Effective from the session – 2009-10

[List of Open Elective of 7th Semester for B.Tech. Civil/Electrical/Electrical and Electronics/ Mechanical & Allied Courses/ Electronics and Communications & Allied Courses/ Instrumentation and Control & Allied Courses/Computer Science and Engineering & Allied Courses/ Information Technology & Allied Courses/ Biotechnology]

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Note: The students will choose any one subject of the course of other than their Engineering Branch.
TOE-01 NON-CONVENTIONAL ENERGY RESOURCES

Unit I: Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Unit II: Solar Cells
Theory of solar cells. Solar cell materials, solar cell power plant, limitations.

Solar Thermal Energy
Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

Unit III: 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.

Unit IV: Fuel Cells
Principle of working of various types of fuel cells and their working, performance and limitations.

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 and limitations of energy conversion systems.

Unit V: 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

Books Recommended:
1. Andra Gabdel, "A Handbook for Engineers and Economists".
2. A. Mani, "Handbook of Solar radiation Data for India".
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".
7. N.G. Calvert, "Wind Power Principles".
TOE – 02 RELIABILITY ENGINEERING

Unit I: Introduction
Definition of reliability, types of failures, definition and factors influencing, system effectiveness, various parameters of system effectiveness.

Unit II: Reliability Mathematics
Definition of probability, laws of probability, conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis procedures, empirical reliability calculations.

Unit III: Reliability
Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

Unit IV: Reliability Improvements
Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance.

Unit V: Reliability Testing
Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Books Recommended:

TOE-03 ENVIRONMENT AND ECOLOGY

Unit I: Environment
Environment and its components, pollution of environment by human activity, kinds of pollution.

Unit II: Water Quality
Measure of water quality, water quality standards, water treatment; waste water transport and treatment, sludge treatment and disposal.

Air Quality
Sources and effects of air pollution, major air pollutants, air quality control, treatment of emissions, dispersion of air pollutants.

Unit III: Solid waste
Collection of refuse, removal and transport, disposal of refuse.

Noise Pollution
Effect of noise on human health and its control.

Unit IV: Ecology
Ecology and Ecosystems, concept of ecological imbalances, physical and climate factors, biotic components, energy and material flows in ecosystems, human influence on ecosystems.

Unit V: Conservation of Natural Resources
water resources, mineral resources, agricultural and forestry resources, agriculture soil and need of nutrients, fertilizers and pesticides. Brief introduction about environmental legislation and environmental audit.

Books Recommended:

TOE-04 GEOGRAPHIC INFORMATION SYSTEMS (GIS) TECHNOLOGY AND ITS APPLICATIONS:

Unit I
Definition of GIS, Cartography and GIS, GIS database: spatial and attribute data; Spatial models: Semantics, spatial information, temporal information, conceptual models of spatial information, representation of geographic information: point, line and area futures, topology,

Unit II
Raster and vector data, raster to vector data conversion, map projection, analytical transformation, rubber sheet transformation, manual digitizing and semi-automatic line following digitizer; Remote sensing data as an input to GIS data;

Unit III
Attribute database: scale and source of inaccuracy; GIS functionality; data storage and data retrieval through query, generalization, classification, containment search within a spatial region;

Unit IV
Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility, aggregation; Network analysis;

Unit V
Applications of GIS in planning and management of utility lines and in the filed of environmental engineering, geotechnical engineering, transportation engineering and water resources engineering.

Books Recommended:

TOE-05 ENTREPRENEURSHIP DEVELOPMENT PROGRAMME

Unit I: Entrepreneur
definition. Growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control type. Government policy for small scale industry; stages in starting a small scale industry.

Unit II: Project identification
assessment of viability, formulation, Evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

Unit III: Accountancy
Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control. Quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

Unit IV: Project Planning and control
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations, control of financial flows, control and communication.
Unit V: Laws concerning entrepreneur
partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Books Recommended:

TOE-06 ANCIENT INDIAN CULTURE

Unit I: Main features of Indian Culture
(a) The orient list view (b) The nationalist view
(c) The Marxist view (d) Analysis and formulations
Principal Components – historical and archeo-ethnic perspective
(a) Indian Civilization (b) Vedic culture
(c) Tribal and folk culture (d) Foreign elements

Unit II: Impact of integrating, disintegrating and proliferating forces of History.
(a) Eras of political unification (b) Foreign invasions
(c) Regional conflicts (d) Religious movements
(e) Trade and Dissemination

Unit III: Ideas and Institution
a. Political b. Social
b. Economic d. Religious

Unit IV: Achievements in Arts, Science and Technology
(a) Literature (b) Art and Architecture
(c) Music and Dance (d) Astronomy and Mathematics
(e) Medicine

Unit V: Values and disvalues
a. Humanism and spiritualism b. Ahinsa
c. Altruism d. Caste
e. Unsociability f. Religious suicide and superstition
g. Degradation of women and prostitution.

Books Recommended:
3. Coomarswami, dance of Siva
4. Thapar Ramila, Ancient Indian Social History
6. Kossambi, Introduction to Indian History.
8. Altekar, A.S., Position of Women in Hindu Civilization
9. Prakash, Om, conceptualization and History.
10. Bartam, A.I., Wonder that was India.
Unit I: Introduction
1. Nature of value crisis in the contemporary Indian society and the larger human community.
2. Meaning and nature of values; holistic view of life and its value.

Material and Societal value
1. Role of material values in promoting human well being.
2. Role of Science and technology; problems of material development.
3. Socio-political ideologies for promoting material wellbeing
4. Conceptualizing ‘good’ society and ‘social goods’
5. Justice as a societal value.
6. Democracy and rule of law.
8. Gandhian concepts of good society; gram swaraj, sarvodaya, antyodaya

Unit II: Psychological and Aesthetic Values
1. Humanistic psychology; meaning of ‘personhood’
2. Maslow’s hierarchy of human need; characteristics of ‘self-actualizing’ persons.
3. Mental health
4. Psycho-spiritual Indian concepts.
5. Areas and nature of aesthetic experiences.

Unit III: Ethical and Spiritual Values
1. Bases for moral judgments : customary morality, religious morality, reflective morality.
2. Some principles of ethics; ethical canons and their significance in modern life.
3. Virtue ethics; personal virtues for the modern times.
4. Ethics of duty and ethics of responsibility.
5. Factors to be considered in making ethical judgments: motives, means and consequences.
6. Spirituality and spiritual values : spiritual wisdom of the Upanishads; Buddha’s view.
7. Science, materialism and spirituality.
8. Spirituality in the modern times.

Unit IV: Human Values
1. Different meaning of human values: foundational human values – freedom, creativity, love and wisdom.
2. Nature of Human freedom; individual freedom, intellectual freedom, freedom of will, spiritual freedom.
3. Creativity: its meaning and nature; different kinds of creativity.
5. Creative personality, creative environment.
6. Love as a foundational human value; different kinds of love.
7. Human wisdom; characteristics of a wise person.

Unit V: Work Ethics and Professional Ethics
1. Different attitudes to work.
2. Demands of work-ethics, ethics at work place.
3. ‘Good’ organization and its values.
4. What is a profession?
5. Professional ethos and code of professional ethics.
7. Problems in practicing the code.
8. Case studies.
Books Recommended:
1. Human Values By : Prof. A.N. Tripathi New Age International.
2. 7 Habits of Highly By : Dr. Stephen R. Covey Effective People Harper Publications.

TOE-08 QUALITY SYSTEM & MANAGEMENT

Introduction
Definition, need of quality systems, role of quality standards, stages of quality assurance systems. quality charts, control charts for variables and attributes, acceptance sampling.

Quality Systems
Overall responsibility for progress of quality systems. quality manuals, procedures and role of auditing, auditing for conformance versus quality for effectiveness, auditing a tool for quality improvement. ISO 9000 quality systems, British Standards BS5750/ISO 9000 origin of standards, requirements, issues associated with implementation.

Registration
registration and accreditation in quality system-certification, approval, registration of leading accessors.

Recommended Books:
1. Mohamed Isiri, " Total Quality Management for Engineers".

TOE – 09 CONDITION MONITORING & DIAGNOSTICS

Unit I
Productivity, Quality circle in Maintenance, Reliability, Reliability assurance, Maintainability vs. Reliability. Failure analysis, Equipment downtime analysis, breakdown analysis.

Unit II
Maintenance type, Breakdown maintenance, Corrective maintenance, Opportunity maintenance, Routine maintenance, Preventive and predictive maintenance, Condition based maintenance systems, Design-out maintenance.

Unit III

Unit IV

Unit V
TOE – 10 VALUE ENGINEERING

Unit I: An Overview
Definition, value engineering recommendations, programmes, advantages. Approach of function
Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth,
determining worth, evaluation of value.

Unit II: VE Job Plan
Introduction, orientation, information phase, speculation phase, analysis phase. Selection of Evaluation of
VE Projects
Projects selection, Methods selection, value standards, application of VE methodology.

Unit III: Versatility of VE
VE operation in maintenance and repair activities, value engineering in non hardware projects.
Initiating A VE Programme
Introduction, training plan, career development for VE specialties.

Unit IV: Fast Diagramming
Cost models, life cycle costs

Unit V: VE level of Effort
VE team, Co-coordinator, designer, different services, definitions, construction management contracts,
value engineering case studies.

Recommended Books:
TOE-11 NANOTECHNOLOGY

Unit I: Introduction to Physics of Solid State
Structure: Size dependence of properties; crystal structures, face centered cubic nano particles; Tetrahedral bounded semiconductor structures; lattice vibrations.
Energy bounds: Insulators, semiconductor and conductors; Reciprocal space; Energy bounds and gaps of semiconductors; effective masses; Fermi Surfaces.
Localized Particles: Acceptors and deep traps; mobility; Eacitons.

Unit II: Methods of Measuring Properties
Structure: Atomic Structures; Crystallography; Particle size determination, surface structure.
Microscopy: Transmission electron Microscopy; field ion microscopy Scanning Microscopy.
Spectroscopy: Infrared and Raman Spectroscopy; Photoemission and X-ray Spectroscopy; Magnetic resonance, optical and vibrational Spectroscopy, Luminescence.

Unit III: Properties of Individual Nano particles
Metal Nano clusters: Magic Numbers; Theoretical Modelling of nano particles, Geometric Structure; Electronic Structure; Reactivity; Fluctuations Magnetic Clusters; Bulle to Nano structure.
Semi conducting Nanoparticles: Optical Properties; Photofragmentation; Columbic Explosion.
Rare Gas & Molecular Clusters: Inert Gas Clusters; Superfluid Clusters molecular clusters.
Method of Synthesis: RF Plasma; Chemical methods; thermolysis; pulsed laser methods.

Unit IV: Carbon Nanoparticles
Carbon Clusters: Small carbon clusters; Discovery of 60 c ; Structures of 60 c , Alkali doped 60 c ; superconductivity in 60 c ; Large and smaller fullerenes; other buckyballs.
Carbon Nano tubes: Fabrication; structure, Electrical Properties; Vibrational properties, Mechanical Properties. Field emission & Shielding; Computers; Fuel cells, chemicals sensors; catalysis, Mechanical reinforcement.
Balle Nanostructure materials:
Solid Disordered Nanostructure, Nano structured Crystals, Nano structured Ferromagnetism Basics of Ferromagnetism; Effect of structuring of Magnetic properties, Dynamics of Nanomagnets; Nanopore containment of magnetic particles, Nanocarbon Ferromagnets, Giant & colossal magnetoresistance; Ferrofluids.

Unit V: Quantum Wells, Wires and Dots
Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared detectors; Quantum dot laser Superconductivity.
Nano-machines & Nano-device, Microelectromechanical systems (MEMS) Nanoelectromechanical systems (NEMS), Fabrication, Nanodevices and Nanomachines. Molecular & Supermolecular switches Applications areas of Nanotechnology in Engineering.

Recommended Books
1. Introduction to Nanotechnology – C.P.Poole Jr F.J. Owens
2. Introduction to S.S. Physics - (7th Edn.) Wiley 1996.
**TOE 12 SOLAR ENERGY**

**Unit I:**

**Unit II:**
Liquid flat-Plate Collectors: General performance analysis, Transmissivity, absorptivity, product and overall loss coefficient and heat transfer correlations, Collector efficiency factor, Numerical, Analysis of collectors similar to the conventional collector. Testing procedures, Alternatives to the conventional collector, Numerical.

**Unit III:**
Solar Air Heaters: Performance analysis of a conventional air heater, Other types of air heaters. Concentrating Collectors: Flat plate collectors with plane reflectors, Cylindrical parabolic collector, Compound parabolic dish collector, Central receiver collector, Numerical.

**Unit IV:**

**Unit V:**

**Recommended Books**
TOE-13 HUMAN RESOURCE MANAGEMENT

Unit I
Scope and Importance of Human Resource management, Historical background of Evolution of HRM and HRD in 20th century, Outlining the contemporary role for HRM in organization. Goals of HRM. (Why behavioural approach?)

Unit II
Manpower as a resource in job related behaviour and individual motivation in a work setting. Various theories of human motivation, Maslow’s hierarchy of needs. Needs for achievement, power and affiliation, other theories, group motivation and conflicts.

Unit III
Manpower planning and recruitment, Testing procedures and their limitations. Reservations in jobs, pre induction training.

Unit IV
Wage and salary administration-pay roll and compensation. Job analysis and job specification, other pay plans, employment contracts, special compensation plans for example personnel, effect of Financial rewards on individual's performance. Goal setting and performance evaluation, promotion policy, employee satisfaction, turnover.

Unit V
Assessment of training needs, forces promoting investment in HRD, Human resource development through individual and group efforts. Training analyses and training methods guidelines for individual development, job enlargement and job enrichment, job rotation, special assignment, Sponsored courses cost benefit exercise. Importance of unions, industrial petitions and conflict analysis and resolution . Relevant labour laws.

TOE-14 ADVANCED MATERIAL SCIENCE

Unit I: Introduction

Unit II: Fatigue & Creep: Fatigue loading, Mechanisms of fatigue, fatigue curve, Fatigue tests. Design criteria in fatigue, Corrosion fatigue.

Unit III: Corrosion and its prevention
Mechanism of corrosion, Chemical Corrosion, Electro chemical corrosion, Anodic and Cathodic protection, Forms of metallic coatings. Anodizing, Phosphasting.

Unit IV: Selection of materials for hazardous/saline environment
Selection of materials of saline/hazardous environment - Boilers, Steam and Gas turbine and Diesel engine components, Pumping, Machinery, Piping, Engine seating, Propellers and Rudders, Composition strength value and other requirements for materials used. Material standards.

Unit V: Electrical and Electronics materials
Science and engineering of electrical and electronics materials such as semiconductor, super conductor, its devices and applications.
TOE-15 INDUSTRIAL INSTRUMENTATION

Unit I
Basic Measurement principles & Source of Errors, Units of pressure and vacuum, different type of manometer, diaphragm gauges, bellows and force balance type sensors, bourdon gauge, and piezoelectric, capacitive and inductive pressure pickups. Vacuum pressure measurements: McLeod gauge, pirani gauge, thermocouple gauge, Knudsen gauge ionization calibration procedures,

Unit II

Unit III

Unit IV

Unit V

Text Books:
2. S.K Singh,/ Industrial instrumentation and control/TMH 2nd edition
3. Eckman/Industrial Instrumentation / Wiley Eastern Ltd.

