Course Contents

Category of Course	Course Title	Course Code	Credit-6C			Theory Paper (ES)
			L	**T**	**P**	
Departmental Core	Data Communication and Computer Networks	**EI601**	3	1	2	Max.Marks-100 Min.Marks-35 Duration-3hrs.

Branch: Electronics and Instrumentation-VI Semester

Course: EI601 Data Communication and Computer Networks

Unit I

Basic data communication concepts:

Introduction to Data communication, channel capacity, parallel and serial transmission, Asynchronous and Synchronous transmission, Simplex, Half Duplex and Full Duplex modes of transmission and their applications. Multiplexing strategies like TDM, FDM, WDM and SDM

Unit II

Data Interfaces and transmission:

Digital interface standards ; RS-232C standard and X.21 standard, connecting a DTE in RS-232 C. RS-449, RS-422A and RS-423A standards High speed desktop serial interfaces. Plesiochronous digital multiplexing hierarchy T carrier and E carrier. Introduction to ISDN, its interfaces and reference points. Need for MoDems for data communication and their types.

Unit III

Communication Networks and its technology:

Concept of Circuit switching, message switching and packet switching, their comparison and application. Computer Networks and concept of layering, OSI reference Model, Introduction to TCP/IP protocol suite and comparison of the OSI TCP/IP layered Models. Classification of networks under the heading LAN, WAN and MAN and their characteristics.

Unit IV

Physical and Data link layer:

Error detection techniques such as Parity check, Vertical and longitudinal redundancy check, CRC code and their error detecting capabilities.

Data link layer issues Point to point and multipoint links, flow control, sliding window protocol, various ARQ techniques for error and flow control and their comparison, SDLC, HDLC as bit oriented link control

Unit V

Local Area Networks and its technology

Various transmission mediums for LAN different types of LAN topologies. Medium Access Control Techniques namely Contention, Token Passing and Polling. CSMA/CD and CSMA/CA. A brief survey of IEEE LAN standards. Comparative study of Ethernet, Fast Ethernet Gigabit Ethernet and 10 Gigabit Ethernet.

Text Books Recommended :

1. Stalling W., *Data and Computer Communication*, PHI.
2. Tanenbaum, *Computer Networks,* PHI.
3. Forouzan B., *Data Communication and Networking*, TMH.

Course Content

Category of Course	Course Title	Course Code	Credit-4C			Theory Paper
			L	T	P	
Departmental Core	VLSI Technology	EI602	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs.

Branch: Electronics & Instrumentation VI Semester
Course: **EI602** VLSI Technology

Course Contents

Unit-I

Crystal Growth and Wafer preparation: Wafer terminology, Different crystalline orientations, CZ method, CMOS IC Design flow, Crystal Defects. Fabrication processes of FETs, MOSFETs, and BIMOS etc.

Unit-II

Layering: Epitaxial growth methods, Oxidation; Kinetics of oxidation, Thin film fabrication, Metallization; Physical Vapor Deposition, Sputtering.

Unit-III

Patterning: Lithography; Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography. Photo masking steps, Resists. Doping: Diffusion; Diffusion Models, Ion Implantation; Implantation Equipment, Channeling.

Unit-IV

VLSI process techniques and Integration: Floor planning, layout, Design rules, stick diagrams, Test generation, Logic simulation, Introduction to EDA tools. Contamination Control; Clean rooms, HEPA, ULPA Filters and Class numbers.

Unit-V

Subsystem Design: Data-paths; adder, Shift registers ALU, Memory; NVRWM, Flash memories, 6-Transistor RAMs. Latch up in CMOS Circuits.

Text/ References:

1. S.K.Gandhi, VLSI Fabrication principles, Wiley.
2. S.M. Sze, VLSI Technology, II edition, McGraw Hill.
3. P.Van Zant, Microchip Fabrication, A Practical Guide to Semiconductor Processing, Third Edition, McGraw Hill.

