ELECTRICAL & ELECTRONICS ENGINEERING YEAR: III SEMISTER: VI

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	EC1611	SIGNALS & SYSTEMS	2	1	-	15	10	25	50	75	
2	EE1612	MICROPROCESSORS & MICROCONTROLLERS	2	1	-	15	10	25	50	75	
3	EE1613	COMMUNICATION ENGINEERING	3	1	-	30	20	50	100	150	
4	EE1614	POWER ELECTRONICS	3	1	-	30	20	50	100	150	
5	EE1615	POWER SYSTEM STABILITY	3	1	-	30	20	50	100	150	
6	EE1616	DESIGN OF CONTROL SYSTEM	3	1	-	30	20	50	100	150	
PRACTICAL/DRAWING/DESIGN											
7	EE1617-P	POWER ELECTRONICS LAB	-	-	3	25	-	25	25	50	
8	EE1618-P	MICROPROCESSORS & MICROCONTROLLERS LAB	-	-	3	25	-	25	25	50	
9	EE1619-P	POWER SYSTEM STABILITY LAB	-	-	3	25	-	25	25	50	
10	EE1620-P	CONTROL SYSTEMS	-	-	3	25	-	25	25	50	
11	ES1621-P	GENERAL PROFICIENCY VI	-	-	-	-	-	50	-	50	
		TOTAL	16	6	12	-	-	-	-	1000	

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

SEMESTER — VI

EC 1612 SIGNALS & SYSTEMS (2-1 -0)

Dynamic Representation of Systems

Systems Attributes, Causality linearity, Stability, Time-invariance; Special Signals, Complex exponentials, Singularity functions - Impulse and Step functions; Linear Time- invariant Systems: Differential equation representation. Convolution integral, Discrete form of special functions, discrete convolution and its properties, Realization of LTI —Differential and Difference equations.

Fourier Analysis of Continuous Time Signals and Systems

Fourier series, Fourier Transform and properties, Parseval's theorem, Frequency response of LTI systems; Sampling theorem;

Fourier Analysis of Discrete Time Signals and Systems

Discrete Time Fourier Transform, and properties, Frequency response of discrete time LTI systems;

Laplace Transform

Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system; Significance of Poles and Zeros.

Z-Transform

Z-Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Z-Transform for the analysis of discrete time LTI systems; Significance of Poles and Zeros.

Random Signals

Introduction to probability; Baycs Concept of random variable, Probabilizydensity and distribution functions, Function of a random variable; Moments, Independence of a random variable; Introduction to random process; Auto and cross correlation; Power spectral density, White noise, Random signal analysis;

Suggested Books & References:

- Oppenheim Alan, V., Willsky Alan. S., and Nawab, H. *"Signals and Systems",* Prentice Hall, 1997.
- Haykin Symon, *"Communication Systems",* 3" Edition, John Wiley, 1995

EE 1601 MICROPROCESSORS AND MICROCONTROLLERS (2 -1 - 0)

Architecture of 8085 Microprocessor

Functional Block Diagram — Registers, ALU, Bus systems, Timing and control signals, Machine cycles and timing diagrams.

Programming of 8085

Instruction formats, Addressing modes, Instruction set, Need for Assembly language — Development of Assembly language programs.

Memory Interfacing

Interface requirements — Address space partitioning — Buffereing of Buses — timing constraints, Memory control signals, Read and write cycles, Interdacing SRAM, EPROM and DRAM sections.

I/O Interfacing

Memory mapped I/O scheme, I/O mapped I/O scheme, Input and Output cycles, Simple I/O ports, Programmable Peripheral Interface (8235), Data Transfer Scheme: Programmable Data Transfer, DMA data transfer, Synchronous, Asynchronous and interrupt driven Data Transfer Scheme, Interfacing, Simple Keyboards and LED displays.

Interrupts and DMA

Interrupt feature, Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupt structure, Methods of servicing interrupts, Developments of interrupt service subroutines; Multiple interrupt requests and their handling, Need for Direct Memory Access., Devices for handling DMA, Programmable DMA controller 8237.

Applications

Interfacing of AID converters (ADC 0800/ADC 0808/ ADC 0809); Interfacing of D/A converters (DAC 0800)' Waveform generators; Multiplexed Seven Segment LED display systems; Measurement of frequency, Phase angle, and Power Factor; Traffic Light Controller, Stepper Motor Control.

Intel 8051 Microcontroller

Architecture of 8051; Memory Organization, Addressing Modes; Instruction set; Boolean processing; Simple programs.

8051 Peripheral Functions

8051 interrupt structures; Timer and serial functions; Parallel port features; Modes of operation: Power control; Interfacing of 8051; typical applications, MCS family features 8031/8051/8751.

