FUZZY CONTROL SYSTEM
(IC-401-E)

L	T	T			
4	**1**	**5**	**Theory**	**:**	**100 marks**
			Sessional	**:**	**50 marks**
			Time	:	3H

UNIT-1
INTRODUCTION :
Fuzzy control from an industrial perspective, knowledge- based controller, knowledge representation in KBC's

UNIT-2
THE MATHEMATICS OF FUZZY CONTROL:
Vagueness, fuzzy logic versus probability theory, fuzzy sets, their properties & operation on fuzzy sets, fuzzy relations & operations on fuzzy relations, the extension principle, fuzzy propositions, the compositional rule of Inference, Different implications, Representing a set of rules.

UNIT-3
FKBC DESIGN PARAMETERS:
The FKBC architecture, choice of variables and contents of rules, Derivation of rules, Choice of membership functions, choice of scaling factors, Choice of fuzzification procedure, Choice of defuzzification procedure, comparison and evaluation of defuzzification methods.

UNIT-4
ADAPTIVE FUZZY CONTROL:
Design and performance evaluation, Approaches to Design such as membership function tuning using gradient descent, Membership function tuning using performance criteria, the self organizing controller, Model based controller.

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NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit

BOOKS FOR REFERENCE :
1. Fuzzy control system by Abraham Kandel and Gideon Imngholz, Narosa.
2. Fuzzy Control system by D. Drainkov & M. Reienfrank.

INDUSTRIAL MEASUREMENTS
(IC-403-E)

L	T	T			
4	**1**	**5**	**Theory**	**:**	**100Marks**
			Sessional	**:**	**50 Marks**
			Time	:	3H

UNIT-1

INTRODUCTION: Generalized configuration and functional description of measuring Instruments. Generalized Performance Characteristics of Instruments.

MOTION MEASUREMENT: fundamental standards, relative displacement, translational and rotational relative velocity, translational and rotational, relative –acceleration Measurements Seismic –(absolute-) displacement pickups. Accelerometers.

UNIT-2

FORCE, TORQUE AND SHAFT POWER MEASUREMENT: Standards and Calibration, basic methods of force measurement, Characteristics of elastic force Transducers, Torque Measurement on rotating shafts, dynamometers.

PRESSURE AND SOUND MEASUREMENT: standards and Calibration, Basic Methods of Pressure measurement, Thermocouple Vacuum Gauges, Pirani Gauges Ionization Type Vacuum Gauges, elastic Transducers, High pressure Measurement. Low –pressure (vacuum) measurement, Sound measurement.

UNIT-3

FLOW MEASUREMENT: Local flow, velocity, magnitude and direction, Gross volume flow rate, Gross Mass flow rate, Turbine Meters Electro Magnetic flow Meters.

UNIT-4

TEMPERATURE MEASUREMENT: Standards and Calibration, thermal expansion Methods, thermo –electric Sensors, Electrical –resistance Sensors.

REFERENCE :

1. Ernest O. Doeblin, Measurement Systems, Application and Design, Mc Graw-Hill.
2. A.K. Sawhney, A course in electrical and electrical measurement and Instrumentation.

NOTE **:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

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DIGITAL SIGNAL PROCESSING
(IC-405-E)

L	T	T	
3	2	5	Theory: 100 marks Sessional: 50 marks Time : 3H

UNIT-1

Introduction of Signal Processing, Applications of signal processing in Speech and image processing, Transform domain representation of signals, Classification of discrete time signals. Digital processing of continuous time signals, Sampling process, Reconstruction Filter, Z-Transform & its properties, Pole Location & time behavior of casual signal

UNIT-2

Introduction of Fourier Transform, Discrete time Fourier Transform, Discrete Fourier Transform and its properties, Fast Fourier Transform and Radix- 2 FFT.

UNIT-3

Digital Filter: - FIR Digital Filter, IIR Digital Filter, Direct Form, Cascade Form, Lattice form realization, Digital sine cosine generators, and computational complexity.

DSP Based Algorithm: - Goetzel Algorithm and Chirp –Z Algorithm for Filter design, Radix-2

UNIT-4

Digital Filter Design: - Impulse Invariance, Bilinear-Z transformation (B Z T) Transformation method of IIR Filter Design, Spectral Transformation of IIR Filter, FIR Filter design using window method truncated Fourier series and frequency sampling approach.