Course Content

Category of Course	Course Title	Course Code	Credit-4C			Theory Paper(ES)
			L	T	P	
Electronics & Instrumentation	Digital Signal Processing	EI603	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs.

Branch: Electronics & Instrumentation: VI Semester
Course: EI603 Digital Signal Processing

Unit - I
The Discrete Fourier Transform: Discrete Fourier series, Discrete Fourier Transform(DFT),properties of DFT, linear convolution using the DFT, two dimensional DFT

Unit - II
Flow Graph and Matrix Representation of Digital Filters :Signal flow graph representation of digital network, matrix representation, basic network structures for IIR and FIR systems, Telligen's theorem for digital filters and its applications.

Unit - III
Digital filter Design Techniques: Design of IIR and FIR digital filters, computer aided design of IIR and FIR filters, comparison of IIR and FIR digital filters.

Unit-IV
Computation of the Discrete Fourier Transform: Goertzel algorithm, FT algorithms, decimation in time and frequency ,FFFT algorithm for N a composite number, Chirp Z transform(CZT).

Unit-V
Discrete Random Signals: Discrete time random process ,averages spectrum representations of infinite energy signals, response of linear system to random signals.
Power Spectrum Estimation :Basic principles of spectrum estimation, estimates of the auto covariance, power spectrum, cross covariance and cross spectrum.

References Books:

1.A.V.Oppenheim and R. W. Schafer," Digital Signal Processing", Prentice Hall, 1975
2.L.R.Rabiner and B. Gold," Theory and Application of Digital Signal Processing", Prentice Hall 1989

Course Contents

Category of Course	Course Title	Course Code	Credits 06			Theory Paper(ES)
			L	T	P	Max.Marks-100
Electronics & Instrumentation Engineering	Medical Instrumentation	EI604	3	1	2	Min.Marks-35 Duration-3hrs.

Branch : Electronics & Instrumentation: VI-Semester
Course : EI604 Medical Instrumentation

Unit I

Introduction to the physiology of cardiac, nervous and muscular and respiratory systems. Neuromuscular interface Transducers and electrodes : Different types of transducers selection for Biomedical applications, Electrode theory, different types of electrodes Hydrogen Calomel, Ag~AgCl, pH, P02, PC02 electrodes, selection criteria of electrodes.

Unit II

Cardiovascular measurement The heart and other cardio vasuclar systems, Measurement of Blood Pressure, Blood flow, Cardiac output and Cardiac rate, Electrocardiography, Phonocardiography, Plethysomography, Magnet- Cardiography, Cardiac pace-maker, Defibrillator, Computer applications.

Unit III

Measurement of Electrical Activities in Muscles and Brain Electromyography, Electroencephalograph and their interpretation. Respiratory System Measurement Respiratory mechanism, Measurement of gas volume, flow rate carbon dioxide and oxygen concentration in inhaled air, respiratory controller.

Unit IV

Instrumentation for Clinical Laboratory : Measurement of pH value of blood, ESR measurements, Hemoglobin measurement, oxygen and carbon dioxide concentration in blood, GSR measurement, polar graphic measurements, Lasersur medicine.

Unit-V

Medical Imaging : Ultrasound imaging, Radiography, MRI, Electrical Tomography and applications. Biotelemetry. Transmission and Reception aspects of Biological signal via long distances. Aspect of Patient Care Monitoring. Electrical shock hazards and prevention.

Suggested Instructional Strategies

1. Instructional stress will be given on study of various systems of human body. Lectures on Transducers and Electrodes and lab work on study of various types and electrodes will be performed.

2. Class room input on various topics will be provided. Related assignments and tutorials will be given to the students. Lab work on Cardio-vascular measurements may be performed. Exposure of Electro-physiological signal analysis using computer may also be given as lab work.

3. Elaborated lectures and discussions maybe held on topics related to measurement of electrical activity of muscle and brain. Using computer signal analysis of EEG and EMG may be carried out as lab work. Periodic assignments and tutorials may be given.