PRACTICAL:

EE 1607-P MICROPROCESSOR & MICROCONTROLLER LAB (0 - 0 - 3)

List of Experiments:

- Programming to add (i) two 8-bit numbers, (ii) two 16-bit numbers.
- Programming to find the smallest number in a data entry.
- To find larger of two numbers.
- To find largest number from a series of numbers
- To arrange a series of number in descending order.
- To find l's complement of a 16-bit/8-bit.
- To find 2's complement of a 16-bit/8-bit.
- Programming to find multiplication of two 8-bit numbers.
- Programming to find a square root of a number.
- Programming and verification of speed control of stepper motor.
- Programming and verification of Seven-segment display

Suggested Books & References:

- Gaonkar, R. S., "Microprocessor Architecture Programming and Applications with the 8085/8080A", 3th Edition, Penram International Publishing House, 1997.
- Singh, I. P., "Microprocessor Systems", Module 9: "Microcontrollers and their Applications", IMPACT Learning Material Series, IIT, New Delhi, 1997.
- Douglas, V. Hall, "Microprocessors and Interfacing Programming and Hardware" 2nd Edition, McGraw Hill Inc., 1992.
- Kenneth, L. Short.. "Microprocessors and Programmed Logic" Prentice Hall of India, 2nd Edition, 1987.
- Microcontroller Hand Book, INTEL, 1984.

EE 1602 COMMUNICATION ENGINEERING (3 — 1 — 0)

Review

Review of frequency Band, Fourier Transform and Fourier series.

Amplitude Modulation Systems

Need for modulation, normal AM, Generation and demodulation — envelop and synchronous detection; Modulation index; DSBSC: Generation and demodulation, Effect of phase and frequency offset on demodulation; SSB: Generation using filter and phasing method, detection; Frequency division multiplexing systems using SSB.

Angle Modulation Systems

Concept of frequency and phase modulation, frequency deviation and modulation index, FM spectra, Carson's Rule, Narrowband FM, Generation of Wideband, FM- Armstrong method, Direct FM generation; Demodulation of FM-discriminator; PLL

Sampling and Discrete time Modulations

Sampling Theorem — Low Pass and Band Pass; Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM) — their generation and detection, Phase time division multiplying.

Digital Communication

PCM, Quantization noise, Bandwidth, Advantages over analog communication, PCM system, Differential PCM, Delta Modulation, Digital Modulation — ASK, FSK, PSK, DPSK, Digital multiplexing.

Power Line Carrier

Interfacing with power line, Description of a typical system

Microwave Communication

Transit and Receive Antennas, Ling Budget, Line of Sight Systems, Satellite Liilg — GT ratio of earth station, VSATS and GPSS, FDMA, TDMA, CDMA.

Optical Communication Systems

Types of optical fibers — step index and graded index, multimode and single mode; Attenuation and Dispersion in fibers; Optical transmitters — LEDs and Laser Diode; Optical Receivers — PIN and APDs, Fiber optic links.

Suggested Books & References:

• Haykins Simon *"Communication Systems",* 3rd Edition, John Wiley, Singapore, 1984.

- Couch Leon, W., *"Modern Communication Systems",* Prentice Hall, India, 1998.
- Keiser Gerd, *"Optical Fiber Communications",* 2nd Edition, McGraw Hill, 1991.
- Lathi, *"Modern Digital and Analog Communication System",* Oxford University Press.

EE 1603 POWER ELECTRONICS (3-1-0)

Power Semiconductor Devices

History of development of Power Electronic devices, Constructional features; Characteristics, rating and specification, gate/base drive circuits; Protection including cooling and application of diodes; SCRs, GT0s, BJTs, MCT, MOSFET and IGBT; Electromagnetic interference.

AC to DC Converters

Operation and analysis of Single phase and multi-phase uncontrolled and controlled rectifiers with R., R-L, and back EMF load, effect of source inductance, Freewheeling effect; 'Power Factor Improvement methods for Phase-Controlled rectifiers; Filters.

AC to AC Voltage Converter

Operation and analysis of single-phase integral cycle and phase controlled converters; Configuration of three-phase controllers.

DC to DC Converters

Single-phase and three-phase bridge inverters, VSI and CSI, Voltage control — PWM and Square wave operation; Harmonics and their reduction techniques.

Cyclo-converters

Single-phase and three-phase configurations and operating Principle;

PRACTICAL: EE 1606-P POWER ELECTRONICS LAB (0 — 0 — 3)

List of Experiments:

- Study of V-I characteristics of SCR, Triac and Diac
- Study of BJT and IGBT, GTO and MOSFET.
- Study of a UJT firing circuit for the control of SCRs.
- To generate and study the PWM control signal for single-phase DC to DC inverter.
- To study and use of the single-phase half controlled and fully controlled AC to DC Converter and effect of firing angle control on load voltage and waveforms.
- To study and use of back to back connected SCR / Triac controlled AC Voltage, controller and its wave forms with Variation of firing angle.

