U.P. TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

2nd Year (III & IV Sem.)

[Effective from session 2009-10]

1. **B.Tech. Instrumentation & Control Engineering**
2. **B.Tech. Applied Electronics & Instrumentation Engineering**
3. **B.Tech. Electronics & Instrumentation Engineering**
4. **B.Tech. Electronics Instrumentation & Control Engineering**
5. **B.Tech. Instrumentation Engineering**

U.P. TECHNICAL UNIVERSITY, LUCKNOW
Study and Evaluation Scheme
B.Tech. Instrumentation & Control Engineering, B.Tech. Applied Electronics & Instrumentation Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Electronics Instrumentation & Control Engineering, B.Tech. Instrumentation Engineering
[Effective from the session 2009-10]

YEAR 2nd, SEMESTER-III

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU-301/ EHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
2.	EAS-301/ EOE-031-EOE-038	Mathematics III/ Science based open Elective**	3	1	0	30	20	50	100	150	4
3.	EEC-301	Fundamentals of Electronics Devices	3	1	0	30	20	50	100	150	4
4.	EEC-302	Digital Electronics	3	1	0	30	20	50	100	150	4
5.	EEC-303	Electromagnetic Field Theory	3	1	0	30	20	50	100	150	4
6.	EEC-304	Fundamentals of Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8	EEC-351	Electronics Engineering Lab I	0	0	2	--	20	20	30	50	1
9.	EEC-352	Digital Electronics Lab-I	0	0	2	--	20	20	30	50	1
10.	EEC-353	PCB & Electronics Workshop	0	0	2	--	10	10	15	25	1
11.	GP 301	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**17**	**5**	**6**	**165**	**160**	**375**	**625**	**1000**	**26**

***** Human Values & Professional Ethics will be offered as compulsory Audit Course for which passing marks are 40% in theory & 50% in aggregate. Students will be required to audit it within the period of their study. There will not be carry over facility for this course and a failure student will be required to repeat this course.

Note : Numbers of departmental subjects/labs in any semester may vary as per requirement keeping subject total and credit total unchanged.

**** Science based open Elective**

EOE031/EOE041 Introduction to soft computing (Neural network, Fuzzy logic and Genetic algorithm)
EOE032/EOE042 Nano-sciences
EOE033/EOE043 Laser systems and applications
EOE034/EOE044 Space sciences
EOE035/EOE045 Polymer science and technology
EOE036/EOE046 Nuclear science
EOE037/EOE047 Material science
EOE038/EOE048 Discrete mathematics

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B.Tech. Instrumentation & Control Engineering, B.Tech. Applied Electronics & Instrumentation Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Electronics Instrumentation & Control Engineering, B.Tech. Instrumentation Engineering

[Effective from the session 2009-10]

YEAR 2nd, SEMESTER-IV

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU-402/ EHU-402	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
2.	EOE-41-EOE-048/ EAS-401	Science based open Elective** / Mathematics III	3	1	0	30	20	50	100	150	4
3.	EEC-401	Electronic circuits	3	1	0	30	20	50	100	150	4
4.	EEC-403	Electronic Instrumentation and Measurements	3	1	0	30	20	50	100	150	4
5.	EEC-404	Signals and Systems	3	1	0	30	20	50	100	150	4
6.	EIC-401	Transducer and Sensors	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC-451	Electronics Engineering Lab II	0	0	2	--	20	20	30	50	1
9	EIC-451	Transducer Lab	0	0	2	--	20	20	30	50	1
10	EEC-453	Measurement Lab	0	0	2	--	10	10	15	25	1
11.	GP 401	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**17**	**5**	**6**	**165**	**160**	**375**	**625**	**1000**	**26**

**** Science based open Elective**

EOE031/EOE041 Introduction to soft computing (Neural network, Fuzzy logic and Genetic algorithm)
EOE032/EOE042 Nano-sciences
EOE033/EOE043 Laser systems and applications
EOE034/EOE044 Space sciences
EOE035/EOE045 Polymer science and technology
EOE036/EOE046 Nuclear science
EOE037/EOE047 Material science
EOE038/EOE048 Discrete mathematics

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Study and Evaluation Scheme

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[Effective from the session 2010-11]

