibrillators.

Radiotherapy: X-Ray therapy, Radio nuclide therapy, Units for radiation and radiation dose.

15 Hr.

UNIT-IV

Bio-Telemetry: Physiological parameters adaptable to bio-telemetry, Components of a biotelemetry system, Implantable units, Application of telemetry in patient care.

Introduction to Telemedicine: Telemedicine System's classification, input and output peripherals, Characteristic of available transmission media, introduction to communication system for telemedicine. Medical image format standards, introduction to DICOM and PACs technologies various image compression techniques, loss less and lossy image compression for biomedical application. Telemedicine and law, confidentiality of telemedicine records, security in medical

methods.

15 Hr.

Reference Books:

1. R. S Kanpur, *Handbook of Biomedical Instrumentation*, TMH, 2nd ed,, 2003 Print
2. Cromwell.L, *Biomedical Instrumentation and Measurements*, 2nd, ed.PHI 2013 Print
3. Webster, John G*, Bio-instrumentation*, John Wiley, Print
4. Webster, John G, *Medical Instrumentation, Applications &Design*, John Wiley, Print
5. Ross & Willson, *Anatomy and Physiology in Health and Illness*, Elsevier, Print
6. Dorf, *The electrical engineering handbook: sensors, nano science, Bio-medical engineering and instruments*, CBS Publishers,3rd ed, 2006, Print
7. Northrop, *Analysis and application of analog electronic circuits to bio-medical instrumentation*, 2nd ed, CBS Publishers, 2012, Print
8. Geddes, L.A & Baker, L.E., *Principles of Applied Biomedical Instrumentation* John Wiley, 3rd ed, 2008, Print

DAV UNIVERSITY

Course Tittle: Power Plant Instrumentation and Protection
Paper Code: ICE303

L	T	P	Credits
3	1	0	3

Course Objective: To teach studentsregarding power plantsand involved instrumentation
Learning Objective:

- Various types of power plants
- Generation of nuclear energy
- Layout of Nuclear plant
- Instrumentation needed in steam power plants
- controls for turbine

UNIT-I

Introduction: Various types of power plants, energy policy of India, priority for sources for power generation, selection of sites and unit size.
Steam Power Plant: Operation of steam power plant, choice of steam pressure and temperatures, Rankine cycle and its analysis, Reheat and regenerative cycle, classification of steam turbines and their working, velocity diagrams, Governing of steam turbines, layout of steam power plant, Steam condensers, vacuum efficiency, and performance of cooling towers, Fuel handling, combustion equipment, Ash handling, Heat exchangers, reheaters, feed water reheaters and evaporators.

15 Hr

UNIT-II

Nuclear Power Plant: Advantages and disadvantages, Generation of nuclear energy by fission, Nuclear reactor, nuclear reactions, types and applications, Layout of Nuclear plant.

15 Hr

UNIT-III

Hydro Power Plant: Advantages and disadvantages, hydrological cycle, hydro-graph, flow duration curve, mass curve, selection of site, essential features of a hydro plant, selection of water turbines for a given hydro power plant, layout of a hydro power plant.

20 Hr

UNIT-IV

Instrumentation: Instrumentation needed in steam power plants for plant supervision, safety and plant performance, Governing and controls needed for water flow, drum level, air/gas flow, coal flow, combustion control, control for furnaces, controls for turbine, condenser safety.

10 Hr

Reference Books:

1. Krisnaswamy.K, & Bala, P. *Power Plant Instrumentation*, 2nd ed.PHI, 2013, Print
2. Degeneff, *Principles of power engineering analysis*, CBS Publishers, 2012, Print
3. David M. Lindsley, *Power Plant Control and Instrumentation*,IEE, 2000, Print
4. Kiameh, P., *Power Plant instrumentation and Control*, TMH, 2014, Print

DAV UNIVERSITY

Course Title: Bio-Medical Instrumentation Lab
Paper Code: ICE308

L	T	P	Credits
0	0	3	2

1. To measure the respiration rate of human body with the help of thermistor as a transducer.
2. To measure the pulse rate of human body with the help of photodiode as a transducer.
3. Study of human blood pressure i.e. Systolic and Diastolic pressure & Study of basic instrumentation system for heart sound detection
4. Record ECG using student physiograph and identify P, Q, R, S and T components on the graph.
5. To find the sensitivity of the ECG signal to the positioning of electrodes.
6. To study the effect of noise on (ECG) signal (noise added to the circuit through noise generator)
7. To study the QRS detection circuit and find out heart rate using R-R interval.
8. Analyze the relationship between EMG intensity and muscle force
9. Compare the EMG signal obtained from unipolar and bipolar electrodes.
10. To study the spectral characteristics of EEG signal.
11. Analyze the rest ECG and moment ECG on the TMT machine.
12. Study the health of lungs with help of spirometer.