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BOOKS FOR REFERENCES :

1) Digital Signal Processing by Sanjit K Mitra.
2) Digital Signal Processing by Proakis, Masnolakis.
3) Digital Signal Processing by Farooq Hussain.
4) Digital Signal Processing by Nair
5) Digital Signal Processing by Ifecher

DIGITAL IMAGE PROCESSING
(IC-419-E)

L	T	Total			
			Theory	**:**	**100 Marks**
4	**1**	**5**	**Sessional**	**:**	**50Marks**
			Time	:	3H

UNIT-1 Digital image fundamental: Elements of visual perception, sampling – uniform and non-uniform and Quantization. Basic relationships between pixels – neighbors of a pixel, connectivity, labeling of connected components, relations, equivalence and transitive closure, distance measures, Image Perception – MTF of Visual system, Visibility function image fidelity criteria, color representation, matching and reproduction. Imaging geometry – Basic transformation, camera model, stereo imaging. Photographic films – film structure and exposure, film characteristics, diaphragm and shutter settings. Image perception-MTF of visual system, visibility function, image fidelity criteria, color representation, matching & reproduction

UNIT-2 Image enhancement and restoration : Background, enhancement by point processing-simple intensity transformation, histogram processing, image subtraction and averaging, spatial filtering, enhancement in frequency domain, generation of spatial mask from frequency domain specification, color image processing-pseudo-color image processing, full-color image Processing.
Degradation Model for continuous functions, Inverse filtering - Removal of blur caused by uniform linear control least mean square (wiener) filter, constrained least square restoration. Van cittert filter, kalman filtering (Recursive) filtering for stali valuable system.

UNIT-3 Image Compression & Segmentation : Fundamentals –coding redundancy, intermixed redundancy Prycovisnal redundancy, fidelity aiteria image compression models – Source Encoder and decoder, channel encoder and decoder, Error compression –variable leigth coding, bit plane coding, loss less predictive coding, Lossy compression –Lossy predictive coding, Transform cosign, Compression –standards.

Direction of discontinuities - Point live, edge and combined detection edge linking and Boundary detention –Local Processing, Global processing via Hough Transform and caroph theoretic techniques. Optional thresholding, Global thresholding. Region oriented segmentation – region growing by pixel aggregation region splitting and merging.

UNIT-4 Recognition and Interpretation : Elements of Image analysis, patterns and pattera classes, Structural methods Matching slope Numbers string matching syntactic methods. Interpretation –Background, Types of Knowledge, Logical system Semantic Networks Production (Expend System.

Books Referred :

1 Digital Inage Processing by Rafael C. Caonzalez and Richard E. woods (Addison Wesley).
2 Fundamentals of Digital image processing by Anil.K.Jain (Pearson Education).

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit.

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ELECTROMAGNETIC THEORY
(IC- 421-E)

L	T	T			
4	**1**	**5**	**Theory**	**:**	**100 marks**
			Sessional	**:**	**50 marks**
			Time	:	3H

UNIT1 Electrostatics :
Review of vector analysis in all the three coordinate system line, surface & volume integrals, gradient, divergence & curl of a vector & their physical significance, Gauss Divergence theorem, Stokes theorem.
Gauss law in electrostatics & its applications, uniform line, surface & volume charge distributions, concepts of electric field & electric potentials, electric field & potential due to a linear dipole,method of images.

UNIT II Magnetic Fields and Maxwell's Equation :
Biot Savart's law, Amperes circuital law & its applications. Boundary conditions for both the electric & magnetic fields at the interface of various types of media. Laplace, Poisson's equation & continuity equation. Faraday's & Lenz's laws, Maxwell's equations in differential & integral forms & their physical significance, retarded potentials.

UNIT III Uniform Plane Waves :
Plane & uniform plane waves and their properties, orthogonality and transversality, UPW in equations in various media, Polarisation & its types. Intrinsic impedance, propagation constant. Relaxation time, skin effect, skin depth & surface impedance, Poynting vector theorem & its physical significance.

Shielding Theory :
Introduction, Shielding theory, and Shielding material, Types of Shielding: High frequency Shielding, Magnetic shielding, Total Shielding, and Effectiveness of Shielding.

UNIT IV Transmission Line and Wave guide :
Distributed parameters, circuit parameters, concepts of voltage & current flow on a transmission line, characteristic impedance. Reflection of transmission line, maxima & minima, standing wave ratio of a transmission line. Impedance matching, Smith's chart & its applications.
Brief Concept of Wave Guide and TE, TM and TEM modes. Cut off and guide wave length, characteristic impedance.
NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit

<u>BOOKS FOR REFERENCE: -</u>

1. Field and Wave Electromagnetics by D.K. Cheng (Pearson Education).
2. Electromagnetic field and waves by SADIKU (Oxford University Press).
3. Electromagnetic waves and radiating system by Jordan and B. Almain, PHI Ed.
4. Shaum outline series in ELECTROMAGNETICS BY Edminister.

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ESTIMATION THEORY AND STOCHASTIC CONTROL
(IC-423-E)

L	T	T			
4	**1**	**5**	Theory	:	100 Marks
			Sessional	:	50 Marks
			Time	:	3H

UNIT 1 – REVIEW : Linear System, Axioms of probability, conditional probability, Combined experiments, Bernoulli trials, Asymptotic Theorem, Baye's theorem. Distribution & Density functions, conditional distributions.

UNIT 2 – RANDOM VARIABLES AND PROCESSES : Mean and Variance, moments, characteristics. Characterization of random variables and random processes, concept of stationarity and ergodicity spectral density, White Noice, Markov and Weiner processes.

UNIT 3 – ESTIMATION THEORY : State and parameter estimation, estimation for stationary systems, sequential estimation, linear and non-linear system static estimation.

UNIT 4 – STOCHASTIC PROCESS AND CONTROL : Stochastic Process Models, Stochastic Optimal Control, Problem formulation, optimality principle. Basic solution techniques.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit

BOOKS FOR REFERENCE :

1. System Identification by Ljung & Lennart
2. Random Processes by W.D. Mix
3. Probability, random variables & Stochastic processes by Athanasios Papoulis, Mc Graw-Hill.

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DATA NETWORKING SYSTEM
(IC-427-E)

L	T	T			
4	1	5	Theory	:	100 Marks
			Sessional	:	50 Marks
			Time	:	3H

UNIT -1

Data Transmission

Overview of Data Communication and networking, Analog And Digital Data Transmission, Transmission Impairments, Various Transmission Media, Data Encoding.

Digital Data Communication Techniques

Asynchronous and Synchronous Transmission, Error Detection and correction techniques, Physical interfaces

UNIT-2

Data Link Control

Link Configurations, Protocol principles (Error control, Flow control), Bit Oriented and character oriented protocol, Data link layer services, Link Control.

UNIT-3

Switching and Computer Networks

Communication Networks, Circuit Switching, Message Switching, Packet Switching, X.25, Virtual circuits and Data gram's, LAN/MAN Technologies, Medium Access control protocols (CSMA/CD, Token ring, FDDI, DQDB)

UNIT-4

Computer Communication Architecture

OSI and TCP/IP Model, Protocol And Architecture, Inter Networking, IP addressing, structure of IP, IPv4, IPv6

ATM Networks

Concepts, history, Architecture, Convergence and challenges

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit**.**

Books Recommended:

1. Data and Computer Communication - by William Stallings, Prentice Hall, 4th Ed.
2. Computer Networking - by Andrew Tanenbaum.
3. Data communications and networking - by Forouzan

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ADVANCED COMMUNICATION SYSTEMS
(IC-425-E)

L	T	T			
4	1	5	Theory	:	100 Marks
			Sessional	:	50 Marks
			Time	:	3H

UNIT-1
Introduction
Introduction to communications systems, analog and digital communication systems, Applications of communication systems.

UNIT-2
Digital Communication
Introduction, Digital Modulation techniques, BPSK, QPSK, PCM, DPCM, Delta Modulation, Digital Transmission and Transmission Impairments.

UNIT-3
Satellite Communication
Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design Of Satellite Link For Specified (C/N). Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT

UNIT-4
Mobile Communications Mobile telephone service, Transmission protocols, Introduction to GSM, GPRS, CDMA, Switching techniques, Fading, Quality of service (QOS).

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit

Books Recommended : Advanced Communication Systems - by Wayne Tomasi; Pearson**.**

1. Digital Communication - by Proakis; PHI
2. Optical Networks - by Uyless Black; Pearson
3. Satellite Communication - by Timothy Pratt; Addison Wesley.
4. Related IEEE/IEE publications

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OPTIMAL CONTROL SYSTEMS
(IC- 429-E)

L	T	Total			
4	1	5	**Theory**	**:**	**100 Marks**
			Sessional	**:**	**50 Marks**
			Time	:	3H

UNIT-1

Introduction: - Introduction to optimal control problem controllability and Observability, concept of Parameter optimization, Lagrange multiplier method for adjoining constraints, general optimal problem different performance criteria.

UNIT-2

Variational Approach: - Definition of functional, euler lagrange equation for scalar case, generalization to vector case, lagrange Multiplier method, fixed and fee end problems, Transversality conditions, Formulation of problem in Lagrange, Myers and Balza forms, Simple examples.

UNIT-3

Pontrayagin's Maximal (Minimal) Principle: - Statement of maximal Principle, Application to optimization, problems with magnitude constraints on control simple examples.

UNIT-4

Dynamic Programming: - Multistage decision processes, Principal of optimality, Discrete Dynamic Programming, Bellman's equations, Quadratic Performance index, Linear Regulator and Servomechanism Problems, Matrix Riccati solutions and its implementation.

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Books Recommended :

1. Optimal System Control (Sage)
2. Control System Design - An introduction to state Space method- Fried land

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B.TECH 7th SEMESTER, INSTRUMENTATION AND CONTROL

Computer Application Laboratory

B. Tech 7th Semester **Computer Application Practical** **(IC-411 E)**

List of experiments

At least Ten experiments based on Simulator to perform Application in Instrumentation.

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