YEAR 3rd, SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU-501	Engineering and Managerial Economics	3	1	0	30	20	50	100	150	3
2.	EEE 507	Electrical Machines	3	1	0	15	10	25	50	75	3
3.	EEC501	Integrated Circuits	3	1	0	30	20	50	100	150	4
4.	EIC501	Control Systems - I	3	1	0	30	20	50	100	150	4
5.	EIC502	Industrial Instrumentation	3	1	0	30	20	50	100	150	4
6.	EIC503	Microprocessors & its application	3	1	0	15	10	25	50	75	3
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC551	Integrated circuits Lab	0	0	2	--	20	20	30	50	1
9.	EIC551	Control Systems Lab I	0	0	2	--	20	20	30	50	1
10.	EIC552	Industrial Instrumentation Lab	0	0	2	--	20	20	30	50	1
11.	EIC553	Microprocessors & its application Lab	0	0	2	--	20	20	30	50	1
12.	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**6**	**8**	**150**	**180**	**380**	**620**	**1000**	**26**

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Study and Evaluation Scheme

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[Effective from the session 2010-11]

YEAR 3rd, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU-601	Industrial Management	3	0	0	30	20	50	100	150	3
2.		Departmental Elective-I	3	1	0	15	10	25	50	75	3
3.		Departmental Elective-II	3	1	0	15	10	25	50	75	3
4.	EIC601	Control System - II	3	0	0	30	20	50	100	150	4
5.	EEC602	Digital Signal Processing	3	1	0	30	20	50	100	150	4
6.	EEC604	Communication Engineering	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EIC651	Control Systems Lab II	0	0	2	--	50	50	-	50	1
9.	EEC652	DSP Lab	0	0	2	--	20	20	30	50	1
10.	EEC654	Communication Lab	0	0	2	--	20	20	30	50	1
11.	EIC652	Seminar	0	0	2	--	20	20	30	50	1
12.	GP 601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**5**	**8**	**150**	**210**	**410**	**590**	**1000**	**26**

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Study and Evaluation Scheme

B.Tech. Instrumentation & Control Engineering, B.Tech. Applied Electronics & Instrumentation Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Electronics Instrumentation & Control Engineering, B.Tech. Instrumentation Engineering

[Effective from the session 2011-12]

YEAR 4th , SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EOE-071- EOE-074	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.		Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.		Departmental Elective-IV	3	1	0	30	20	50	100	150	4
4.	EIC701	Telemetry Principles	3	1	0	30	20	50	100	150	4
5.	EIC702	Digital Measurement Techniques	3	1	0	30	20	50	100	150	4
6.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	EIC751	Project	0	0	2	-	20	20	30	50	1
8.	EIC752	Telemetry Lab	0	0	3	-	50	50	-	50	2
9.	EIC753	Process Control Lab	0	0	2	-	20	20	30	50	1
10.	EIC754	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

1. EOE-071 Entrepreneurship Development
2. EOE-072 Quality Management
3. EOE-073 Operation Research
4. EOE-074 Introduction to Biotechnology

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B.Tech. Instrumentation & Control Engineering, B.Tech. Applied Electronics & Instrumentation Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Electronics Instrumentation & Control Engineering, B.Tech. Instrumentation Engineering

[Effective from the session 2011-12]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EOE-081- EOE-084	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.		Departmental Elective-V	3	1	0	30	20	50	100	150	4
3.		Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4.	EIC801	Biomedical Instrumentation	3	1	0	30	20	50	100	150	4
5.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	EIC851	Project	0	0	12	-	100	100	250	350	8
7.	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

1. EOE-081 Non Conventional Energy Resources
2. EOE-082 Introduction to Soft Computing (Neural Networks, Fuzzy Logic and Genetic Algorithm)
3. EOE-083 Product Development
4. EOE-084 Automation and Robotics

B.Tech. Instrumentation & Control Engineering, B.Tech. Applied Electronics & Instrumentation Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Electronics Instrumentation & Control Engineering, B.Tech. Instrumentation Engineering

LIST OF ELECTIVES:

Elective – I

1. EIC011 Fluid Mechanics
2. EIC 012 Optical Instrumentation
3. ECS016 Data Structure

Elective – II

1. EEC021 Digital System using VHDL
2. EEC023 Reliability and Quality management
3. EIC021 PC Based Measurements

Elective – III

1. EEC032 Embedded Systems
2. EEC033 IC Technology
3. EIC031 Computerized Process Control
4. ECS037 Data Base Management Systems

Elective – IV

1. ECS046 Operating Systems
2. EEC041 Advance DSP
3. EIC041 Remote Sensing
4. EEC043 Data Communication Networks

Elective – V

1. EEC051 Industrial Electronics
2. EIC051 Intelligent Instrumentation
3. EEC053 Biomedical Signal Processing
4. EEC054 Filter Design

Elective – VI

1. EIC061 Analytical Instrumentation
2. EIC062 Power Plant Instrumentation
3. EEC062 VLSI Design

Syllabus third semester:

THEORY SUBJECTS

EEC-301 Fundamentals of Electronics Devices			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	10
IV	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs,	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	6
V	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semiconductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.			
Reference Books: Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press.			