DAV UNIVERSITY

Course Tittle: Fuzzy Logic and Neural Networks
Paper Code: ICE401

L	T	P	Credits
3	1	0	3

Course Objective: To lay a foundation for further studies in Soft computing
Learning Objective:

- Artificial neural network technology
- Basic hop field model
- Basic concepts of fuzzy logic

UNIT-I

Introduction: History of development in neural networks, neural network characteristics, Artificial neural network technology, Model of a neuron, topology, learning, types of learning, supervised, unsupervised and reinforcement learning.

15 Hr

UNIT-II

Supervised Learning: Basic hop field model, the perceptron, linear reparability, Basic learning laws, Hebb's rule, Delta rule, Widroff and Huff LMS learning rule, correlation learning rule, In star and out star learning rules, Unsupervised learning, competitive learning, K mean clustering algorithm, Kolwner's feature maps.

15 Hr

UNIT-III

Radial Basis Function: Basic learning laws in RBF network, recurrent networks, recurrent back propagation, Real time recurrent learning algorithm.
Counter Propagation Networks: Introduction to counter propagation networks, CMAC networks, ART networks, Application of neural networks, pattern recognition, optimization, associative memories, vector quantization, control.

15 Hr

UNIT-IV

Fuzzy Logic: Basic concepts of fuzzy logic, Fuzzy logic crisp set, Linguistic variable, Membership functions, Operation of fuzzy set, Fuzzy IF THEN rules, Variable inference techniques, Defuzzification techniques, Basic fuzzy inference algorithm, Application of fuzzy logic, Fuzzy system design, Implementation of fuzzy system, Useful tools supporting design.

15 Hr

Reference Books:

1. Bishop, C.M., *Neural Networks for Pattern Recoginition*, Oxford, August 2005, Print
2. Ross, *Fuzzy logic with engineering applications*, Wiley, 3rd ed, Print
3. Driankov, D. & Hellendoorn, H. *An introduction to fuzzy control***,** Narosa Publishers, 2001, Print
4. Nanda, S.& Das, N.R., *Fuzzy Mathematical Concepts*, Narosa Publishers, 2012, Print
5. Rao, M. A & Srinavasa, J., *Neural Networks :alogorithms and Application*, Narosa Publishers, 2010, Print
6. Yagaer, *Essentials of Fuzzy modelling and control*, CBS Publishers, 2002, Print
7. RizaBerkin &Trubatch, *Fuzzy System Design Principles*, IEEE Press, 1997, Print
8. Haykin, Simon, *Neural Networks and learning machines*,PHI, 2009, Print

9. Robert Schalkoff, *Artificial Neural Networks*, TMH, 2011, Print

DAV UNIVERSITY

Course Tittle: Digital and Non-Linear Control System
Paper Code: ICE402

L	T	P	Credits
3	1	0	3

Course Objective:

- To strengthen the knowledge of Feedback control
- To inculcate the controller design concepts
- To introduce the concept of Mathematical Modeling

Learning Objective:

- Basic elements of a discrete data control system
- Different types of non-linearities
- State Space models

UNIT-I

State space analysis & design: Invariance of eigen values, Digonalisation of system matrices having distinct & repeated eigen values, Vander monde & modified Vander monde matrix. Definition of controllability & observability, derivation of controllability & observability matrix, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback, state feedback with integral control, luenberger observer.

15 Hr.

UNIT-II

Non-linear control systems: Different types of non-linearities. Peculiarities of non-linear systems. Definition of describing function. (D.F.) derivation on D.F.'s for various non-linearities, D.F. analysis of non-linear control systems, Limit cycles, Merit and limitations of D.F. analysis. Phase-plane method. Singular points, Construction of phase-plane plots for non -linear systems by isocline method, Obtaining time- domain response from the phase-plane plots, Stable, semistable and unstable limit cycles.

15 Hr.

UNIT-III

Discrete time control systems (Part-I) : Basic elements of a discrete data control system & its advantages over the continuous time systems A/D and D/A conversions, Sample and hold device, Pulse transfer function, starred Laplace transforms, Pulse transfer functions of cascaded elements, Pulse transfer function of close loop system Modified Z-transform, Stability analysis of close loop systems in Z-domain, Stability criterion by Jury's test, Stability analysis by bilinear transformation and Routh's stability criterion.

