SCHEME OF INSTRUCTION & EXAMINATION

B.E. IIIrd YEAR
(INSTRUMENTATION ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 303	Power Electronics	4	-	3	75	25
2.	EE 304	Digital Electronics and Logic Design	4	-	3	75	25
3.	EE 305	Linear Integrated Circuits	4	-	3	75	25
4.	EE 306	Linear Control Systems	4	-	3	75	25
5.	EE 311	Instrumentation Systems	4	-	3	75	25
6.	EE 312	Signal and Systems	4	-	3	75	25
		PRACTICALS					
1.	EE 383	Integrated Circuits Lab.	-	3	3	50	25
2.	EE 385	Transducers Lab.	-	3	3	50	25
		Total	**24**	**6**	**24**	**550**	**200**

EE 303

POWER ELECTRONICS

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Power Semiconductor Diodes and Transistors: Types of power diodes-General purpose diodes -Fast recovery diodes -Their characteristics and applications. Bipolar Junction transistors, Power MOSFETs P-Channel, N- Channel. IGBTs -Basic structure and working, Steady state and switching characteristics-Comparison of BJT, MOSFET and IGBT -Their applications. ISCRs-Static and dynamic characteristics,Two transistor analogy.

UNIT-II

Turn on and turn off mechanism of BJT , Power MOSFET, IGBTs .SCR trigger circuits-R, RC and UJT triggering circuits. Triggering circuits for Single phase bridge rectifier and Choppers. Driver Circuits for MOSFET, IGBT and BJT. The various commutation methods of SCRs. Protection of SCRs . GTO's - Basic structure, principle of operation, characterisics and applications.

UNIT-III

Principles of controlled rectification -Study of Single phase and three-phase half controlled and full controlled bridge rectifiers with R, RL, RLE loads. Effect of source inductances. Dual converters- circulating current mode and circulating current free mode-control strategies.

UNIT-IV

Classification of Choppers A, B, C, D and E, Switching mode regulators-Study of Buck, Boost and Buck-Boost regulators, Cuk regulators. Principle of operation of Single phase bridge type Cyclo converters and their applications. Single phase AC Voltage Controllers with R, and RL loads.

UNIT-V

Principle of operation of Single phase Inverters -Three phase bridge Inverters (180^0 and 120^0 modes)-voltage control of inverters-Single pulse width modulation- multiple pulse width modulation, sinusoidal pulse width modulation. Comparison of Voltage Source Inverters and Current source Inverters, Elementary Multilevel Inverters.

Suggested Reading:

1. Singh.M.D and Khanchandani.K.B,-*Power Electronics,* Tata McGraw Hill, 2nd Edition, 2006.
2. Rashid.M.H. *Power Electronics Circuits Devices and Applications.* Prentice Hall of India, 2003
3. M.S.Jamil Asghar, *Power Electronics,* Prentice Hall of India, 2004
4. Bimbra.P.S, *Power Electronics,* Third Edition, Khanna Publishers, 1999
5. Mohan, Undeland, Robbins, *Power Electronics,* John Wiley, 1996.

EE 304

DIGITAL ELECTRONICS AND LOGIC DESIGN

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Boolean Algebra and combinational logic AND,OR and NOT operations, Laws of Boolean Algebra, minimization of Boolean expressions, Truth tables and maps sum of products and product of sums -map method of reduction, incompletely specified functions multiple output minimization.

UNIT-II

Tabular minimization, Digital logic families and IC's, Characteristics of Digital IC's, Introduction to RTL, DTL, TTL, CMOS, ECL families, Details of TTL logic family -totem pole, open collector outputs. Wired AND operation, comparison of performance, TTL subfamilies, multiplexer and de-multiplexer, encoder and decoder, code converters, implementation of combinational logic using standard logic gates and multiplexers.

UNIT-III

Binary arithmetic and circuits -Half and Full adder- subtractor and Magnitude comparator, number complements-two's complement arithmetic, carry look ahead adder, decimal numbers and their codes, BCD and Excess-3 arithmetic.

UNIT-IV

Synchronous Sequential Circuits -Basic latch circuit -debouncing switch -SR., JK, D and T flip-flops-truth table and excitation table -ripple and synchronous counters up/down counter -general BCD counter- Counter decoding-shift registers, ring counters.

UNIT-V

Design of Digital Systems -Concept of state. State diagram-design of counters Sequence detector and generators -Design procedure, synthesis using D, JK, T flip-flops -applications of registers -concepts of programmable logic -PROM, PLA, PAL.

Suggested Reading:

1. Donald Pleach / Albert Paul Malvino / Goutam Saha *"Digital Principles and Applications "* McGraw- Hill, 2006.
2. Tocci & Widmer, *Digital Systems*-Pearson Education-Eigth Edition, 2003.
3. Morris Mano M.., *Digital Design,* Prentice Hall of India, Third Edition, 2002.
4. B. Somnadh Nair, *Digital Electronics and Logic Design,* Prentice Hall, India, 2002.
5. Floyd, *Digital Fundamentals,* 4th edition, Universal Book Stall, New Delhi, 1992.
6. J.P. Uyemura, *A First Course in Digital Systems Design,* Brooks/ Cole Publishing Co., (Available from Vikas Publishing House in India).

EE 305

LINEAR INTEGRATED CIRCUITS

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Operational amplifiers -Characteristics, open loop voltage gain, output impedance, input impedance, common mode rejection ratio -Offset balancing techniques -Slew rate, Frequency response -Stability, frequency compensation of Op-amp, basic applications -inverter summer, analog integrator, differentiator, current to voltage converter, voltage to current converter, voltage follower, ac amplifier.

UNIT-II

Voltage limiter, clipper and clamper, precision rectifier-full wave and half wave, peak detector, comparator, zero crossing detector, Schmitt trigger, monostable, astable, bistable multiplier, divider, difference amplifier instrumentation amplifier circuits using Op-amps.

UNIT-III

Waveform generation using Op-amps- Sine, Square, Triangular and Quadrature oscillators, voltage controlled oscillator / multi vibrator, voltage to frequency converter, 555 timer functional diagram, operation as monostable and astable. phase locked loop, A/D and D/ A converters.

UNIT-IV

Series voltage regulator using Op-amp, shunt regulators using Op-amp, switching regulators using Op-amp, dual voltage regulator ,fixed voltage regulators ,dual tracking regulators ,hybrid regulator, current sensing and current feedback protection.

UNIT-V

RC active filters, low pass, high pass band pass, band reject, notch, first order, second order transformation, state variable filter, switched capacitor filter, universal filter. Balanced modulator/ demodulator.

Suggested Reading:

1. D.Roy Choudhury, *Linear Integrated Circuits,* Shail B.Jain, 3rd Edition, New Age International(P) Ltd., 2007.
2. Malvino Albert Paul, *Electronic Principles,* 7th Edition, Tata McGraw Hill, 2006
3. Coughlin and Driscoll, *Operational Amplifiers and Linear integrated Circuits,* 6th Edition, Prentice hall of India 2003.
4. David A. Bell, *Operational Amplifiers and Linear IC s,* PHI, 2003.
5. Gayakwad R.A. *Op-Amps and Linear Integrated Circuits,* 4th Edition, Prentice Hall of India, 2002.
6. S. Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill Inc., 2002, (Available from Tata McGraw Hill in India).

EE 306

LINEAR CONTROL SYSTEMS

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Open and Closed loop Systems, Continuous time and discrete time control systems. Control system components, Error sensing devices, Potentiometers. Synchros, AC-DC servo motors-Block diagram representation, Transfer function and impulse response, Signal flow graphs.

UNIT-II

Time Response: Types of Input, Transient response of second order system for step input. Time domain specifications - Types of system- static error coefficients, Error Series-Routh-Hurwitz criterion of stability. Root Locus Technique- Typical systems analyzed by root locus technique-Effect of location of roots on system response PID Controller.

UNIT-III

Frequency Response Plots: Bode Plots, Frequency domain specifications. : Mp, w_p for a second order system, Nyquist criterion for a stability, relative stability, gain and phase margin, Compensation: Cascade Compensation using Bode plots.

UNIT-IV

State Space Representation: Concept of State, State Variable, State Models of linear time invariant systems. Derivation for state models from transfer functions and differential equations. State Transition matrix- Solution of State equations by time domain method. Observability and Controllability.

UNIT-V

Discrete Control Analysis: Introduction to signals and systems, The Z-transformation, digital control, advantages and disadvantages. Digital

control system architecture. The discrete transfer function. Sample data system. Transfer function of sample data systems- Z-plane specifications of control system design.Z-domain stability.

Suggested Reading:

1. I.J.Nagrath, M.Gopal, *Control System Engineering,* New Age International (P) Limited Publishers, 5th Edition, 2007.
2. J.F.Franklin and J.D.Powell, *Digital Control of Dynamic Systems,* Addison Wesley, 1980.
3. M.Gopal, *Control Systems Principles and Design*, Tata McGraw Hill, 2nd Edition, 2003.
4. K.Ogata, *Modern Control Systems,* 3rd Edition.PHI, 2000.
5. B.C. Kuo, *Automatic Control Systems,* 8th edition, Prentice Hall, New Delhi, 2002.
6. Shinners S.M., *Modern Control Engineering,* Prentice Hall, New Jersey, 1995.
7. D'azzo and Houpis, *Linear Control System Analysis and Design*, 4th edition, Singapore, 1995.

EE 311

INSTRUMENTATION SYSTEMS

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Measurement of Motion: Angular Velocity/Speed Measurement-Electrical methods DC and AC Tachogenerators- Eddy Current-Drag Cup Tachometers- Stroboscopic method. Acceleration measurements-Seismic displacement/velocity/acceleration- pick-ups. Electromagnetic and electro dynamic velocity transducers, Piezo-electric transducers, Deflection type accelerometer-bonded strain gauge accelerometer, Piezo-electric accelerometers.

UNIT-II

Measurement of force and Torque: Basic methods of force and measurement-characteristics of elastic force transducers-load cells. Various types of Torque measurement-absorption, transmission, stress, deflection type.

Measurement of Temperature: Laws of thermocouples-Thermocouple circuits-reference junction considerations-ice bath reference junction-Special materials, configurations and techniques-cooled thermocouples-pulsed thermocouples-multifunction thermocouples-radiation thermometers.

UNIT-III

Measurement of flow: Classification of flow meters-Head flow meters-Orifice plate-Venturi tube-flow nozzle and pilot tube-Rotameter-Electromagnetic flow meter-Positive displacement meters-Hot wire Hot Film Anemometer-Mass Flow measurements-Rotor torque mass flow meter.

UNIT-IV

Measurement of liquid level: Electrical methods-Resistive, inductive and capacitive methods-Capacitive variable area method- Capacitive voltage divider method-Capacitive variable dielectric constant method-Measurement of liquid level using Gamma Rays-Ultrasonic method-Measurement of liquid level using float.

Measurement of humidity: Absolute Humidity-Relative humidity-Hygrometers-Resistive Hygrometers-capacitive hygrometer-Microwave refractometer - Aluminum oxide Hygrometers-Measurement of PH Electrodes-Station Glass and Calomel Electrodes-Installation of PH meters.

UNIT-V

Measurement of sound: Sound level Meter-Microphones-Types-Carbon and capacitive microphone-Dynamic microphone-Inductive microphone-Piezo-electric microphone-Pressure response of capacitive microphone-Measurement of sound using microphones.

Suggested Reading :

1. C.S.Rangan, G R Sarma & V S N Mani, *Instrumentation Devices and Systems*-TMH, 2nd Edition 2004
2. B.Nakra & Chowdhari, *Instrumentation Measurement and Analysis,* TMH, 2nd Edition 2003
3. D.V.S.Murthy, *Transducers and Instrumentation.* PHI, 1995
4. John P. Bentley, *Principles of Measurement Systems*, 3rd Edition, Pearson Education, 2000.
5. Doebelin E.O, *Measurement Systems - Application and Design*, 4th Edition, McGraw-Hill, New
6. Patranabis D, *Principles of Industrial Instrumentation*, 2nd Edition, Tata McGraw Hill, New Delhi, 1997.

EE 312

SIGNALS AND SYSTEMS

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Definition and Classification and systems, continuous time Unit-step Unit-impulse, exponential and sinusoidal. Discrete time unit step, unit impulse, exponential and sinusoidal Linear time invariant systems, properties of LTI system, impulse response, convolution sum, convolution integral, system described by difference and differential equation.

UNIT-II

Signal representation by a discrete set of orthogonal functions, orthonormailty and completeness. Trigonometric and exponential Fourier series, convergence, Dirichlets conditions, discrete spectrum, symmetry conditions.

UNIT-III

Signal representation by continuous exponentials – the direct and inverse Fourier transform continuous spectrum, properties of Fourier Transform, Singularity function, parseval theorem.

UNIT-IV

Signal representation by exponentials – the Laplace transform, properties of Laplace transform-initial and final value theorems, Laplace transform of periodic function, waveform synthesis, partial fraction expansion, solution of networks by Laplace transform method.

UNIT-V

Discrete time signals, sampling of continuous time signals, sampling theorem, reconstruction of the signal from its samples, analysis, discrete time system Z- transform, its properties , Inverse Z- transform , Difference equations ,simple problems using Z- transforms.

Suggested Reading:

1. A.V. Oppenheium, A.S.Willsky, I.J.Young, "*Signals and System*", Prentice Hall of India, 1983 .
2. B.P.Lathi, "*Signals Systems and Communication*", John Wiley,1967.
3. C.T.Chen, "*Systems and Signal Analysis*", Oxford University Press, India, 3rd Edition, 2004, ISBN 100195156617
4. Gabel R.A. and Robert R.A, "*Signals and Linear Systems*", 3rd Edition, John Wiley and Sons, New York, 1987.
5. Ziemer R.E., Tranter W.H., and Fannin D.R., "*Signals and Systems*", 4th Edition, Pearson Education Asia, Singapore, 1998.

EE 383

INTEGRATED CIRCUITS LAB

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

1. Generation of triangular, sine and square wave using IC's.
2. PLL (Phase Locked Loop)
3. Design of astable multivibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier-Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp
7. Multiplexer-application for logic realization and parallel to serial conversions.
8. Synchronous counters.
9. Asynchronous counters.
10. Clippers and clampers using Op-Amps.
11. Monostable operation using IC'S
12. Boot strap sweep circuit using Op-Amp
13. Half adder, full adder and Subtractor and Realization of Combinational Logic
14. A/D Converters
15. D/A Converters

Note : Atleast 10 experiments should be conducted in the semester

EE 385

TRANSDUCERS LAB

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

1. Measurement of speed by magnetic pickup
2. Measurement of temperature by (a) Thermistors (b) Thermocouple
3. Study and calibration of strain gauge
4. Measurement of speed and torque using Opto Electronic Sensor
5. Measurement of pressure by bellows
6. Measurement of Displacement by Capacitive pickup
7. Measurement of Displacement by (a) Piezoelectric pickup and (b Light dependent resistor
8. Level Measuring System
9. Study and Calibration of LVDT
10. Study and calibration of RTD
11. Measurement of displacement by inductive pickup

Note : Atleast 10 experiments should be conducted in the semester

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IIIrd YEAR
(INSTRUMENTATION ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 350	Digital Signal Processing & Applications	4	-	3	75	25
2.	EE 354	Microprocessor and Microcontrollers	4	-	3	75	25
3.	EE 356	Power Plant Instrumentation	4	-	3	75	25
4.	EE 357	Process Control	4	-	3	75	25
5.	EE 358	Biomedical Instrumentation	4	-	3	75	25
6.	CM 371	Managerial Economics and Accountancy	4	-	3	75	25
		PRACTICALS					
1.	EE 382	Power Electronics Lab	-	3	3	50	25
2.	EE 332	Control System Lab.	-	3	3	50	25
3.	EE 384	Industrial Visit	-	-	-	-	*Gr
		Total	**24**	**6**	**24**	**550**	**200**

****Excellent / Very Good / Good / Satisfactory / Unsatisfactory***