EEC-302 Digital Electronics			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Digital system and binary numbers: : Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes. Floating point representation Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).	1.6, 1.7, 7.4 3.1 to 3.7, 3.10	8
II	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	4.1 to 4.11	8
III	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.	5.1 to 5.5, 5.7 to 5.8 6.1 to 6.5	8
IV	Memory and programmable logic: RAM, ROM, PLA, PAL. Design at the register transfer level: ASMs, design example, design with multiplexers.	7.1 to 7.3, 7.5 to 7.7 8.4, 8.5, 8.10	8
V	Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	9.1 to 9.7	8
Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education			
Reference Books:			

EEC-303 Electromagnetic Field Theory			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	a. to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
V	Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, Some applications of transmission lines.	11.1 to 11.6	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th TMH			

EEC-304 Fundamental of Network Analysis & Synthesis			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Signal analysis, complex frequency, network analysis, network synthesis General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV	Properties of transfer functions, zeroes of transmission, synthesis of Y_{21} and Z_{21} with 1Ω terminations.	12.1 to 12.3	6
V	Introduction to active network synthesis	Material available on UPTU website	8
Text Book: Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.			
Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.			

LABORATORY

EEC- 351 ELECTRONICS ENGINEERING LAB I

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply-Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC .
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

EEC- 352 DIGITAL ELECTRONICS LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project.

EEC-353 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Winding shop: Step down transformer winding of less than 5VA.
2. Soldering shop: Fabrication of DC regulated power supply
3. PCB Lab: (a) Artwork & printing of a simple PCB.
   (b) Etching & drilling of PCB.
4. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
5. Testing of regulated power supply fabricated.

Fabricate and test the audio amplifier circuit by using above power supply

Syllabus fourth semester:

THEORY SUBJECTS

EEC-401 Electronic circuits			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V	**Feedback:** The general feed back structure, properties of negative feed back, the four basic feed back topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	4+3
Text Book: A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.			
Reference Books:			

EEC-403 Electronic Instrumentation and Measurements			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter,	1.1 to 1.7 2.1 to 2.5 3.1 to 3.4	8
II	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter system	4.1, 4.2, 4.4, 4.5, 4.7 6.1 to 6.3	8
III	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	7.1, 7.3, 7.4, 7.5 8.2 to 8.4, 8.9	8
IV	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications	9.1, 9.3, 9.4, 9.5, 9.7, 9.9, 9.12 10.1, 10.3, 10.4, 10.5	8
V	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters	12.1, 12.2, 12.3 13.2, 13.4	8

Text Book: David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008.

Reference Books:

1. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
2. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.

EEC-404 Signals and Systems			3 1 0
Unit No.	Topics	Chapter/ Section	Proposed number of Lectures
I	**Signals:** Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/multi-dimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV	**Systems:** Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10
Text Book: P. Ramakrishna Rao, `Signal and Systems' 2008 Edn., Tata MGH, New Delhi			
Reference Books: 1. Chi-Tsong Chen, `Signals and Systems', 3rd Edition, Oxford University Press, 2004 2. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'signals & System',PEARSON Education, Second Edition, 2003.			

EIC-401 Transducers and Sensors			3 1 0
Unit No.	Topics	Chapter/ Section	Proposed number of Lectures
I	**Generalised configurations, functional description & performance characteristics of measuring instruments**: Functional elements of an instrument; active & passive transducers; analog & digital modes of operation; null & deflection methods; I/O configuration of measuring instruments & instrument system – methods of correction for interfering & modifying inputs. Generalized performance characteristics of Instruments: Static characteristics and static calibration- Meaning of static calibration,	2.1 to 2.5 3.2.1 to 3.2.6, 3.2.8 to 3.2.13	08