15 Hr.

UNIT-IV

Discrete time control systems (Part-II) : Discrete time equivalent of continuous time filters, State space representations of discrete time systems, State Space models from pulse transfer functions, Solution of discrete time state space equations, Design of digital control system, PID controller and frequency domain compensation design, State variable method.

15 Hr.

Reference Books:

1. Ogata.K , *Discrete time control systems*, 2nd ed., PHI, 2013, Print
2. Goodwin & Graebe, Salgado, *Control System Design*, PHI, Print
3. Kuo. Benjamin C., *Digital Control Systems*, Oxford, March 2007, Print
4. Tewari, *Modern Control Design with MATLAB and Simulation*, Wiley, Print
5. Moudgalya, *Digital Control*, Wiley, Print
6. Fadali*, Digital control Engineering-Analysis and design* 2 ed, Elsevier, 2012, Print.
7. M. Gopal, *Digital Control Engineering*, New Age international, 2003, Print
8. Benjamin C. Kuo, *Automatic Control system*, PHI, 7 ed, Print

DAV UNIVERSITY

Course Tittle: Virtual Instrumentation
Paper Code: ICE403

L	T	P	Credits
4	1	0	4

Course Objective: To make the students familiar with current scenario of industry
Learning Objective:

- Instrumentation system
- Graphical programming in data flow
- RS 232, RS485, GBIP

UNIT-I

Introduction to Virtual Instrumentation: Historical perspective, Classification of different instruments / instrumentation system, Definition and architecture of virtual instrumentation system, salient features and application area of virtual instrumentation.

15 Hr

UNIT-II

Data Flow Programming Techniques: Graphical programming in data flow, comparison with conventional programming, popular data flow and VI software packages. Building a VI front panel and block diagram, sub VI, for and while loops, case and sequence structure, formula nodes, local and global, string and file I/O, array and clusters, charts and graphs, attributes nodes.

15 Hr

UNIT-III

Data Acquisition Basics: ADC, DAC, D/O, counters and timer, PC hardware structure, timing, interrupts, DMA, software and hardware installation, Configuring data acquisition hardware using the drives in application software, use of DAQ library functions for different analog and digital input/output operations.
Common Instrument Interfaces: Current loop, RS 232, RS485, GBIP. Use of library functions to communicate with different instruments.

15 Hr

UNIT-IV

Use of Measurement Analysis Tools: Measurement of Max, Min, Peak-Peak voltage, Mathematical tools, time period of a signal, power spectrum and logging Fourier transform, Correlation methods, windowing and filtering.
Building a web based virtual instrument: Networking basics for office and industry application.

15 Hr

Reference Books:

1. Jerome.J, *Virtual instrumentation using LabVIEW*, PHI, 2013, Print.
2. Gupta, S, *Virtual Instrumentation Using Labview*, TMH, 2nd ed, 2010, Print
3. Wells Lisa K,Travis Jeffry*, LabVIEW for everyone*, PHI, 3rd ed, Print
4. Johnson Gary W*, Lab view Graphical Programming*, TMH, 2006, Print

DAV UNIVERSITY

Course Tittle: Virtual Instrumentation Lab
Paper Code: ICE404

L	T	P	Credits
0	0	3	2

1. Data Acquisition using Virtual Instrumentation from Temperature transducer.
2. Data Acquisition using Virtual Instrumentation from a Pressure Transducer
3. Creation of a CRO using Virtual Instrumentation.
4. Creation of a Digital Multi-meter using Virtual Instrumentation.
5. Design Variable Function Generator Using Virtual Instrumentation.
6. Creation of Digital Temperature Controller using Virtual Instrumentation.
7. Machine Vision concepts using Virtual Instrumentation

DAV UNIVERSITY

Course Tittle: Bio-Sensors and MEMS
Paper Code: ICE413

L	T	P	Credits
4	1	0	4

Course Objective:

- To introduce the concept of Bioinstrumentation
- To make the students familiar with Nanotechnology and fabrication technology

UNIT-I

Overview: Overview of biosensors and their electrochemistry: Molecular reorganization: enzymes, Antibodies and DNA, Modification of bio recognition molecules for Selectivity and sensitivity Fundamentals of surfaces and interfaces.

15 Hr

UNIT-II

Bioinstrumentation: Bioinstrumentation and bioelectronics devices: Principles of potentiometry and potentiometric biosensors, principles of amperometry and amperometric biosensors, Optical Biosensors based on Fiber optics, FETs and Bio-MEMS, Introduction to Chemometrics, biosensor arrays; electronic nose and electronic tongue.