- Study and use of Chopper circuit for the control of DC voltage using (i) Pulse Width Modulation, (ii) Frequency Control, (iii) Current limit Control.
- Study of Single-phase inverter and its waveform.
- Study of three-phase firing circuit with synchronization, and testing with tree-phase AC to DC bridge converter.
- Testing of waveforms of digital firing modules.
- Study and Testing of a three-phase bridge inverter with different types of loads.
- To study the harmonics and reactive power measurement in AC mains with rectifier and AC Voltage Controller loads.

Suggested Books & References:

- Rashid Muhammad, H., "Power Electronics, Devices and Applications", 2nd Edition, Prentice Hall, 1998.
- Mohan Ned, Undeland Tore, M. and Robbins William, P. "Power Electronics: Converer, Applications and Design", John Wiley & Sons, 1994.
- Landel Cyrill, W., "Power Electronics", McGraw Hill, London, 1981.
- Dewan, S. B. and Satrughan A., "Power Semiconductor Circuits", John Wiley & Sons, 1975.
- Dubey, G. K., Doradlla, S. R., "Thyristorised Power Controllers", Wiley Eastern, 1987.

EE 1604 **POWER SYSTEM STABILITY** (3-1-0)

Introduction

System Modeling and Dynamics of Synchronous Generator;

Small Signal Stability Analysis (Low Frequency Oscillations)

- Analysis of Single Machine System.
- Application of P. S. Stabilizers.
- Analysis of Multi-machine System.

Small Signal Stability Analysis (Synchronous Frequency Oscillations)

- Transient Stability Analysis.
- Dynamic Stability Analysis.
- Dynamic Equivalence.
- Voltage Stability Analysis.
- Static VAR control and loads.
- Direct Stability evaluation— Lypnor and Popor's criteria.

PRACTICAL: EE 1608-P POWER SYSTEM STABILITY LAB (0 -0 -3)

List of Experiments:

- Study of Synchronous Generator.
- Study and analysis of Transient stability of a Single and Multi-Machine System.
- Study and analysis of Dynamic stability of a Multi-Single Machine System.
- Analysis of voltage stability.
- To control Static VAR.

Suggested Books & References:

- Nagrath, I. J. and Kothari, D. P. *"Power System Engineering",* Tata McGraw Hill, New delhi, 1994.
- Podiyar, K. R., *"Power System Dynamics: Stability and Control",* Interline, 1996.

EE 1605 DESIGN OF CONTROL SYSTEMS (3 -1 -0)

Review of frequency response, Frequency domain specifications; Design of controllers for single loop systems in the frequency domain — Lag, lead, Lag-Lead networks as compensators; Design of P, PDT, I, PI and PID controllers for first, second and third order systems; Control loop with auxiliary feedback, Feed forward control, Multivariable control.

Ziegler and Nichol's methods, Oppelt's method; State variable representation of control systems; Design using state variable feedback;
AC Carrier Control Systems

Modern Control Theory

Formulation of equations of a system — Linearization, Input-output relations, State space methods; State Transition Matrix, Stability, controllability, Observeability and Transfer Function

Lyapunov's direct method, Sensitivity, Optimal control formulation, Calculus of variations, Performance indices, Pontryagin's maximum principle, Time optimal control, Principle of optimally, Dynamic programming

Pole placement, Quadratic performance index, Linear regulator problem;

PRACTICAL: EE 1609-P CONTROL SYSTEM LAB (0-0-3)

List of Experiments:

- Identification of transfer function of a system using Bode plots from experimentally obtained frequency response.
- Experimental study of characteristics of Synchro device & AC and DC servo motor.
- Position control of DC servo system with Lead / Lag compensator in the loop.
- Experimental study of a hydraulic servomechanism.
- Experimental study of a pneumatic system.
- PID tuning on process control simulator_
- Stepper motor control using 8-bit Microprocessor.
- PID control of thermal and / or liquid level system.
- Study of Proportional, Integral and Derivative Control.
- Study of stability of a control mechanism.

Suggested Books & References:

- Gopal, M. *"Control Systems: Principles and Design",* Tata McGraw Hill, 1997.
- Kuo, B. C. *"Digital Control Systems",* 2"[1] Edition, Saunders College Publishing, 1992.
- Ogata, K., "Discrete Time Control System", Prentice Hall, 1987.

HS1606-P GENERAL PROFICIENCY VI (0-0-0)

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation -Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS)