Integral University Lucknow
Study & Evaluation Scheme
B. Tech. (Electrical & Electronics Engg.)

3rd YEAR		SEMESTER-V						
S. No	**Course Code**	**Subject**	**Periods**			**Evaluation**		**Subject Total**
			L	**T**	**P**	**Sessional**	**Examination**	
THEORY								
1.	IEN-504	Measurement & Instrumentation II	3	1	0	50	100	150
2.	IEN-501	Control System	3	1	0	50	100	150
3.	IEC-502	Integrated Circuits	3	1	0	50	100	150
4.	IEN-502	Electrical Machine II	3	1	0	50	100	150
5.	IEN-503	Elements of Power System	3	1	0	50	100	150
6.	IEC-509	Digital Electronics	2	1	0	25	75	100

LABS

1.	IEN-554	Measurement & Instrumentation II Lab	0	0	3	20	30	50
2.	IEN-551	Control System Lab	0	0	3	20	30	50
3.	IEC-552	Digital Electronics &Integrated Circuits Lab	0	0	3	20	30	50
4.	IEN-552	Electrical Machine II Lab	0	0	3	20	30	50
5.	GP-501	General Proficiency				50	-	50
		Total	15	6	12	405	690	1100

L-Lecture **T-T**utorial **P-**Practical **CT-**Class Test **TA-**Teacher Assessment

Sessional Total = Class Test + Teacher Assessment

Subject Total = Sessional total + End semester Examination

IEN- 504 MEASUREMENTS AND INSTRUMENTATION II

L T P
3 1 0

Unit I
Electrical Standards, IEEE standards, Minimization of errors, frequency response of instrument systems; Classification of transducers; Displacement, resistive, capacitive, inductive, piezo-resistive, photo-electric and semiconductor transducers. (8)

Unit II
Guarded Wheatstone bridge, problems in high frequency measurement, RF power and voltage measurement, RF Impedance measurement Q meter, group delay measurement,Digital Storage Oscilloscope. (7)

Unit III
Measurement of temperature using resistance thermometer, thermocouple, IC sensor, Pyrometer(radiation method); measurement of pressure, fluid flow, force, torque, velocity and acceleration. (8)

Unit IV
Measurement of Amplifier and Receiver Characteristics, Data Distribution and Bus Structure, RS-232,IEEE488 Interface, PC Based Acquisition System, Data Transmission, Telemetry. (8)

Unit V
Frequency synthesized signal generator , frequency divider generator, sweep frequency generator , wave analyzer , harmonic distortion analyzer, spectrum analyzer, microprocessor based instrumentation, computer controlled test system, fiber optic measurement. (9)

Books:

1. Helric & Cooper/ “Modern Electronic Instrumentation & Measurement Techniques”/ PHI
2. E.O. Doeblin/ “ Measurement Systems”/ MC Graw Hill.
3. Oliver & J.M. Cage/ “Electronic Measurement And Instrumentation”/ MC Graw Hill.
4. Ranjan C.S./ “Instrumentation Devices & Systems” / Tata MC Graw Hill.

IEN-501 CONTROL SYSTEM

L T P
3 1 0

UNIT-1

INPUT/OUTPUT RELATIONSHIP

Introduction to control system, open and closed loop control system, Mathematical modeling of physical systems, Transfer function of Electrical, Mechanical system. Analogous systems, Block Diagram and signal flow graph, Reduction Algebra , Mason's gain formula. (8)

UNIT-2

TIME DOMAIN ANALYSIS

Time domain criteria, Test Signals, Transient and steady state response of first and second order feedback systems. Performance Indices, Response analysis with proportional, PL, PID controllers. (8)

UNIT-3

Asymptotic and conditional stability, Routh Hurwitz criterion, root locus plots and their applications.
Frequency response, Analysis, co-relation between time and frequency domain specifications, Resonant peak, resonant frequency and bandwidth, cutoff frequency. (8)

UNIT-4

Polar plots, bode Nyquist stability criterion, Relative stability, gain margin and phase margin, Constant M and N circles. (8)