15 Hr

UNIT-III

MEMS Technology: MEMS Technology: Introduction Nanotechnology and MEMS, MEMS design, and fabrication technology, Lithography, Etching, MEMS material, bulk micromachining, Surface micromachining, Microactuator, electrostatic actuation Micro-fluidics.

15 Hr

UNIT-IV

Applications: MEMS types and their applications : Mechanical MEMS strain and pressure sensors, accelerometers etc., Electromagnetic MEMS, micromotors, wireless and GPS MEMS etc Magnetic MEMS, all effect sensors, SQUID magnetometers, Optical MEMS, micromachinedfiber optic component, optical sensors, Thermal MEMS, thermo-mechanical and thermo-electrical actuators, Peltier heat pumps.

15 Hr

Reference Books:

1. Soloman, S., *Sensors Handbook,* 2 ed, CBS, Publishers, 2010, Print
2. Grimes, *Encyclopedia of sensor,s* CBS Publishers, 2007, Print
3. Mukhopadhyay, *Smart sensors and sensing technology*, CBS Publishers, 2008, Print
4. Saliterman, *fundamentals of Bio-Mems and medical micro devices*, CBS Publishers, 2006, Print
5. Julian W. Gardner, Vijay Varadan& Osama O. Awadelkarim, *Microsensors, MEMS and Smart Devices*, Wiley-Blackwell,
6. Donald G. Buerk, *Biosensors: Theory and Applications*, CRC, Print
7. Xueji Zhang, HuangxianJu & Joseph Wang, *Electrochemical Sensors, Biosensors and their Biomedical Applications*, Academic Press, Print

DAV UNIVERSITY

Course Tittle: Opto-Electronics Instruments
Paper Code: ICE414

L	T	P	Credits
4	1	0	4

Course Objective:

- To teach the students regarding optical devices and holography
- To expose the students to optical instruments

UNIT-I

Ray Tracing: Paraxial optics, matrix method in paraxial optics.
Lasers: Principle of laser, He-Ne, CO2 & ruby lesser constructions.

15 Hr

UNIT-II

Image Defects: Theories of image defects, aberrations, coma, distortions, astigmatism, chromatic aberrations their removal.

15 Hr

UNIT-III

Optical Devices: Principle & theory of telescopes reflecting & astronomical telescope& microscopes, principle &applications of ordinary camera.
Holography: Principle of holography, theory & applications.

15 Hr

UNIT-IV

Design Criteria Of Opto-Electronic Systems: Prism & gratings, spectrophotometer, flame photometer, introduction to laser based instruments.

15 Hr

Reference Books:

1. Maity, A.B., *Opto electronics and optical Fiber Sensors*, PHI, 2013, Print
2. Walker, B.H., *Optical Engeineering Fundamentals*, PHI, 2010, Print
3. Ganguly, A.K., *Optical and Opto-Electronics instrumentation*, Narosa Publishers, 2010, Print
4. Ghata, Ajoy k, *Optics*, TMH, 2009, Print

DAV UNIVERSITY

Course Tittle: Non-Conventional Sources
Paper Code: ICE415

L	T	P	Credits
4	1	0	4

Course Objective: This course providescomprehensive understanding of various conventional sources of energy and its significanceand role of contemporary scenario**.**
Learning Objective: After completion of this course participant would gain the knowledge ofhow to cope updiminishing conventional sources like coal, nuclear fuel.

UNIT-I

Introduction: Introduction to Energy Science & Technology, Law of conservation of energy, Energy calculations, energy demand, various resources of non-conventional energy.
Solar Energy: Historical review and future prospects, fundamentals and applications, Solar thermal energy conversion systems: Solar Collectors, Solar thermal power plants, solar photovoltaic systems, Prospects of solar PV systems, principles of a photo voltaic cell, V-I characteristics of a solar cell, efficiency of a solar cell.

15 Hr

UNIT-II

Geo-Thermal Energy: History resources and applications, Hydrothermal (convertive) resources, geo-thermal electric power plants, vapor dominated (stream) geothermal electrical power plant, liquid dominated (hot-water) geo-thermal electrical power plant, Liquid dominated lashed steam geothermal electric power plant, Binary cycle liquid dominated geothermal power plants, Comparison of various liquid dominated geo-thermal systems.

15 Hr

UNIT-III

Liquid Energy: Introduction, History and applications, Pipes of wind turbine generator units, Horizontal axis propeller type wind turbine generator units, Three blends, Horizontal axis wind turbine (WAWT), vertical axis wind turbines, introduction to wind energy forms and energy conversion systems.

15 Hr

UNIT-IV

Bio-mass Energy: Introduction, various resources and applications, processes, combustion, thermo-chemical, bio-chemical, hybrid bio-gas plants, Introduction and brief idea about ocean energy, tidal energy and nuclear energy systems etc.

15 Hr

Reference Books:

1. Sawhney, G.S., *Non-Conventional Energy Resources*, PHI, 2012, Print
2. Solanki, C.S., *Solar photovoltaics: Fundamental technologies and applications*, 2 ed, PHI, 2011, Print
3. Chauhan, D.S.*, Non-Conventional Energy Sources*, New Age International, Print

DAV UNIVERSITY

Course Tittle: Mechatronics
Paper Code: ICE416

L	T	P	Credits
4	1	0	4

Course Objective: To familiarize students with the combined effect of Mechanical Engineering, Electronics & Control Engineering and Computer Science.

Learning Objective:

- Integrated Mixed Systems
- Equations of motion
- Stepper Motors

UNIT-I

Introduction: Integrated Mixed Systems, Integration of Mechanical Engineering, Electronics & Control Engg and Computer Science.
Dynamic Systems Modeling and Simulation: Equations of motion, transforming, physical model to Math, Model, linearization, Frequency response.

15 Hr

UNIT-II

Control Systems: Performance specifications, Transfer functions, Stability, Controller types and their design using frequency domain and Laplace domain method, PID control, Digital Control, z-transforms, problems in analogue to digital conversion-Nyquist frequency, Digital controller design.

15 Hr

UNIT-III

Sensors and Actuators: Temperature-Sensing Thermocouples, Stress, Strain and Force measurements using strain gauges, Piezoelectric strain sensors and Accelerometers, Analog / Digital Position Measurements, Velocity Measurements. Direct Current Motors, Stepper Motors, Piezoelectric Actuators.

15 Hr

UNIT-IV

Electronics: AD and DA converters, Op Amps, Microprocessors, Digital signal processing, Logic Circuit Devices, Gates- AND, OR, NAND etc. and combinations, Study of Some Mechatronics.
Devices: Hard disk drive, dot matrix printer, optical sensing and control mechanism in NC machine tools etc.

15 Hr

Reference Books:

1. Billingslet, *Essentials of Mechatronics*, CBS, Publishers, Print
2. Cetinkunt, *Mechatronics*, CBS Publishers, 2007, Print
3. Regtien, *sensors for mechatronics* 2012, print
4. HMT, *Mechatronics*,TMH, 2000, Print
5. Michael B. Histand& David G. Alciatore, *Introduction to Mechatronics and Measurement System*, Tata McGrawHill, 2010, Print

DAV UNIVERSITY

Course Tittle: Analytical Instrumentation
Paper Code: ICE407

L	T	P	Credits
4	1	0	4

Course Objective: To teach the students about various chemical processes
Learning Objective:

- Difference between analytical and other instruments
- Gas Chromatography
- X-ray analyzers

UNIT-I

Introduction: Difference between analytical and other instruments, sampling, sampling system for liquids and gases, sampling components, automatic and faithful sampling.
Humidity and Moisture Measurements: Humidity measurement: definitions – absolute, specific, relative humidity and dew point, Dry and wet bulb psychrometer, Hair hygrometer, dew point meter. Moisture Measurement: definitions, electrical methods, NMR method, IR method.

15 Hr

UNIT-II

Gas Analysis: Gas Chromatography – principles & components, Thermal conductivity gas analyzers, Heat of reaction method, Estimation of Oxygen, Hydrogen, Methane, CO_2, Carbon monoxide etc. in binary or complex gas mixtures, paramagnetic oxygen analyzer, Electro chemical reaction method, Polarography, Density measurement.

15 Hr

UNIT-III

Chemical Composition Measurements: Newtonian and Non Newtonian flow, Measurement of viscosity and consistency, Laboratory and on line methods, Measurement of pH:- definition and methods, redox potential, electrical conductivity, conductivity cell and applications, density measurement: solids, liquids, gages.

15 Hr

UNIT-IV

Spectro-chemical Analysis: Classification of techniques, Principles and components, emission **Spectrometery:-** flame emission, atomic absorption type, Dispersive techniques, scheme for UV, IR and near IR analysis, comparison of methods, X-ray analyzers NMR spectrometry, ESR spectroscopy, Mass spectrometery.

15 Hr

Reference Books:

1. Khandpur R S*, Handbook of Analytical Instruments*, TMH, Print
2. Khare R P, *Analytical Instrumentation: an Introduction*, C.B.S. Publication, Print
3. Patranbis D*., Principles of Industrial Instrumentation*, TMH, Print
4. Liptak, Bela G., *Analytical Instrumentation*, CRC press, Print

DAV UNIVERSITY

Course Tittle: Advanced Process Control
Paper Code: ICE408

L	T	P	Credits
4	1	0	4

Course Objective: To expose the students to the latest demands in industry
Learning Objective:

- Concept of multiloop process controls
- Multivariable Maintenance and trouble shooting
- PLC and SCADA

UNIT-I

Introduction: Review and limitations of single-loop control, need for multi-loop systems.
Advanced Process Control Techniques: Concept of multiloop process controls, analysis and applications of cascade, ratio, Feed forward, override, split-range, selective and Auctioneering Control Systems with multiple loops, Dead time compensation, Adaptive control, inferential control.

15 Hr

UNIT-II

Design of control systems for multivariable process: Multivariable control system, interaction in multiple loops, RGA method for minimizing interactions e.g. distillation column, absorbers, Heat Exchangers, Furances and Reactors, P-I diagrams, standard instrumentation symbols for devices, signal types, representation and reading of instrumentation scheme using PI diagrams.

15 Hr

UNIT-III

Introduction to Computer Control systems in Process Control: DCS Configuration, control console equipment, communication between components, local control units, DCS flow sheet symbols, DCS I/O hardware and setpoint stations, SCADA

15 Hr

UNIT-IV

Programmable Logic Control: Introduction, relative merits over DCS and relays, programming languages, Hardware and system sizing, PLC installation, Maintenance and trouble shooting.

15 Hr

Reference Books:

S. No.	Author	Tittle	Publisher	Year
1.	Johnson Curtis D, *Process Control Instrumentation Technology*, PHI, Print			
2.	George Stephanopoulos, *Chemical Process Control – An introduction to Theory & Practice*, PHI, Print			
3.	Coughanowr R Donald, *Process System Analysis and Control*, TMH,Printl			
4.	Liptak B G, *Handbook of Process Control*, CRC Press, Print			

DAV UNIVERSITY

Course Tittle: Reliability Engineering
Paper Code: ICE409

L	T	P	Credits
3	1	0	3

Course Objective:

- To strengthen the knowledge of causes of failure and importance of reliability
- To introduce the concept of Redundancy

UNIT-I

Reliability Fundamentals: Introduction, Importance of reliability, Reliability functions, Failure and Failure Modes, causes of failure, Instantaneous failure rate, General reliability Function
Component Reliability and Hazard Model: Component reliability from Test data, failure data (Failure density, failure rate, reliability, probability of failure) mean failure rate MTTF,MTBF. Hazard Models (Time dependent Hazard models, Constant Hazard model, Linear Hazard model, on-linear hazard model

15 Hr

UNIT-II

10 Hr

UNIT-III

Reliability Improvement: Introduction, Improvement of components, redundancy: standby with perfect and imperfect switching. Comparison of component redundancy to system/unit redundancy, mixed redundancy, stand by redundancy
Reliability Allocation: Introduction, Redundancy allocation and techniques for reliability allocation

10 Hr

UNIT-IV

Availability and Maintainability: Concepts of reliability ,availability and maintainability, types of availability, objectives of maintenance, classification and factor effecting maintenance, maintenance levels, Inventory control of spare parts, Preventive maintenance of some electrical appliances.

10 Hr

Reference Books:

1. L.S. Srinath, *Reliability Engineering* Affiliated East –West Press
2. E. Balagurusamy, *Reliability Engineering*,Tata McGraw Hill, Print
3. Govil. A. K , *Reliability Engineering*, TMH, Print.
4. Billinton .R. & Ronald N. Allan , *Reliability Evaluation of Engg. Systems: Concepts & Techniques* Plenum Press, 2nd ed. Print.
5. Aggarwal K K, *Reliability Engineering*, Kluwer Academic Press, Print.

DAV UNIVERSITY

Course Tittle: Optimal Control System
Paper Code: ICE417

L	T	P	Credits
4	1	0	4

Course Objective:

- To teach the students regarding Optimization and Optimal control
- To create interest in Dynamic programming and Dynamic optimization

Learning Objective:

- Dynamic optimization with equality and inequality constraints
- Linear regulator and servomechanism problem
- Robust Control System

UNIT-I

Introduction and Parametric Optimization: Introduction to optimal control problems, Classification of optimal control problems, performance indices for optimal control and their selection, Dynamic optimization using.
Calculus of variations: Lagrange multiplier, Euler Lagrange's equation for different conditions, Transversality conditions, Dynamic optimization with equality and inequality constraints

15 Hr

UNIT-II

Pontryegans Max/min Principle: Optimization using Pontryegans maximum (minimum) principles with special emphasis on Bang-Bang type system.
Dynamic Programming in Continuous Time: Developments of Hamilton Jacobi equation, Matrix Riccati equation, Optimal control based on quadratic performance indices, Linear regulator and servomechanism problem.

15 Hr

UNIT-III

Dynamic programming in Discrete System: Dynamic programming multi stage decision processes in continuous time. Principle of causality, Invariant inbedding& optimality
Iterative Method of Optimization: Optimization using gradient methods and interactive techniques (steepest descent), Newton Raphson and Fletcher Powell. Introduction to multivariable system and decoupling, Introduction to Optimal Filters (Kalman Filter)

15 Hr

UNIT-IV

Robust Control System: Introduction, Robust Control System and System sensitivity, Analysis of Robustness, system with uncertain parameters, the design of robust control system, PID controllers, the design of robust PID controlled systems, design examples

15 Hr

Reference Books:

1. Gopal,Modern M, *Control System Theory*, New Age publishers, 2nd ed. Print.

2. Richard C Drof& R H Bishop *Modern Control Systems*, CRC Press 8th Ed. Print.

DAV UNIVERSITY

Course Tittle: Environmental Instrumentation and Safety
Paper Code: ICE418

L	T	P	Credits
4	1	0	4

Course Objective: Understand what constitutes the environment, what precious resources in the environment are, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

UNIT-I

Introduction: Source and classification of Air Pollution, Effect of Air Pollution in Human Health, Effect of Air Pollution on Animals, Effect of Air Pollution on Plants

15 Hr

UNIT-II

Economic Effect and Control of Pollution: Economics Effects of Air Pollution, Control of Air Pollution by Equipment, Control of Air Pollution by Process Changes, Air Pollution from Major Industrial Operations, Air Pollution legislation and regulation, Environment Protection Act, Air Pollution in Indian cities, Water & Noise Pollution. & its control, Green House effects & its control.

15 Hr

UNIT-III

Pollution Control For Specific Pollutants: Industrial Pollution Emission and Indian Standards, Analysis of Pollutants, Control of BOD, Removal of Chromium, Removal of Mercury, Removal of Ammonia / urea, Treatment of Phenolic Effects, Removal of particular matter, Removal of Sulphur Dioxide, Removal of Oxides of Nitrogen, Removal of Vapour from Efficient case, Control of CO2 and CO.

15 Hr

UNIT-IV

Pollution Control In Selected Process Industries: General considerations of Pollution Control in Chemical Industries, Pollution Control aspects of fertilizer industries, Pollution Control in Petroleum & Petrochemical Units, Pollution Control in Pulp & Paper Industries, Tanning Industries, Sugar Industries, Alcohol Industries, Electroplating & Metal Finishing Industries, Radioactive Wastes, Pollution Control methods used in Power Plants.

15 Hr

Reference Books:

1. Mahayar S P, *Pollution Control in Process Industries* Tata McGraw Hill, Print
2. H V Rao *Air Pollution* McGraw Hill
3. Graedal & Allenby*, Industrial Ecology and Sustainable Engineering*, PHI, Print
4. Henry & Heinke, *Enviormental Science and Engineering*, 2nd ed, PHI, Print
5. Nathanson, *Basic Envoirmental Technology: water supply, waste management and Pollution Control*, PHI, Print
6. ` Nazaroff, *Enviormental Engineering Science*, Wiley, Print

DAV UNIVERSITY

Course Tittle: Ultrasonic Instruments and Measurements
Paper Code: ICE419

L	T	P	Credits
4	1	0	4

Course Objective: Toenhance the skills of students in ultrasonic engineering and ultrasonic instrumentation

Learning Objective:

- Ultrasonic Transducers
- Ultrasonic flow meters
- ultrasonic Instrumentation in Bio- Medical Engineering

UNIT-I

Introduction: Ultrasonic engineering, Types of sound waves, Wave motion, velocity of propagation, characteristic impedance, reflection, attenuation and transmission through layers. Particle and radiation pressure, black diagram of ultrasonic instruments, Health hazards of Ultrasonic.

15 Hr

UNIT-II

Generation of Ultrasonic: Ultrasonic Transducers Piezoelectric and magnetostrictive transducers. Ultrasonic Transducers for Industrial Processing –Siren, whistles, liquid, Ultrasonic Generators, Depletion Layer transducers, Coupling of transducers to the load .

15 Hr

UNIT-III

Ultrasonic Measurements: Ultrasonic flow meters, liquid level sensing and control. Signaling density measurement, viscosity measurement, measurement of small particle contaminants in hydraulic systems. Measurement of temperature in hot gases. Ultrasonic flaw selection, scanning and imaging.

15 Hr

UNIT-IV

Instrumentation and applications: Ultrasonic sensing using pulse echo and Doppler techniques, industrial processing units: mechanism involved in cavitations, cleaning process, ultrasonic impact grinding, welding, ultrasonic Instrumentation in Bio- Medical Engineering .

15 Hr

Reference Books:

Sr. No.	Author	Tittle	Publisher	Year
1.	J.R.Fredrick, *Ultrasonic Engineering*, Wiley , 1965, Print			
2.	Kocis, S. & Figura, Z., *Ultrasonic Measurements and technologies*, Springer London, 2011, Print			

DAV UNIVERSITY

Course Tittle: Distributed Control System
Paper Code: ICE420

L	T	P	Credits
4	1	0	4

Course Objective: To enhance the participant's knowledge, skills, and abilities necessary to understand SCADA system and digital control system.

Learning Objective:

- DCS configuration with associated accessories
- Introduction to expert systems

UNIT-I

Computers-Hierarchical Control: Introduction to computers, memory organization, and its characteristics, RAM, ROM, magnetic disk memory, magnetic tape memory bubble memory, Introduction to centralized, de-centralized & dedicated computer process control systems.

15 Hr

UNIT-II

Supervisory Control & Data Acquisition: Layout, functions & operation of SCADA system, remote terminal unit details, control center details, communication between control centers, communication between control center& remote terminal units, introduction to internet based telemetry.

15 Hr

UNIT-III

DCS- Basic Packages: Introduction, analog control, direct digital control, distributed process control, DCS configuration with associated accessories, control console equipment, control unit (Relay Rack mounted equipments), local control units, attributes of DCS & DCS Flow sheet symbols

15 Hr

UNIT-IV

DCS System Integration: I/O hardware stations, Set-point station control, Supervisory Computer Tasks & configurations, system integration with PLCs and computers. Man-Machine Interface process monitoring and control, Introduction to expert systems, and Statistical Process Controls.

15 Hr

Reference Books:

S. No.	Author	Tittle	Publisher	Year
1.	Bela G, Liptak, *Instruments engineers handbook* Vol-II Process Control, 3rd Ed, CRC Press, 1995 Print.			
2.	Krishan Kant, *Computer-based Industrial Controls*, PHI, Print			
3.	Tsai T.H, Lane J.W, Mareeet Dekkar *Modern control techniquesfor the process industries,*1986 Print.			
4.	Iserman *Digital Control System,* springer, Print.			

DAV UNIVERSITY

Course Tittle: Advanced Process Control Lab
Paper Code: ICE411

L	T	P	Credits
0	0	3	2

1. To study various Instructions used in Ladder Logic programming of Industrial PLC.
2. To write program & control the level of water Tank using PLC.
3. To write program & control the Conveyor Belt using PLC.
4. To write program & control the Temperature using PLC.
5. To write program & control a Elevator using PLC.
6. To write program & control Traffic Light using PLC.
7. To write program & control the Speed of DC motor using PLC.
8. To study the tank level control loop.
9. Implementation of the logic gates using siemens make plc
10. Implementation of the various timers using siemens make plc.
11. Implementation of flip flops and counters using siemens make plc.

DAV UNIVERSITY

Course Tittle: Analytical Instrumentation Lab
Paper Code: ICE412

L	T	P	Credits
0	0	3	2

UNIT-I

1. To:
a) Study the various parts of a digital pH meter.
b) Study the use of various controls/knobs/displays of a pH meter and
c) Measure the pH value of a given sample solution.
2. To:
a) Study the various parts of a conductivity meter.
b) Study the use of various controls/knobs/sockets/displays, etc. of a conductivity meter
c) Measure the conductivity of the given sample solution using Conductivity Meter.
3. To measure the viscosity of a given liquid using Ostwald Viscometer.
4. To
a) Study the use of UV/Visible spectrophotometer and
b) Measure the transmittance of a given sample solution
5. To measure the absorbance of a given sample solution using UV/Visible spectrophotometer
6. To
a) Study the various parts of a practical gas chromatograph
b) Learn the use of its various controls, knobs, displays, switches, etc., and
c) Determine the composition of a given sample using gas chromatograph.
7. To
a) Study the various parts of a Microprocessor-based Atomic Absorption Spectrophotometer.
b) Study the use of various controls/knobs/displays of a Microprocessor-based Atomic Absorption Spectrophotometer.
c) Determine the transmittance of the copper sample using Atomic Absorption Spectrophotometer