M.D. UNIVERSITY, ROHTAKM.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
B.Tech. III YEAR (INSTRUMENTATION AND CONTROL ENGINEERING)
SEMESTER –V
Modified 'F' Scheme effective from 2011-12

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
IC-301-F	LINEAR CONTROL SYSTEMS (EI,IC)	3	1	-	4	50	100	-	150	3
IC-303-F	TRANSDUCERS AND SIGNAL CONDITIONING (EI,IC)	3	1	-	4	50	100	-	150	3
CSE-210-F	COMPUTER ARCHITECTURE AND ORGANISATION (EL,EI,IC & Common with 4th Sem. – CSE)	3	1	-	4	50	100	-	150	3
EE-303-F	ELECTRONIC MEASUREMENT AND INSTRUMENTATION (EL,EI, IC,EE, EEE)	3	1	-	4	50	100	-	150	3
EE-305-F	ANALOG ELECTRONIC CIRCUITS(EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-309-F	MICROPROCESSORS AND INTERFACING (EL,EI, IC,CSE,IT, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-323-F	ELECTRONIC MEASUREMENT AND INSTRUMENTATION LAB (EL,EI, IC,EE)	-	-	2	2	25	-	25	50	3
EE-325-F	ANALOG ELECTRONIC CIRCUITS LAB (ECE, IC)	-	-	2	2	25	-	25	50	3
EE-329-F	MICROPROCESSORS AND INTERFACING LAB (ECE,EE, IC,CSE,IT, EEE)	-	-	2	2	25	-	25	50	3
IC-321-F	LINEAR CONTROL SYSTEM LAB	-	-	2	2	25		25	50	3
IC-333-F	PRACTICAL TRAINING-I	-	-	2	2	-	-	-	-	
	TOTAL	**18**	**6**	**10**	**34**	**400**	**600**	**100**	**1100**	

Note:

1) **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**
2) **Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry. According to performance letter grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.**

IC-301-E **LINEAR CONTROL SYSTEM**

L T P	Theory	: 100 Marks
3 1 -	Class work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTORY CONCEPTS :

System/Plant Model, Types of models illustrative examples of plants and their inputs and outputs, controller, servomechanism, regulating systems, linear time-invariant (LTI), Time-varying, and causal systems; open loop control system, closed control system, illustrative examples of open-loop and feedback control systems, continuous time and sampled data systems. Effects of feedback on sensitivity (to parameter variations), stability, external disturbance (noise), overall gain etc. Introductory remarks about non-linear control systems.

Section B

MATHEMATICAL MODELLING :

Concept of Transfer function, relationship between transfer function and impulse response, order of a system, introduction to state variable modelling approach, state variable models (only equations) of LTD, time varying, continuous time and discrete-time systems. Block diagram, block diagram algebra, signal flow graphs and associated terms/definitions, Mason's formula & its application, characteristic equation, derivation of transfer functions of liquid level, electro-mechanical, mechanical & electrical systems.

Section C

TIME DOMAIN ANALYSIS :

Typical test signals, time response of Ist order systems to various standard inputs, Time response of 2nd order system to step input, relationship between location of roots of characteristic equation and w and wn, time domain specifications(general and of an under damped 2nd order system), steady state error and error constants, dominant closed loop poles, concept of stability, pole-zero configuration and stability, necessary and sufficient conditions for stability, Hurwitz stability criterion, Routh stability criterion, relative stability.

Section D

ROOT LOCUS TECHNIQUES :

Root locus concept, development of root loci for various systems, stability considerations.

FREQUENCY DOMAIN ANALYSIS:

Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots; stability , GM and PM, relative stability frequency response specifications.

CONTROL SYSTEM COMPONENTS:

Synchros, AC and DC techo-generators, servo motors, stepper motors & their applications.