	measured value versus true value, Some basic statistics least square calibration curves, calibration accuracy versus installed accuracy, Combination of component errors in overall system accuracy calculations, static sensitivity, linearity, threshold, noise floor, resolution, hysteresis and dead space. Scale readability. Span, Generalized static stiffness & input impedance.		
II	**Motion and Dimensional measurement**: Fundamental standards, relative displacements- translational and rotational, Calibration, Resistive potentiometers, differential transformers, variable inductance & variable reluctance pickups, capacitance pickup, Piezo-electric transducers, digital displacement transducers, Relative velocity Translational and rotational, calibration, velocity by electrical differentiation of displacement voltage signals, average velocity from measure Δx and Δt, mechanical fly ball angular velocity sensor, mechanical revolution counters and timers, tachometer encoder methods, stroboscopic method, translational velocity transducer, eddy current Drag-cup tachometer, Gyroscopic angular displacement and velocity sensors.	4.3.1 to 4.3.5, 4.3.7 to 4.3.10, 4.4.1 to 4.4.6, 4.4.8 to 4.4.10, 4.11	08
III	**Force, Torque, Shaft power and Pressure measurement**: Standards & calibration; basic methods of force measurement; characteristics of elastic force transducer-Bonded strain gauge, differential transformer, Piezo electric transducer, variable reluctance/FM-oscillator, digital systems. Loading effects; Torque measurement on rotating shafts, shaft power measurement (dynamometers). Basic methods of pressure measurement; dead weight gauges & manometer, manometer dynamics; elastic transducers; high pressure measurement; low pressure (vacuum) measurement – McLeod gage, Knudsen gage, momentum-transfer (viscosity) gages, thermal conductivity gages, ionization gages, dual gage technique.	5.1 to 5.5 6.1, 6.3, 6.4, 6.7 6.8, 6.8.2, 6.8.4 to 6.8.7	8
IV	**Flow measurement**: Local flow velocity, magnitude and direction. Flow visualization. Velocity magnitude from pilot static tube. Velocity direction from yaw tube, pivoted vane, servoed sphere, dynamic wind vector indicator. Hot wire and hot film anemometer. Hot-film shock-tube velocity sensor. Laser Doppler anemo-meter; gross volume flow rate: calibration and standards. Constant-area, variable-pressure-drop meters (obstruction meters). Averaging pitot tubes. Constant pressure drop, variable area meters (Rota meters), turbine meters, positive displacement meters. Metering pumps. Electromagnetic flow meters. Drag force flow meters. Ultrasonic flow meters, vortex shedding flow meters.	7.1 to 7.2	08
V	**Temperature measurement**: Standards & calibration; thermal expansion methods- bimetallic thermometers, liquid-in-glass thermometers, pressure thermometers; thermoelectric sensor (thermocouple) – common thermocouple, reference junction considerations, special materials, configuration & techniques; electrical resistance sensors – conductive sensor (resistance thermometers), bulk semiconductor sensors thermistors), bulk semiconductor sensors (thermistors); junction semiconductor sensors; digital thermometers. Radiation Methods – radiation fundamentals, radiation detectors: thermal and photon, automatic null-balance radiation thermometers, monochromatic brightness radiation thermometers, two colour radiation thermometers, black body tipped fiber optic radiation thermometer, fluoroptic temperature measurement, infrared imaging systems.	8.1 to 8.7	08
Text Books: E. DOEBELIN and D. N. Manik, "Measurement systems application and design", 5th Ed., TMH, 2007, New Delhi.			

LABOROTARY

EEC-451 ELECTRONICS ENGINEERING LAB II

Objective -To design and implement the circuits to gain knowledge on performance of the circuit and its application.

1. **Measurement of Operational Amplifier Parameters**-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
2. **Applications of Op-amp**- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator
3. **Field Effect Transistors**-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier
4. **Bipolar Transistors**- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency Vs gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.
5. **Two stage Amplifier**. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier
6. **Common Collector Configuration-Emitter Follower** (using Darlington pair)-Gain and input impedance measurement of the circuit.
7. **Power Amplifiers**-Push pull amplifier in class B mode of operation –measurement of gain.
8. **Differential Amplifier** –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier
9. **Oscillators** -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator
10. **Simulation of Amplifier** circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

EIC-451 TRANSDUCER LAB

1. Characteristics of resistance transducer
   - (i.) Potentiometer
   - (ii.) Strain Gauge/ Measurement of Strain using quarter, half and full bridge.
2. Characteristics of LVDT.
3. Characteristics of capacitance transducer:
   - (i) Variable area
   - (ii) Variable distance.
4. Characteristics of Thermistors
5. Characteristics of RTD.
6. Thermocouples and AD590.
7. Characteristics of LDR, Photo Diode, and Phototransistor:
   - (i) Variable Illumination.
   - (ii) Linear Displacement.
8. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
9. Measurement of Capacitance by de'Sautys and Schering Bridge.
10. Measure of low resistance by Kelvin's double bridge.
11. Characteristics of diaphragm type pressure transducer.
12. Characteristics of one Solid State sensor/ Fiber optic sensor,

EEC-453 MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements