EIC-801

Transducers and Sensors

UNIT 1:

Functional elements of an instrument; active &passive transducers ;analog & digital modes of operation; null & deflection methods; I/O configuration of measuring instruments &instrument system-methods of correction for interfering &modifying inputs. Generalized performance characteristics of Instruments: Static characteristics and static calibration-Meaning of static calibration, measured value versus true value, Some basic statistics least square calibration curves, calibration accuracy versus installed accuracy.

UNIT 2:

Motion and Dimensional measurement: Fundamental standards ,relative displacements-translational and rotational, Calibration, Resistive potentiometers, differential transformers, variable inductance &variable reluctance pickups, capacitance pickup, Digital displacement transducers, Mechanical fly ball angular velocity sensor, Mechanical revolution counters .

UNIT 3:

Force, Torque, Shaft power: Standards & calibration; basic methods of force measurement; characteristics of elastic force transducer -Bonded strain gauge, differential transformer, Piezoelectric transducer, variable reluctance/FM-oscillator, digital systems.

UNIT 4:

Flow measurement: Local flow velocity, magnitude and direction. Flow Visualization.Velocity magnitude from pilot static tube. Velocity   direction from yaw tube, dynamic wind vector indicator. Hot-film shock-tube velocity sensor. Laser Doppler anemo-meter; gross volume flow rate: calibration and standards .Constant-area, variable-pressure-drop meters (obstruction meters).Averaging pilot tubes..

UNIT 5:

Temperature measurement: Standards & calibration; thermal expansion methods-bimetallic thermometers, liquid-in-glass thermometers, pressure thermometers; RTD, thermistor and thermocouple (comparative study); digital thermometers. Radiation Methods - radiation fundamentals, radiation detectors: thermal and photon, monochromatic brightness radiation thermometers, two color radiation thermometers, black body tipped fiber optic radiation thermometer, Fluor optic temperature measurement, infrared imaging systems.

Text Book:

1. 1. E. O. Doebelin and D.N. Manik,"Measurement systems application and design‖, Tata McGraw Hill Publication.

Reference Book:

1. Arun K Ghosh, "Introduction to Transducers", PHI Publication.

2. Bela G. Liptak, "Process Measurement and Sensors.

List of Experiments:

1. Characteristics of resistance transducer

(i) Potentiometer

(ii) Strain Gauge

2. Characteristics of LVDT.

3. Characteristics of capacitive transducer

(i) Variable area

(ii) Variable distance.

4. Characteristics of Thermistors

5. Characteristics of RTD.

6. Characteristics of Thermocouples

7. Characteristics of LDR, Photo Diode, and Phototransistor:

(i) Variable Illumination.

(ii) Linear Displacement.

8. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.

9. Measurement of Capacitance by De'Sautys and Schering Bridge.

10. Measure of low resistance by Kelvin's double bridge.

11. Characteristics of diaphragm type pressure transd

EIC-802

Opto Electronics

UNIT 1:

ELEMENTS OF LIGHT AND SOLID STATE PHYSICS: Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT 2:

DISPLAY DEVICES AND LASERS: Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

UNIT 3:

OPTICAL DETECTION DEVICES :Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT 4:

OPTOELECTRONIC MODULATOR: Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT 5:

OPTOELECTRONIC INTEGRATED CIRCUITS :Introduction, hybrid and Monolithic Integration, Application of Opto Electronic .

TEXTBOOKS:

1. Pallab Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt.,

Ltd., New Delhi, 2006. 2. Jasprit Singh, "Opto Electronics – As Introduction to Materials and Devices", Mc Graw-Hill International Edition, 1998

REFERENCES:

1. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India, 2005.

2. J. Wilson and J.Haukes, "Opto Electronic An Introduction", Prentice Hall, 1995

List of Experiments:

1) To understand the basics of solid state physics.

2) To understand the basics of display devices.

3) To understand the optical detection devices.

4) To understand the design of optoelectronic integrated circuit

5) To design display devices.

6) To design optoelectronic detection devices and modulators.

7) To design optoelectronic integrated circuits.

EIC-803(A)

Nuclear Science

UNIT 1:

Nucleus and Its Basic Features: Nuclear structure; nuclear forces and their properties, nuclear stability, nuclear radius and its measurement, nuclear spin, nuclear magnetic and electrical moments.

UNIT-2:

Nuclear Models: Single particle model, liquid drop model and semi-empirical mass formula, nuclear potential and shell model, collective model.

UNIT-3:

Nuclear Reaction: Nuclear reaction and laws of conservation, types of nuclear reaction, mechanism of nuclear reaction, nuclear fission & binuclear fusion and their explanation by liquid drop model.

UNIT-4:

Nuclear Decay: Decay constant, half-life period and mean life, alpha decay, beta decay, gamma decay, interactionof nuclear radiation with matter.

Nuclear Instruments-I Mass spectrograph,: General principle, Aston's Mass Spectrograph.

UNIT-5:

Nuclear Instruments-II Accelerators: Van de Graph Generator, Cyclotron,Synchrotron.Detectors: G M Counter, Scintillation counter, cloud chamber, Bubble Chamber, production and detection of neutrons and Gamma-photon. Application of Nuclear Techniques: Nuclear magnetic resonance, positron emission topography, radiotracer techniques and applications in material science and agriculture.

Text Books:

1. Tayal, "Nuclear Physics" Himalaya Publishing House.

2. S.N. Ghosal, "Nuclear Physics" S. Chand & Co.

3. S. B. Patel, "Nuclear Physics: An Introduction New Age International.

4. H. B. Lal, "Introuctory Nucler Physics" United Book Depot.

5. Wang, "Introductory Nuclear Physics", PHI Learning

EIC-803(B)

Process Plant Design and Safety Management

UNIT 1:

Introduction: Basic concepts: General design considerations, Process design development, Layout of plant items, Flow sheets and PI diagrams, Economic aspects and Optimum design, Practical considerations in design and engineering ethics, Degrees of freedom analysis in interconnected systems, Network analysis, PERT/CPM,

UNIT 2:

 Direct and Indirect costs, Optimum scheduling and crashing of activities. Flow-sheeting: Synthesis of flow sheet: Propositional logic and semantic equations, Deduction theorem Algorithmic flow sheet generation using P-graph theory, Sequencing of operating units, Feasibility and optimization of flow sheet using various algorithms viz, Solution Structure Generation (SSG), Maximal Structure Generation (MSG), Simplex, Branch-and-bound etc.

UNIT 3:

Methods of calculating depreciation, Profitability, Alternative   investments and replacements.Optimum Design and Design Strategy: Break-even analysis, Optimum production rates in plant operation, Optimum batch cycle time applied to evaporator and filter press, Economic pipe diameter, Optimum insulation thickness,

UNIT 4:

Optimum cooling water flow rate and optimum distillation reflux ratio. Management of safety in Industry Safety Management - Concept of Safety, Applicable areas, unsafe actions &Conditions. Responsibility of Safety - Society, Govt Management.

UNIT 5:

Union & employees. Safety Officer - Appointment, Qualification, Duties of safety officer. Safety Committee - Membership, Functions & Scope of Safety committee. Motivation & Training of employees for safety in Industrial operations. Management - Designing, Importance & implementation of Disaster Control Action Plan

Text Books:

1. Peters, M.A. and Timmerhaus, K.D., Plant Design and Economics for Chemical Engineers, McGraw Hill(2003).

2. Anil Kumar, Chemical Process Synthesis and Engineering Design, Tata McGraw Hill (1982).

Reference Books:

1. Ulrich, G.D., A Guide to Chemical Engineering Process Design and Economics, John Wiley & Sons

(1984).

2. Perry, R.H. and Green, D., Chemical Engineer's Handbook, McGraw-Hill (1997)

EIC-803 (C)

Telemetry and Data Transmission

UNIT 1:

Sampling Fundamentals :Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate , Aliasing errors, Digital Modulation Techniques: review of PCM and DPCM , methods of binary data transmission, Data formats , DM code converters, PSK, QPSK , FSK, probability of error- phase ambiguity resolution and differential encoding , error detection, error correction and error correction codes. Data handling System:

UNIT 2:

Block schematic, sensors, signal conditioning, multiplexing- high level and low level , ADC-range and resolution ,Word format, frame format , frame synchronizer code , R.F. links, X24, RS422, RS423, RS232c interfaces, multi terminal configuration, multipliers and concentrator , Data modems , data transmission over telephone lines.

UNIT-3

Data reception Systems :Bit synchronizers , frame synchronizers and sub frame synchronizers , PLL and Display systems.

UNIT-4

Remote Control : Communication based processing control system, pipelines, operational security systems components, pipeline control, power system control, programmable controllers for factory automation. Command, Tone command system, Tone digital command system, ON/OFF command and data commands.

UNIT-5

Aerospace Telemetry: Signal formation and conversion multiplexing techniques in tele-control, Industrial Tele-control installations, reliability in tele control installations.

Text Books:

1. Patranabis," Telemetry Principles: Tata Mcgraw Hill.

2. Schweber," Data Communication " Mcgraw Hill.

3. Berder&Menjewlse," Telemetry Systems".

EIC-804(A)

Automation and Robotics

UNIT 1:

AUTOMATION:

Definition, advantages, goals, types, need, laws and principles of Automation. Elements of automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

UNIT 2:

Manufacturing Automation:Classification and type of automatic transfer machines; Automation in part handling and feeding,Analysis of automated flow lines, design of single model, multimodel and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

UNIT 3:

ROBOTICS

Definition, Classification of Robots - Geometric classification and Control classification, Laws

of Robotics, Robot Components, Coordinate Systems, Power Source.Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

UNIT 4:

ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

Robot drive mechanisms: Hydraulic / Electric / Pneumatics, servo & stepper motor drives,

Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings.

UNIT 5:

ROBOT END EFFECTORS

Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for grippers Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design

Books and References:

1. An Introduction to Robot Technology, by CoifetChirroza, Kogan Page.

2. Robotics for Engineers, by Y. Koren, McGraw Hill.

3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.

4. Introduction to Industrial Robotics, by Nagrajan, Pearson India

5. Robotics , by J.J. Craig, Addison-Wesley.

6. Industrial Robots , by Groover, McGraw Hill.

7. Robots & Manufacturing Automation, by Asfahl, Wiley

8. Fundamentals of Robotics: Analysis and Control, by Schilling, Pearson India

9. Automation & Robotics, byGhoshal, Oxford University Press.

10. Introduction to AI Robotics, by Murphy, PHI, India.

EIC-804(B)

Advanced Control System

UNIT 1:

State Space Analysis of Continuous System:State space analysis, Solution of state equation, determination of state-transition matrix, using Laplace method, Similarity transformation method and Caley-Hamilton Method.

UNIT 2:

Analysis of Discrete System:Concept of state feedback design, Determination of controllability Matrix and test of controllability, State feedback controller design via pole placement method, Concept of state observer design, Determination of the observability matrix and test of observability condition, Design of the full state observer using pole placement.

UNIT 3:

Nonlinear systems:Nonlinear System Modeling Analysis of Nonlinear system (Inverted Pendulum)via Linearization, Describing function analysis of nonlinear system, Stability Analysis of Nonlinear system using Describing function Analysis.

UNIT 4:

Phase Plan Analysis: Construction of Phase portrait using Isoclines approach, Singular points, Phase plane analysis of 2nd order linear system, Phase plane analysis of nonlinear control system.

UNIT 5:

Liapunov Stability Analysis:Concept of stability in the sense of Liapunov. Linear system analysis using Liapunov approach,Determination of Liapunov functions using variable gradient method, Stability analysis of nonlinear systems.

Text Books:

1. M. Gopal, "Digital Control and State variable Methods", Tata Mc Graw Hill.

2. Ajit K. Madal, "Introduction to Control Engineering: Modelling, Analysis and Design" New Age.

Reference Books:

1. B.C. Kuo, "Digital Control Systems" Sounders College Publishing

EIC-804(C)

Non -Conventional Energy Sources

UNIT 1:

Introduction : Various non-conventional energy resources- Introduction, availability,

Classification , relative merits and demerits .Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT 2:

Solar Thermal Energy: Solar radiation, flat plate collectors and their materials,

applications and performance, focussing of collectors and their materials, applications and

performance; solar thermal power plants, thermal energy storage for solar heating and cooling,

limitations.

UNIT 3:

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal

energy conversion-electrical conversion, non-electrical conversion, environmental considerations.Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT 4:

Thermo-electrical and thermionic Conversions Principle of working, performance and limitations.Wind Energy: Wind power and its sources, site selection, criterion, momentum theory,classification of rotors, concentrations and augments, wind characteristics. performance andlimitations of energy conversion systems.

UNIT 5:

Bio-mass :Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle ,performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.

Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.

2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.

3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.

4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.

5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

7. Godfrey Boyle," Renewable Energy Power For A Sustainable Future", Oxford University

EIC-805 (A)

Quality Management

UNIT 1:

Quality Concept :Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design ,Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT 2:

Quality Management :Organization structure and design, quality function, decentralization, designing and fitting ,organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Human Factor in quality attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT 3:

Control Charts: Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart Defects, construction and analysis of charts, improvement by control chart, variable sample size, Construction and analysis of C charts.

UNIT 4:

Defects diagnosis and prevention defect study, identification and analysis of defects, correctingmeasure, factors affecting reliability, MTTF, calculation of reliability, building reliability in theproduct, evaluation of reliability, interpretation of test results, reliability control,maintainability,

UNIT 5:

ISO-9000 and its concept of Quality Management ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.

2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.

3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

EIC-805(B)

Operation Research

UNIT 1:

Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study. Linear Programming :Two variable Linear Programming model and Graphical method of solution, Simplex method ,Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT2:

Transportation Problems :Types of transportation problems, mathematical models , transportation algorithms, Allocation and assignment problems and models, processing of job through machines.

UNIT 3:

Network Techniques :Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.Project Management: Phases of project management, guidelines for network construction, CPM and PERT.

UNIT 4:

Theory of Games :Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queuing model, single server models.

UNIT 5:

Inventory Control:Models of inventory, operation of inventory system, quantity discount.

Replacement:Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Text / Reference Books:

1. Wayne L. Winston, "Operations Research" Thomson Learning,2003.

2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.

3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.

4. V.K.Khanna, "Total Quality Management" New Age International, 2008

EIC-805 (C)

Mobile Application Development

UNIT 1:

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications Requirements gathering and validation for mobile applications.

UNIT 2:

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS – Design Constraints for mobile applications, both hardware and software related – Architecting mobile Applications – User interfaces for mobile applications – touch events and gestures – Achieving Quality constraints performance, usability, security, availability and modifiability.

UNIT 3:

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities. Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT 4:

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT 5:

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation Touchframeworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application –Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012

2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply

3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012

4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development