4. Theory lectures will cover the topics of the unit. Periodic assignments and tutorials may be given.

5. Classroom input and discussions will be given for every topic of the unit. Periodic assignments and tutorials may be given

6. Apart from these, Seminar presentation and Minor project development work in related field will be done.

Suggested List of Experiments

1. To record and study ECG of a person.
2. To record and study EEG of a person.
3. To record and study EMG of a person.
4. To analyze ECG using a computer.
5. To analyze EEG & EMG using a computer.
6. To measure blood pressure of a person.
7. To measure various respiratory volumes and parameters of a person.

Suggested Reading Reference:

1. Biomedical Instrumentation – Pfiffer, Chromvell – PHI
2. Medical Instrumentation – Webster – Willey
3. Medical Instruments & Measurement – Carr – Asia Pearson
4. Handbook & Biomedical Instrumentation – Khandpur - TMH

Course Contents

Category of Course	Course Title	Course Code	Credit-4C			Theory Paper (ES)
Departmental Core	Control systems	EI605	L	T	P	Max.Marks-100
			3	1	0	Min.Marks-35
						Duration-3hrs.

Branch: Electronics and Instrumentation-V Semester
Course: EI605 Control systems

Unit I

Introduction to the Control Problem

Basic Control System Terminology viz. open loop & close loop system, Servomechanism, Feed forward & Feed back control, Digital Control, Multivariable Control System, Non-Linear Control System.

Modelling Techniques for Physical System

Differential Modelling of Physical Systems, Linear Approximations of Physical Systems, The Laplace Transform, The transfer function of linear system, Block Diagram algebra, Signal Flow graphs.

Control System Components & Their Mathematical Modeling

S.C. Servomotors, A.C. Servomotors, Pneumatic devices for control, Hydraulic Devices for control, Synchronous, A/D Converters.

Unit II

Feedback *Control System* Characteristics

Sensitivity of control systems to parameter variation, Control over the dynamics of the system, Disturbance signals in a feedback control system, Steady-state Error.

Time Response Studies

Difference of time response, Test input signals, model of prototype D.C. position control system, Time response of prototype second order system, Performance specifications of the prototype 2nd order system, Effects of additions of poles and zeros to open loop & close loop transfer functions, time response of higher order s, stems & concept of dominant pole, Steady-state error constants for type 0,1 & @ systems, Need for compensation for the prototype 2nd order system.

Unit III

Time Domain Stability Analysis

Concept of stability of linear systems, bounded input bounded output / zero-input stability, The routh stability criteria, Stability range for a parameter, Co-relation between the closed loop poles & stability, The Root-locus concept, Guidelines for sketching Root-locus, Elementary idea of reshaping the Root-locus, Root-locus of systems with Dead time, Root sensitivity.

Frequency Domain Analysis of Control System

Performance specification in frequency domain, Co-relation between frequency domain & time domain, Polar plots, Bode plots, Nicholas Charts, Determination of system transfer function from experimental data.

`Stability Analysis in Frequency Domain`

Development of Nyquist Criteria stability margins, Relative stability using Nyquist and boder plots, Systems with dead time.

`Design of feedback control systems`

Approaches to system design, Cascade compensation networks, Design of Compensators in Time & Frequency domain, Examples of proportional, PD & PID mode of control.

Unit IV

`State Variable Techniques`

State variable representation for an LTI system, Different Counouical forms, Co- relation between state models & Transfer function, Solution Of State Equations, Concepts of controllability & observability.

Unit V

Introduction to Software Packages Used in Control System

MATLAB, SIMULINK

Suggested Texts

1. Automatic Control System - B.C. Kuo (PHI)
2. Control System Engineering - Nagrath & Gopal (Newage Publishers)
3. Control Systems (Principles & Design) - M.Gopal (TataMcGraw Hill)
4. Modem Control System - Bishop & Dorf (Addison Welseley)
5. Automatic Control System – Kuo PHI