IC-405-E **COMPUTER BASED INSTRUMENTATION AND CONTROL**

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

UNIT 1. INTRODUCTION:
Necessity and functions of computers. Level of automation and economy of computer control. Centralized computer control Vs distributed computer control.

UNIT 2. COMPUTER ARCHITECTURE:
Micro and mini computer, functional models of I.O. system .

UNIT 3. 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.

UNIT 4. STRUCTURAL STUDY OF AUTOMATIC PROCESS CONTROL:
Fundamental of automatic process control, building block of automatic system, direct and distributed digital control system. Programmable controllers.

UNIT 5. 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

UNIT 6. 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. Computer based industrial control: Krishan Kant,; PHI

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

EE-206-E **COMMUNICATION SYSTEMS**

(EE,EL,EI)

L	T	P
3	1	0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

UNIT 1. INTRODUCTION TO COMMUNICATION SYSTEMS :
The essentials of a Communication system, modes and media's of Communication, Classification of signals and systems , Fourier Analysis of signals.

UNIT 2. AMPLITUDE MODULATION :
Amplitude modulation, Generation of AM waves, Demodulation of AM waves, DSBSC, Generation of DSBSC waves, Coherent detection of DSBSC waves, single side band modulation, generation of SSB waves, demodulation of SSB waves, vestigial sideband modulation (VSB).

UNIT 3. ANGLE MODULATION :
Basic definitions: Phase modulation (PM) & frequency modulation(FM), narrow band frequency modulation, wideband frequency modulation, generation of FM waves, Demodulation of FM waves.

UNIT 4. PULSE ANALOG MODULATION :
Sampling theory, time division (TDM) and frequency division (FDM) multiplexing, pulse amplitude modulation (PAM), pulse time modulation.

UNIT 5. PULSE DIGITAL MODULATION :
Elements of pulse code modulation, noise in PCM systems, Measure of information, channel capacity, channel capacity of a PCM system, differential pulse code modulation (DPCM). Delta modulation (DM)

UNIT 6. DIGITAL MODULATION TECHNIQUES:
ASK, FSK, BPSK, QPSK, M-ary PSK.

UNIT 7. INTRODUCTION TO NOISE:
External noise, Internal noise, S/N ratio, noise figure.

TEXT BOOKS :
1. Communication systems (4th edn.) : Simon Haykins; John wiley & sons.
2. Communication systems: Singh & Sapre; TMH.

REFERENCE BOOKS :
1. Electronic Communication systems : Kennedy; TMH.
2. Communication Electronics : Frenzel; TMH.
3. Communication system : Taub & Schilling; TMH.
4. Communication systems : Bruce Carlson.

NOTE: Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.

IC-304-E **TELEMETRY DATA-PROCESSING AND RECORDING**

L	T	P
3	1	0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

UNIT 1. INTRODUCTION:
Overview, Block diagram of a generalized instrument & description of its various blocks.

UNIT 2. 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.

UNIT 3. 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, 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.

NOTE : Eight questions are to be set - at least one question from unit 1 and at least three each from units 2 and 3. Students will be required to attempt five questions in all.

IC-306-E **BIO- MEDICAL INSTRUMENTATION**

L	T	P
3	1	0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

UNIT 1. 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.

UNIT 2. 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.

UNIT 3. BLOOD GAS ANALYSERS:
B.P measurement, patient monitoring system, blood PH measurement, blood PO_2, PCO_2, complete blood gas analyser.

UNIT 4. 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.

UNIT5. CARDIAC PACEMAKERS AND DEFIBRILLATORS:
External pacemaker, implantable pace maker, programmable pace maker, leads and electrodes used , DC defibrillators, electrodes used, implantable defibrillators.

UNIT6. LASER APPLICATIONS IN BIOMEDICAL FIELDS:
Lasers: ruby laser , argon laser, helium- neon laser, CO_2 laser, Nd-YAG laser

TEXT BOOKS:
1. 1. Introduction to Bio-medical Instrumentation : R.S khandpur.
2. 2. Bio-medical instrumentation: Crambell.

NOTE : Eight questions are to be set –one from each unit. Students have to attempt any five questions.

EE-310-E DIGITAL SYSTEM DESIGN

L	T	P
3	1	0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

UNIT 1. 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 behavioural, dataflow and structural models.

UNIT 2. 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.

UNIT 3. COMBINATIONAL CIRCUIT DESIGN:
VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

UNIT 4. SEQUENTIAL CIRCUITS DESIGN :
VHDL Models and Simulation of Sequential Circuits
Shift Registers, Counters etc.

UNIT 5. DESIGN OF MICROCOMPUTER :
Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL

UNIT 6. DESIGN WITH CPLDs AND FPGAs :
Progr ammable logic devices : ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design implementation using CPLDs and FPGAs

REFERENCE BOOKS:
1. IEEE Standard VHDL Language Reference Manual (1993).
2. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.

3. "A VHDL Primmer" : Bhasker; Prentice Hall 1995.
4. "Digital System Design using VHDL" : Charles. H.Roth ; PWS (1998).
5. "VHDL-Analysis & Modelling of Digital Systems" : Navabi Z; McGraw Hill.
6. VHDL-IV Edition :Perry; TMH (2002)
7. "Introduction to Digital Systems" : Ercegovac. Lang & Moreno; John Wiley (1999).
8. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH (2000)
9. Modern Digital Electronics- III Edition: R.P Jain; TMH (2003).

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

EE-317-E POWER ELECTRONICS

L	T	P
3	1	0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

UNIT1. 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.

UNIT2. 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.

UNIT3. 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.

UNIT4. 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.

UNIT5. 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.

UNIT6. 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.

UNIT7. CYCLOCONVERTERS :
Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.

UNIT8. 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 : MH Rashid; PHI

REFERENCE BOOKS :
1. Power Electronics : PC Sen; TMH
2. Power Electronics : HC Rai; Galgotia
3. Thyristorised Power Controllers : GK Dubey, PHI
4. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh;Dhanpat Rai
5. Power Electronics: P.S Bhimra.

NOTE : Eight questions are to be set –one from each unit. Students have to attempt any five questions.

IC-322-E

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-E **DIGITAL SYSTEM DESIGN LAB**

L	T	P
0	0	2

CLASS WORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

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. a. register

b. b. shift register

10. Implement any three (given above) on FPGA/CPLD kit

NOTE : Ten experiments are to be performed out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

EE-331-E **ELECTRONIC CIRCUIT SIMULATION LAB**

L	T	P
0	0	2

CLASS WORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1. 1. Simulate and study half-wave, full-wave, and bridge-rectifier using PSPICE windows
2. 2. Simulate and study diode clipper and clamper circuits using PSPICE windows
3. 3. Simulate and study emitter bias and fixed bias BJT and JFET circuits using PSPICE windows, and determine quescient conditions.
4. 4. Simulate a common emitter amplifier using self biasing and study the effect of variation in emitter resistor on voltage gain , input and output impedance using PSPICE windows .
5. 5. Determine the frequency response of Vo/Vs for CE BJT amplifier using PSPICE windows. Study the effect of cascading of two stages on band width.
6. 6. Simulate and study Darlington pair amplifier circuit using PSPICE windows and determine dc bias and output ac voltage .
7. 7. Study an operational amplifier using PSPICE windows and find out: CMMR, gain band width product, slew rate, 3-db frequency, and input offset voltage.
8. 8. Simulate and study active low pass, high pass, and band pass filters using PSPICE windows.
9. 9. Simulate and study class A, B, C, and AB amplifier using PSPICE windows.
10. 10. Study the operation of 555 timer oscillator using PSPICE.
11. 11. Simulate logic expression……..and determine its truth table.
12. 12. Simulate logic expression of full adder circuit and determine its truth table.
13. 13. Simulate a synchronous 4-bit counter and determine its count sequence.
14. 14. Simulate a master-slave flip-flop using NAND gates and study its operation. Study the operation of asynchronous preset and clear .

NOTE **:** 1. At least ten experiments have to be performed in the semester; out of which at least seven experiments should be performed from above list. Remaining three

experiments may either be performed from the above list or designed & set by the concerned institution.

EE-321-E **POWER ELECTRONICS-LAB**

L	T	P
3	1	0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

15.	15.	Study of characteristics of diode, thyristor and triac.
16.	16.	Study of characteristics of transistor and MOSFET.
17.	17.	Study of R and R-C firing circuits.
18.	18.	Study of UJT firing circuit.
19.	19.	Study of complementary voltage commutation using a lamp flasher.
20.	20.	Study of complementary voltage commutation using ring counter.
21.	21.	Study of thyristorised d-c circuit breaker.
22.	22.	Study of a.c. phase control.
23.	23.	Study of full wave converter.
24.	24.	Study of dc chopper.
25.	25.	Study of series inverter.
26.	26.	Study of bridge inverter.
27.	27.	Study of single phase cycloconverter.

NOTE : At least ten experiments have to be performed in the semester. At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus of EE-308-C.