TEXT BOOK:

1. Control System Engg : I.J.Nagrath & M.Gopal; New Age India.

REFERENCE BOOKS:

1. Automatic Control Systems : B.C.Kuo; PHI.
2. Modern Control Engg : K.Ogate; PHI.
3. Control Systems: Principles & Designing : Madan Gopal; TMH.
4. Modern Control Engg. :R.C.Dorf; Addison Wesley.

IC-303-F TRANDUCERS & SIGNAL CONDITIONING

L T P	Theory	: 100 Marks
3 1 -	Class work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTION:
Overview, primary & secondary transducers,. Active & passive transducers.

INDUCTIVE TRANSDUCERS:
LVDT, RVDT & uses. Transducers using L, Mu(u), G, N & Reluctance change.

Section B

CAPACITIVE TRANSDUCERS:
Use of changes in A, d, Ed(Epsilon), differential arrangement.

RESISTIVE TRANSDUCERS:
Potentiometers, loading effect, power rating linearity & sensitivity, Helipots, Strain gauges, unbounded & bounded types, wire & foil strain gauges.

Section C

MEASUREMENT OF NON-ELECTRICAL QUANTITIES:
Measurement of linear & rotatory displacements, strain, linear & angular velocity, liquid level & flow, thickness & temperature.

Section D

SIGNAL CONDITIONING:
Instrumentation amplifier characteristics, CMRR, Balanced modulator & demodulator, filters, voltage sensitive bridge & current sensitive bridge. Push-pull transducers, Blumlein bridge, integration, differentiation & sampling, A/D & D/A conversion, choppers, voltage to time A/D conversion, voltage to freq. Conversion concept & methods.

TEXT BOOK:
1. A course in Electrical & Electronic Measurement & Instrumentation : A.K.Sawhney; Dhanpat Rai.

REFERENCE. BOOKS**:**
1. Measurement Systems : E.O. Doeblin;TMH.
2. Electronic Instrumentation & Measurement Techniques : W.D. Cooper & A.D. Helfrick ; PHI.

CSE-210E

COMPUTER ARCHITECTURE & ORGANIZATION

L	T	P		
3	1	-	Class Work:	50
			Exam:	100
			Total:	150

Duration of Exam: 3 Hrs.

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

Boolean algebra and Logic gates, Combinational logic blocks(Adders, Multiplexers, Encoders, de-coder), Sequential logic blocks(Latches, Flip-Flops, Registers, Counters) Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language; structured organization; CPU, caches, main memory, secondary memory units & I/O; Performance metrics; MIPS, MFLOPS.

Section B

Instruction Set Architecture:

Instruction set based classification of processors (RISC, CISC, and their comparison); addressing modes: register, immediate, direct, indirect, indexed; Operations in the instruction set; Arithmetic and Logical, Data Transfer, Control Flow; Instruction set formats (fixed, variable, hybrid); Language of the machine: 8086 ; simulation using MSAM.

Section C

Basic non pipelined CPU Architecture and Memory Hierarchy & I/O Techniques

CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage); microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining.

The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit); Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types); Cache memory (Associative & direct mapped cache organizations.

Section D

Introduction to Parallelism and Computer Organization [80x86]:

Goals of parallelism (Exploitation of concurrency, throughput enhancement); Amdahl's law; Instruction level parallelism (pipelining, super scaling –basic features); Processor level parallelism (Multiprocessor systems overview). Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts; Memory Hierarchy.

Text Books:

Patterson - Computer Organization & design, Elsevier

 Computer Organization and Design, 2nd Ed., by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.

 Computer Architecture and Organization, 3rd Edi, by John P. Hayes, 1998, TMH.

Reference Books:

 Operating Systems Internals and Design Principles by William Stallings,4th edition,

EE-303-F **ELECTRONIC MEASUREMENT AND INSTRUMENTATION**

L T P		
3 1 -	Theory	: 100 Marks
	Class work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3 Hrs.

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

OSCILLOSCOPE:
Block diagram, study of various stages in brief, high frequency CRO considerations measurement of phase &frequency, electrostatic deflection, dual trace &dual beam oscilloscope Sampling and storage oscilloscope

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Section-B

ELECTRONIC INSTRUMENTS:
Instruments for measurement of voltage, current & other circuit parameters, Q-meters, R.F. power measurements, introduction to digital meter,chopper amplifier type voltmeter,true RMS voltmeter,electronic multimeter

Section-C
GENERATION & ANALYSIS OF WAVEFORMS:
Block diagram of pulse generators, signal generators, function generators wave analysers, distortion analysers,
spectrum analyser, Harmonic analyser, FFT analyser
FREQUENCY & TIME MEASUREMENT:
Study of decade counting Assembly(DCA), frequency measurements, period measurements, universal counter,

Section-D
TRANSDUCERS & SIGNAL CONDITIONING:
Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of measurement of displacement, velocity, acceleration, strain, pressure, liquid level & temperature.
DC signal conditioning system, AC signal conditioning system, data acquisition and conversion system

TEXT BOOK:

1. A course in Electrical & Electronics Measurements & Instrumentation : A.K.Sawhney; Dhanpat Rai & Sons.
2. Morris - Principles of electronics measurements & instrumentation,Elsevier

REFERENCE BOOKS.
1. Electronics Instrumentation & Measurement Techniques : Cooper; PHI.

EE-305-F **ANALOG ELECTRONIC CIRCUITS**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

SINGLE AND MULTISTAGE AMPLIFIERS:
Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, pass-band of cascaded stages, RC-coupled amplifier, low frequency response of RC coupled stage, effect of an emitter bypass capacitor on low Frequency response, multistage CE amplifier .
FEEDBACK AMPLIFIERS :
Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.

Section-B

OSCILLATORS:
Sinusoidal oscillators, Barkhausen criteria, R-C phase shift oscillator, general form of oscillator circuit, wien-bridge oscillator, crystal oscillator.

Section-C

POWER AMPLIFIERS:
Class A, B, and C operations; Class A large signal amplifiers, higher order harmonic distortion, efficiency, transformer coupled power amplifier, class B amplifier : efficiency & distortion; class A and class B push-pull amplifiers; class C power amplifier.
OPERATIONAL AMPLIFIERS :
Ideal and practical operational amplifiers, inverting and non-inverting amplifier, differential amplifier, emitter coupled differential amplifier, transfer characteristics of a differential amplifier, offset error : voltage and current, common mode rejection ratio (CMRR) .

Section-D

LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS :
Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, DC voltage follower, Bridge amplifier, AC coupled amplifier, AC voltage follower, Integrator, differentiator.

NON-LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS :
Comparators, sample & hold circuits, Logarithmic amplifier, anti-log amplifier, logarithmic multiplier, waveform generators , Miller & Bootstrap sweep generators, regenerative comparator (Schmitt Trigger), multivibrators, ADC.

TEXT BOOK:

1. Agarwal - Foundations & Analog & digital electronics,Elsevier
2. Integrated Electronics: Milman Halkias, TMH.
3. Microelectronic Circuits : Sedra & Smith.

REFERENCE BOOKS:

1. Operational Amplifiers:Gaikwad
2. Electronic Circuit Analysis and Design (Second edition) : D.A.Neamen; TMH

EE-309-F Microprocessors and Interfacing

L	T	P		
3	1	-	Theory	: 100 Marks
			Class work	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

PART A

THE 8085 PROCESSOR :
Introduction to microprocessor, 8085 microprocessor : Architecture, instruction set, interrupt structure, and Assembly language programming.

PART B

THE 8086 MICROPROCESSOR ARCHITECTURE :
Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals

PART C

INSTRUCTION SET OF 8086 :
Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instructions, directives and operators, programming examples.

PART D

INTERFACING DEVICE :
8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

TEXT BOOKS :
1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd.
2. The Intel Microprocessors 8086- Pentium processor : Brey; PHI

REFERENCE BOOKS:
1. Microprocessors and interfacing : Hall; TMH
2. The 8088 & 8086 Microprocessors-Programming, interfacing,Hardware & Applications :Triebel & Singh; PHI
3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design : Yu-Chang Liu & Glenn A Gibson; PHI.
4. Advanced Microprocessors and Interfacing : Badri Ram; TMH

EE-323-F ELECTRONIC MEASUREMENT AND INSTRUMENTATION-LAB

L T P			
0 0 2	CLASS WORK	:	25
	EXAM	:	25
	TOTAL	:	50
	DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1) Study blocks wise construction of a analog oscilloscope & Function generator.
2) Study blocks wise construction of a Multimeter & frequency counter.
3) Study Measurement of different components & parameters like Q of a coil etc using LCRQ meter.
4) Study of distortion factor meter and determination of the % distortion of the given oscillator
5) Determine output characteristics of a LVDT and Measure displacement using LVDT
6) Study characteristics of temperature transducer like Thermocouple, Thermistor & RTD with implementation of a small project using signal conditioning circuits like instrumentation amplifier.
7) Measurement of Strain using Strain Guage.
8) To study differential pressure transducer & signal conditioning of output signal.
9). Measurement of level using capacitive transducer..
10) Study of Distance measurement using ultrasonic transducer.

Note: Any Eight Experiments should performed from above list and two experiments can be suitably chosen on the contemporary topics

EE-325-F **ANALOG ELECTRONIC CIRCUITS LAB**

L T P			
0 0 2	CLASS WORK	:	25
	EXAM	:	25
	TOTAL	:	50
	DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS: (Select Any ten Experiments)

1. Design & measure the frequency response of an RC coupled amplifier using discrete components.
2. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth
3. Study the effect of voltage series, current series, voltage shunt, and current shunt feed-back on amplifier using. discrete components.
4. Design & realize inverting amplifier, non-inverting and buffer amplifier using 741 Op Amp.
5. Verify the operation of a differentiator circuit using 741 op amp and show that it acts as a high pass filter.
6. Verify the operation of a integrator circuit using 741 op amp and show that it acts as a low pass filter.
7. Design and verify the operations of op amp adder and subtractor circuits.
8. Plot frequency response of AC coupled amplifier using op amp 741 and study the effect of negative feedback on the bandwidth and gain of the amplifier.
9. Study of IC 555 as astable & monostable multivibrator
10. Design & realize using op amp 741, Wein -bridge oscillator.
11. To design & realize using op amp 741, square wave generator.
12. To design & realize using op amp 741, logarithmic amplifier & VCCS.
13. Study of 8 bit monolithic Analog to digital converter
14. Study of R-2R ladder network & 8 bit monolithic Digital to Analog Converter.

EE-329-F **Microprocessor & Interfacing Lab**

L T P			
0 0 2	CLASS WORK	:	25
	EXAM	:	25
	TOTAL	:	50
	DURATION OF EXAM	:	3 HRS

List of Experiments:

ANY TEN EXPERIMENTS SHOULD BE PERFORMED:

1. Write a program using 8085 for Hexadecimal addition & subtraction of two numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers
3. Write a program to perform multiplication and division of two 8 bit numbers using 8085
4. Write a program using 8086 for division of a defined double word (stored in a data segment) by another double Word division and verify.
5. Write a program using 8086 for finding the square root of a given number and verify.
6. Write a program using 8086 to copy 12 bytes of data from source to destination & verify.
7. Write a program to find maximum and minimum from series using 8086.
8. Write a program to initiate 8251 and to check the transmission and reception of character.
9. Write a program to interface ADC & DAC with 8085 & demonstrate generation of square wave.
10. Write a program to control the operation of stepper motor using 8085/8086 and 8255 PPI.
11. Write a program to interface 8X8 LED Matrix Display using 8085/8086 microprocessors and 8255 PPI.
12. Write a program to control the traffic light system using 8085/8086 and 8255 PPI.
13. Write a program to control simulated elevator 8085/8086 microprocessors and 8255 PPI.

IC-321-F LINEAR CONTROL SYSTEM LAB

L T P			
0 0 2	CLASS WORK	:	25
	EXAM	:	25
	TOTAL	:	50
	DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1. To study A.C. servo motor and to plot its torque speed characteristics.

2. To study D.C. servo motor and to plot its torque speed characteristics.

3. To study the magnetic amplifier and to plot its load current v/s control current characteristics for :
   (a) series connected mode
   (b) parallel connected mode.

4. To plot the load current v/s control current characteristics for self exited mode of the magnetic amplifier.

5. To study the synchro & to:
   (a) Use the synchro pair (synchro transmitter & control transformer) as an error detector.

   (b)Plot stator voltage v/s rotor angle for synchro transmitter i.e. to use the synchro transmitter as position transducer.

6. To use the synchro pair (synchro transmitter & synchro motor) as a torque trans mitter.

7. (a) To demonstrate simple motor driven closed loop position control system.
   (b) To study and demonstrate simple closed loop speed control system.

8. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots .

9. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing number of steps, direction of rotation & speed.

10. To implement a PID controller for level control of a pilot plant.

11. To implement a PID controller for temperature control of a pilot plant.

12. To study the MATLAB package for simulation of control system design.

IC-333-F **PRACTICAL TRAINING – I**

L T P
- - 2

At the end of fourth semester each student would undergo six weeks practical training in an industry/Professional organization/research laboratory with the prior approval of the Director Principal/Principal of the concerned college and submit a written typed report along with a certificate from the organization. The record will be evaluated by a board of examiners to be appointed by the Director- Principal/Principal of the concerned college during V Sem. who will award one of the following grades:

Excellent	:	A
Good	:	B
Satisfactory	:	C
Non – Satisfactory	:	F

A student who has been awarded 'F' grade will be required to repeat practical training even after eighth semester.

M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATION
B.Tech. III YEAR (INSTRUMENTATION AND CONTROL ENGINEERING)
SEMESTER – VI
Modified 'F' Scheme effective from 20012-13

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
IC-308-F	COMPUTER BASED INSTRUMENTATION AND CONTROL	3	1	-	4	50	100	-	150	3
IC-302-F	NON LINEAR CONTROL SYSTEM	3	1	-	4	50	100	-	150	3
IC-304-F	TELEMETRY, DATA PROCESSING & RECORDING	3	1	-	4	50	100	-	150	3
IC-306-F	BIOMEDICAL INSTRUMENTATION	3	1	-	4	50	100	-	150	3
EE-310-F	DIGITAL SYSTEM DESIGN (IC,EE,EEE,ECE,CSE,)	3	1	-	4	50	100	-	150	3
EE-317-F	POWER ELECTRONICS (EI, IC, COMMON WITH V-SEM. EE, EEE)	3	1	-	4	50	100	-	150	3
IC-322-F	INSTRUMENTATION PROJECT LAB	-	-	2	2	25	-	25	50	3
EE-330-F	DIGITAL SYSTEM DESIGN LAB (IC,EE,EEE,ECE,CSE,)	-	-	3	3	25	-	25	50	3
EE-321-F	POWER ELECTRONICS LAB (EI, IC & COMMON WITH V-SEM EE, EEE)	-	-	2	2	25	-	25	50	3
GPIC-302-F	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	
	TOTAL	**18**	**6**	**7**	**31**	**425**	**600**	**75**	**1100**	

1. **Note: Students will be allowed to use non-programmable scientific calculator. However, sharing of Calculator will not be permitted in the examination.**
2. **Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.**

IC-308-F COMPUTER BASED INSTRUMENTATION AND CONTROL

L T P	Theory	: 100 Marks
3 1 -	Class Work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3Hrs

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTION:

Necessity and functions of computers. Level of automation and economy of computer control. Centralized computer control Vs distributed computer control.

COMPUTER ARCHITECTURE:

Micro and mini computer, functional models of I.O. system .

Section B

INTERFACING:

Sampling; Multiplexing; A/D and D/A converters, interfacing with different types of transducers - Analog / Digital, Electrical and non electrical selection of sensors; Micro computer interfacing standard buses Serial buses; Serial data communication protocols.

STRUCTURAL STUDY OF AUTOMATIC PROCESS CONTROL:

Fundamental of automatic process control, building block of automatic system, direct and distributed digital control system. Programmable controllers.

Section C

PERSONAL COMPUTER IN REAL LIFE ENVIRONMENT:

Introduction, personal computer: system and facility, PC bus and signals, interrupts, interfacing PC with outer world, PC in RTE, Real time application of IBM PC PC based distributed control system

Section D

PROGRAMMING AND APPLICATION:

Modeling and simulation for plant automation, PLC Architecture and programming of PLC, industrial control application: cement plant, thermal power plant , water treatment plant, steel plant,

TEXT BOOK :

1. Bolton - measurementation & control systems,Elsevier
2. Computer based industrial control: Krishan Kant,; PHI

IC-302-F **NON-LINEAR CONTROL SYSTEM**

L T P	Theory	: 100 Marks
3 1 -	Class Work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3Hrs

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTION:

Nonlinear components such as dead band, backlash, relay, saturation. Difficulties in nonlinear modelling & control

.PHASE-PLANE ANALYSIS:

Phase portraits of 2nd order systems, method of isoclines, phase portrait of 2nd order system with non-linearities, limit cycles, singular points.

Section B

DESCRIBING FUNCTION ANALYSIS:

Definition, limitations, use of DF for stability analysis, DF of ideal relay, relay with hysteresis, dead zone, saturation, coulomb friction, backlash etc.

Section C

STATE VARIABLE TECHNIQUES:

State space modelling, state transition matrix. State models for linear continuous time systems, State variables and linear discrete time systems, Diagonalisation, solution of state equations, conversion of state variable model to transfer function, conversion of transfer function to canonical state variable model. Concept of Controllability and Observability, test for Controllability and Observability.

Section D

LYAPUNOV STABILITY ANALYSIS:

Introduction, basic concepts, stability definitions, stability theorems, lyapunov function for non-linear systems and linear systems. Model reference adaptive system, discrete time system.

TEXT BOOK:

1. Fadali - Digital control engineering,Elsevier
2. Control System Engineering (Third Edition): I.J Nagrath and M.Gopal; New Age Internatinal

REFERENCE BOOKS:

1. Control Systems Principles and Design (second edition) : M.Gopal; TMH.
2. Digital Control And State Variable Methods : M.Gopal; TMH.

NOTE : Eight questions are to be set - at least one from each unit. Students have to attempt five questions in all.

IC-304-F TELEMETRY DATA-PROCESSING AND RECORDING

L T P	Theory	: 100 Marks
3 1 -	Class Work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3Hrs

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTION:

Overview, Block diagram of a generalized instrument & description of its various blocks.

Section B

TELEMETRY:

Modes of data transmission, D.C. telemetry system, voltage telemetry system, current telemetry system, A.C telemetry system., AM , FM, phase modulation, pulse telemetry system, PAM,. Pulse frequency system, Pulse duration modulation (PDM), digital telemetry, Pulse Code Modulation, Transmission channels & media, wire line channels, radio channels, microwave channels, power line carrier channels, Multiplexing in telemetry systems, TDM.

Section C

DATA PROCESSING & RECORDING:

Digital V/s analog processing, quantization, aperture, Electronic counters, R S flip flop, decade counter, Digital display methods, SS display, LED, LCD, Nixie Tube,

Section D

Decade counting assembly (DCA), Decimal decoders, BCD to S-S converter, BCD to dot-matrix converter, resolution & sensitivity & accuracy in digital meters.

TEXT BOOK:

A course in Elec. & Elect. Measurement & Instrumentation :A.K. Sawhney; Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Measurement Systems & Analysis: E.O. Doeblien; TMH.
2 Electronics Instrumentation & Measurement Techniques: W.D.Cooper and A.D.Helfrick.

IC-306-F **BIO- MEDICAL INSTRUMENTATION**

L T P	Theory	: 100 Marks
3 1 -	Class Work	: 50 Marks
	Total	: 150 Marks
	Duration of Exam	: 3Hrs

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTION:

Origin of bio-electric signals, recording systems, source of low level recording circuits, preamplifiers, main amplifier and driver stage, writing systems, types of recorders and transducers used.

Section B

BIO-MEDICAL RECORDERS AND DISPLAY SYSTEMS:

ECG, EEG, EMG, photo-cardiograph and electrodes used for ECG, EEG and EMG, oscilloscopes used for biomedical measurements, multi-channel display.

BLOOD GAS ANALYSERS:

B.P measurement, patient monitoring system, blood PH measurement, blood PO_2, PCO_2, complete blood gas analyser.

Section C

SPECIAL MACHINES:

MRI, and ultrasonic imaging systems, x-ray machine, x-ray computed tomography, basic NMR components, physics of ultrasonic rays, A-scanner, B-scanner, echocardiograph, display devices for ultra sonic imaging.

Section D

CARDIAC PACEMAKERS AND DEFIBRILLATORS:

External pacemaker, implantable pace maker, programmable pace maker, leads and electrodes used , DC defibrillators, electrodes used, implantable defibrillators.

LASER APPLICATIONS IN BIOMEDICAL FIELDS:

Lasers: ruby laser , argon laser, helium- neon laser, CO_2 laser, Nd-YAG laser

TEXT BOOKS:

1. Endrele - Biomedical instrumentation,Elsevier
2 Introduction to Bio-medical Instrumentation : R.S khandpur.
3 Bio-medical instrumentation: Crambell.

EE-310-F **DIGITAL SYSTEM DESIGN**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

. INTRODUCTION :Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to VHDL data objects, classes and data types, Operators, Overloading, logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioral dataflow and structural models.

Section-B

VHDL STATEMENTS : Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements. Subprograms: Application of Functions and Procedures, Structural Modelling, component declaration, structural layout and generics.

Section-C

COMBINATIONAL & SEQUENTIAL CIRCUIT DESIGN:VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders , code converters, comparators, implementation of Boolean functions etc. VHDL Models and Simulation of Sequential Circuits Shift Registers, Counters etc.

Section-D

DESIGN OF MICROCOMPUTER & PROGRAMMABLE DEVICE : Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL Programmable logic devices : ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design implementation using CPLDs and FPGAs

REFERENCE BOOKS:

1. Ashenden - Digital design,Elsevier
2. IEEE Standard VHDL Language Reference Manual (1993).
3. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.
4. "A VHDL Primmer" : Bhasker; Prentice Hall 1995.
5. "Digital System Design using VHDL" : Charles. H.Roth ; PWS (1998).
6. "VHDL-Analysis & Modelling of Digital Systems" : Navabi Z; McGraw Hill.
7. VHDL-IV Edition :Perry; TMH (2002)
8. "Introduction to Digital Systems" : Ercegovac. Lang & Moreno; John Wiley (1999).
9. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH (2000)
10. Modern Digital Electronics- III Edition: R.P Jain; TMH (2003).
11. Grout - Digital system Design using FPGA & CPLD 'S,Elsevier

EE-317-F **POWER ELECTRONICS**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION :

Role of power electronics, review of construction and characteristics of power diode, Shottky diode, power transistor, power MOSFET, SCR, DIAC, Triac, GTO, IGBT & SIT.

SCR:

Ratings and protections, series and parallel connections, R, RC and UJT firing circuit and other firing circuits based on ICs and microprocessors; pulse transformer and opto-coupler, commutation techniques.

Section-B

AC REGULATORS:

Types of regulator, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage and synchronous tap changer, three phase regulator.

CONVERTERS :

One, two, three, six and twelve pulse converters, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant / dual converter, power factor improvement techniques, forced commutated converter, MOSFET and transistor based converters.

Section-C

INVERTERS :

Basic circuit, 120 degree mode and 180 degree mode conduction schemes, modified McMurray half bridge and full bridge inverters, McMurray -Bedford half bridge and bridge inverters, brief description of parallel and series inverters, current source inverter (CSI), transistor and MOSFET based inverters.

CHOPPERS :

Basic scheme, output voltage control techniques, one, two, and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers.

Section-D

CYCLOCONVERTERS :

Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.

DRIVES:

Introduction to electric drives: DC drives – converter and chopper fed dc drives, ac drives - stator voltage control, V/f control, rotor resistance control, static Scherbius system and static Kramer systems.

TEXT BOOK:

1. Power Electronics: P.S Bhimra
2. Power Electronics : MH Rashid; PHI
3. Bose - Power electronics,Elsevier

REFERENCE BOOKS :

1. Rashid - Handbook of power electronics,Elsevier
2. Power Electronics : PC Sen; TMH
3. Power Electronics : HC Rai; Galgotia
4. Thyristorised Power Controllers : GK Dubey, PHI
5. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh;Dhanpat Rai

IC-322-F

Instrumentation Project Lab

L	T	P
-	-	2

Practical : 25 Marks
Class work : 25 Marks
Total : 50 Marks
Duration of Exam : 3 Hours

In this lab, the students will carry out, in group of 2-5, or even individually, projects involving hardware/software/analysis etc. relating to the area of instrumentation.

EE-330-F **DIGITAL SYSTEM DESIGN LAB**

L T P		
0 0 2	CLASS WORK	: 25 Marks
	EXAM	: 25 Marks
	TOTAL	: 50 Marks
	DURATION OF EXAM	: 3 HRS

LIST OF EXPERIMENTS:

ANY FIVE EXPERIMENTS: VHDL

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. half adder
   b . full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. multiplexer
   b. demultiplexer
4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. decoder
   b. encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated
6. Write a VHDL program for a code converter and check the wave forms and the hardware generated
7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
8. Write a VHDL program for a counter and check the wave forms and the hardware generated
9. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
   a. register
   b. shift register

ANY FIVE EXPERIMENTS USING: using FPGA (Spartan 3) & CPLD

1) Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor
2) Design a parity generator
3) Design a 4 Bit comparator
4) Design a RS & JK Flip flop
5) Design a 4: 1 Multiplexer
6) Design a 4 Bit Up / Down Counter with Loadable Count
7) Design a 3: 8 decoder
8) Design a 8 bit shift register
9) Design a arithmetic unit
10) Implement ADC & DAC interface with FPGA
11) Implement a serial communication interface with FPGA
12) Implement a Telephone keypad interface with FPGA
13) Implement a VGA interface with FPGA
14) Implement a PS2 keypad interface with FPGA
15) Implement a 4 digit seven segment display

EE-321-F **POWER ELECTRONICS-LAB**

L T P		
0 0 2	CLASS WORK	: 25 Marks
	EXAM	: 25 Marks
	TOTAL	: 50 Marks
	DURATION OF EXAM	: 3 HRS

LIST OF EXPERIMENTS:

1. Static Characteristics of Power diode & Shottky diode and to study reverse recovery of Power Diode & Shottky diode.
2. Characteristics of IGBT & GTO
3. To study R, RC and UJT firing Circuit with Pulse transformer
4. To study of Firing Circuit based on ICs NE555, 7408 & 3140
5. To Study of Pulse transformer & optocoupler technique
6. To Study of SCR Communication Technique Class A-E.
7. Speed control of small motor using Single Phase Half wave & Full wave fully controlled Converter
8. Speed control of small motor using Single Phase Dual Converter (Continuous and discontinuous Control)
9. Study of Mc Murray - Bed ford Half & Full Bridge Inverter
10. To study Parallel Inverter to drive small AC Induction motor
11. Speed control of a small DC motor using MOSFET based Chopper with output voltage control technique
12. Speed control of small AC induction motor using Single Phase non circulating type bridge by frequency conversion.