With effect from 2016-17

SCHEME OF INSTRUCTION AND EXAMINATION
B.E III/IV
Electronic and Instrumentation Engineering

SEMESTER-I

SI. No	Course Code	Course Title	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hours	Maximum Marks	
			L/T	D/P		Sessionals	University Exam
1.	**EE 303**	Power Electronics	4	-	3	25	75
2.	**EE 304**	Digital Electronics and Logic Design	4	-	3	25	75
3.	**EE 305**	Linear Integrated Circuits	4	-	3	25	75
4.	**EE 306**	Linear Control Systems	4	-	3	25	75
5.	**EE 311**	Instrumentation Systems	4	-	3	25	75
6.	**EE 312**	Signal and Systems	4	-	3	25	75
7.	**EE 382**	Transducers Lab	-	3	3	25	50
8.	**EE 383**	Integrated Circuits Lab		3	3	25	50
		Total	**24**	**6**		**200**	**550**

EE-303

POWER ELECTRONICS

(Common to both EEE & IE)

Instruction	:	4/1 Periods per week
Duration of University Examination	:	3 Hours
Sessionals	:	25 Marks
University Examination	:	75 Marks

Objectives:

1. To be able to understand various power switching devices, characteristics and applications.
2. To learn and understand the various converters like rectifiers, choppers and inverters principle operation, characteristics and applications.

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. SCRs-Static and dynamic characteristics-Two transistor analogy. ETO, MTO, IGCT Characteristics.

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 of MOSFET IGBT & BJT- Various commutation methods of SCRs- Protection of SCRs.

UNIT-III

AC-DC Converter: 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

DC-DC Converter: Classification of Choppers: A, B, C, D&E-Switching mode regulators - Study of Buck, Boost and Buck-Boost regulators .

AC-AC Converter: Principle of operation of Single Phase Bridge type Cycloconverters and their applications. Single phase AC Voltage controllers with R & RL load.

UNIT-V

DC-AC Converter: Principle of operation of Single Phase Inverters-Three phase bridge inverters (180 and 120 Degree modes)-voltage control of invertors—Single Pulse Width Modulation-Multiple pulse width Modulation-Sinusoidal Pulse Width Modulation .Comparison of Voltage Source Inverter 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 Application,* 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 both EEE & EIE*)

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

Objectives:

1. To
2. To

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, J K,D and T flip flops- truth table and excitation table-ripple and synchronous counters up/down counter-general BCD 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. Donaid Pleach, Albert Paul Malvino, Goutam Saha, *Digital principles and application* , McGraw- Hill, 2006
2. Tocci & Windmer, *Digital Systems*, Prentice Hall of India-Eighth Edition, 2003.
3. Morris Mano. M, *Digital Design*, Prentice Hall of India, Third Edition, 2002.
4. Somnadh Nair, *Digital Electronics and Logic Design*, PHI, 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 both EEE & IE*)

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

Objectives:

1. To familiarize and able to understand Op-amps and its applications.
2. To understand the voltage regulators by using op-amps and active filters.

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 application- inverter summer, analog integrator differentiator, current to voltage converter, voltage to current converter, voltage follower, a-c 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/ multivibrator ,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 regulators-current sensing and current feed back protection.

UNIT-V

RC active filters-low pass-high-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 Choudhary, *Linear Integrated Circuits*, 3rd Edition, New age international (P) Ltd 2007
2. Malvino Albet Paul, *Electronic Principles*, 7th Edition, Tata McGraw Hill, 2006
3. Coughilin 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*, 3rd Edition, Mc-Graw Hill Inc., 2002. (Available from Tata McGraw Hill in India).

EE-306

LINEAR CONTROL SYSTEMS

(*Common to both EEE & IE*)

Instruction	:	4/1 Periods per week
Duration of University Examination	:	3 Hours
Sessionals	:	25 Marks
University Examination	:	75 Marks

Objectives:

1. To develop basic skills of utilizing mathematical tools needed to analyze and design classical linear control systems.
2. To understand and develop the state space representation of control systems.

UNIT – I

Open and Closed loop Systems- Continuous time and discrete time control systems. Control system components- Error sensing devices-Potentiometers. Syncros, 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 diagram 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, ώp 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 of 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: 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.

Suggesting Reading:

1. I.J. Nagarath, 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, McGraw Hill, Singapore, 1995.

EE-311

INSTRUMENTATION SYSTEMS

Instruction		4 Periods per Week
Duration of University Examination	:	3 Hours
Sessionals	:	25 Marks
University Examination	:	75 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.

References:

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
Sessionals	:	25 Marks
University Examination	:	75 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- 382

TRANSDUCERS LAB

Instruction		4/1Periods per Week
Duration of University Examination	:	3 Hours
Sessionals	:	25 Marks
University Examination	:	75 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

EE- 383

INTEGRATED CIRCUITS LAB

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