UNIT-5

Design through compensation Techniques: Realization of Lag Lead, And Lag-Lead compensation, design of closed loop control system using root locus and bode plot compensation.
State variable analysis; introduction, state space representation, state equations, state transfer matrices, controllability and observability. (8)

References:

1. BC Kuo, Automatic Control system, PHI
2. IJ Nagrath & M Gopal, Control system Engineering, New Age International.
3. K. Ogata, Modern Control Engg. PHI
4. S K Bhattacharya, Control system Engg. Pearson Education
5. S. Hasan Saeed, Automatic control system, Kataria and sons, New Delhi.

IEC-502 INTEGRATED CIRCUITS

L	T	P
3	1	0

Unit 1

Review of Basic Integrated Circuits:Bipolar, NMOS,CMOS and BiCMOS,use of composite structure, cross-section, layout and equivalent circuit for Darlington pair, Differential pair, Multimeter and Multicollector for BJT and MOS. (6)

Unit 2

BJT and MOS single stage analog amplifiers, differential amplifiers current mirrors and active loads, Widlar, cascaded and Wilson current source, current sources as active loads, Multistage amplifiers, gain and frequency response of the amplifier and other characteristics. (8)

Unit 3

BJT Operational Amplifier, DC analysis and AC analysis of the 741 Op Amp, gain and frequency response, slew rate. Two stage MOS operational amplifier, CMOS Op Amp design, Folded-Cascode load, Bi CMOS Op Amp.

IC Operational Transconductance Amplifier (OTA) using BJT and CMOS, Applications of Op Amp and OTA, Active Filters. (10)

Unit4

Analog Multiplier with BJT Gilbert Multiplier(GM) cell. GM cell as a Balanced Modulator and Phase detector.

Analog Multiplier using NMOS/CMOS devices, Voltage Controlled Oscillator, ICPLL 560,565, BJT/CMOS Bistable Multivibrators and Schmitt Trigger. BJT/CMOS Monostable and Astable circuits, crystal controlled square wave generators, IC Timer(555) as a Monostable, Asatable Multivibrators. (9)

Unit 5

Data Converter ICs, Sample and Hold circuit, DAC: Binary-weighted resistors, R-2R Ladder network & others. ADC: Feedback converter, Dual slope ADC, Flash Converter, successive approx. ADC, IC Voltage Regulators, Circuit analysis of 723 and 78/79 (8)

Reference Books:

1. A.S.Sedra and K.C.Smith, Microelectronics Circuits, Oxford University press,2003
2. Gray,Ilurst,Lewis& Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley
3. B.Razavi,Design of Analog CMOS Integrated Circuits, McGraw-Hill .
4. Gayakwad, Op Amps and Linear Integrated Circuits.

IEN-502 ELECTRICAL MACHINE II

L	T	P
3	1	0

UNIT-1

Synchronous Machine
Construction features, EMF Equation, Winding Co-efficient, Harmonics in the induced EMF, Production of rotating magnetic field in 3 phase, two reaction theory, Power expression for cylindrical and salient pole machines performance characteristics. Parallel operation of alternators. (9)

UNIT-2

Synchronous Motor
Principle of operation, starting methods
Poly Phase Induction Machine
Construction features, production of rotating magnetic, field, Phasor diagram, Equivalent circuit, Torque and power expressions. (9)

UNIT-3

Induction Motor (Contd.)
Torque/ Slip characteristics, No Load and blocked rotor test, Efficiency, Starting and speed control, deep bar and double cage induction motor, Cogging and Crawling, Operation under unbalance supply. (9)

UNIT-4

Single Phase Induction Motor
Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, Repulsion motor. (7)

UNIT-5

AC Commutator Motor
EMF Induced in Commutator winding, Single phase AC series motors, universal motor. (6)

References:

1. Nagrath & Kothari; Electrical machine, TMH
2. H.Cotton, Advance Electrical Machines, Wiley Eastern & Co.
3. Fitzgerald & Kingsley, Electrical Machinery, TMH

IEN-503 ELEMENTS OF POWER SYSTEM

L T P
3 1 0

UNIT-1

Power Transmission System: Basic structure of power system, voltage levels for transmission, sub transmission, distribution.

Overhead Transmission Lines: Resistance: Resistance of transmission lines, effect of temp, skin effect and proximity effect.

Inductance: flux linkages GMD and GMR inductance of single phase and three phase lines with symmetrical and unsymmetrical spacing transposition of line Double circuit 3 phase lines.

Capacitance: capacitance of three and single phase lines, double circuit 3 phase lines. Bundle conductors, sag and tension in case of supports at unequal levels effect of wind pressure and ice covering on conductor sag, Introduction of T.L poles, Importance of ROW (right of way). Insulator: pin type, Suspension type, strain type and shackle type insulators, Potential distribution over suspension insulator string, string efficiency, method of improving strain efficiency, testing of insulators (8)

UNIT-2

Corona: Theory of corona formation, affecting corona, critical disruptive voltage, visual critical voltage and power loss due to corona, method of reducing corona.

Underground Cable Transmission: Requirement of under ground cables and cable insulating materials, cable construction, insulator resistance, capacitance and dielectric stress in single core cable, grading of cables, capacitance of 3 core cable.

Classification of Cables: Belted cables, screened cables and pressure cables, method of laying UG cable and OHTL. (8)

UNIT-3

Performance of Transmission Lines: representation of power system, single line diagram and impedance or reactance diagram, P.U. method of representation of system and its components (such as transformers, synchronous machines, load) classification of lines, voltage at sending end receiving end of the lines, Determination of ABCD constants. Power circle diagrams, universal power circle diagram. (8)

UNIT-4

Power Factor Improvement: Causes and disadvantages of low power factor by equipment, static capacitors, synchronous condensers, phase advancers, Calculation of P.F. correction.

Voltage Control: automatic voltage regulators, TAP changing transformer, booster transformer, Induction regulators, synchronous phase modifiers. (8)

UNIT-5

Distribution: Classification of distribution systems, rig main interconnected systems, function of feeders and distributors.

A.C. Distribution: Calculation of current fed and drops, for distribution with concentrated A.C loading and fed at one-end and ring mains.

Substations(SS): Types of SS of major equipment in SS and its function, busbar arrangement, single bus bar system, duplicate busbar systems, distribution SS and HV substations. (8)

References:

1. I.J Nagrath & D.P. Kothari, Modern Power System Analysis, PHI
2. W.D. Stevenson, elements of power System Analysis, TMH
3. A. Hussain, Electrical power System, CBS Pub.
4. L.P. Singh, Advanced Power System Analysis 7 dynamics
5. C.L. Wadhwa, Electrical power System, Wiley eastern

IEC-509 DIGITAL ELECTRONICS

L T P
2 1 0

UNIT-1

Digital System and binary numbers: Signed Binary, binary Codes, Gate – level minimization, The map method, up to four variables don't care condition, POS simplification, AND & NOR implementation. Quince MC-clunky method (Tubule-Method). (8)

UNIT-2

Combination Circuit: Binary Adder, sub tractor, decimal adder binary multiplier, magnitude comparator. Encoder/Decoder, Multiplexer, Demultiplexer. A/D, D/A converters. (8)

UNIT-3

Sequential Circuits: Synchronous circuits, Latches, Flip/Flop (S-R, T,D, J-K), shift register and Counters (N-mode Counters, Ripple Counters, Ring/Johnson) asynchronous sequential circuits and their analysis procedure. (8)

UNIT-4

Memory & Programmable Logic: RAM, ROM, PLA, PAL, Introduction to design of digital system at register transfer level. (8)

References:

1. Digital Electronics Principle and Applications, by Malvino.
2. Digital Logic design, by Morris Mano.
3. Digital Systems Principle & Applications, by Tocci and Widdmer.
4. Digital Fundamentals, by Floyd