Reference Books:
TOE-16 BIOMEDICAL ENGINEERING

Unit I: Introduction:
Specifications of bio-medical instrumentation system, Man- Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body.


Unit II: Cardiovascular Measurements:

5. Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment.

Unit III: Respiratory system Measurements:

Unit IV: Ophthalmology Instruments:
Electroretinogram, Electro-oculogram, Ophthalmoscope, Tonometer for eye pressure measurement. Diagnostic techniques: Ultrasonic diagnosis, Eco-cardiography, Ecoencephalography, Ophthalmic scans, X-ray &Radio-isotope diagnosis and therapy, CAT-Scan, Emission computerized tomography, MRI.

Unit V: Bio-telemetry:
The components of a Bio-telemetry system, Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring.

Prosthetic Devices and Therapies: Hearing Aides, Myoelectric Arm, Dia-thermy, Laser applications in medicine.

Text Books:
1. Khandpur R.S.- Biomedical Instrumentation- TMH

Reference Books::
3. Cromwell- Biomedical Instrumentation and Measurements- PHI
5. Ananthi, S. –A Text Book of Medical Instruments-2005-New Age International
6. Carr &Brown –Introduction to Biomedical Equipment Technology – Pearson
7. Pandey & Kumar-Biomedical Electronics and Instrumentation. - Kataria
TOE-17 FUNDAMENTALS OF CODING THEORY

Unit I
Purpose of encoding, separable binary codes, Shannon-fano encoding, noiseless coding. Shannon binary encoding, Huffman encoding, discrete coding in presence of noise.

Unit II
Error detecting and error correcting codes, Hamming single error correcting code, Elias's iteration technique for coding.

Unit III
Block codes, encoders and decoders for block codes, syndrome and syndrome decoding.

Unit IV
Cyclic codes. Encoders and decoders for cyclic code, Golay code, BCH code, Reed soloman code.

Unit V
Convolution coding, code generation, decoding of convolution code, sequential decoding, state and trellis diagram.

Text Book:

TOE-18 CONSUMER ELECTRONICS

Unit I
Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalizers and Mixers, Electronic Music Synthesizers, Commercial Sound, Theater Sound System

Unit II
Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing

Unit III
Domestic Appliances: Washing machines, Microwave ovens, Air-conditioners and Refrigerators, In car computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

Unit IV
Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System

Unit V
Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM

Text Books:
Unit I: Fundamental Concepts

Unit II: Geometry of Binary threshold neurons and their networks
Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution. Perceptions and LMS Learning objective of TLN, pattern space & weight space, perception learning algorithm, perception convergence theorem, pocket algorithm, $\alpha$ - LMS learning, MSE error surface, steepest descent search, $\mu$ - LMS and application.

Unit III: Back propagation algorithm
Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of FFNN. Statistical Pattern Recognition Bayes' theorem, classical decisions with bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems.

Unit IV: Self Organizing Feature MAP
Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, maxican hat networks, SOFM, applications of SOFM. Other Networks Generalized RBF networks. Stochastic Machines: simulated annealing, Boltzmann machine, ART.

Unit V: Fuzzy Logic
Introduction, classical & Fuzzy sets, classical & fuzzy relations, membership function, geometry & operations of fuzzy sets, fuzzy rules, rule composition & defuzzification, fuzzy engineering applications, Neural network & fuzzy logic. Fuzzy Neural Control

Text Books
2. Satish Kumar, "Neural Networks," Tata McGraw-HIII.

Reference Books
TOE- 20 HUMAN COMPUTER INTERACTION

Unit I
User centered design of system & interfaces, anatomy and rational of WIMP (Window, Icon, Menus & Pointing Devices ) interfaces.

Unit II
Dialogue design, Presentation design, user documentation, evaluation / usability testing of user interface.

Unit III

Unit IV
User centered design, human factors in user-centered design, development & evaluation, Interactive design rapid prototyping.

Unit V
Designing for usability –effectiveness, learnability, flexibility, attitude and usability goals, criteria for acceptability.

Books Recommended:

TOE – 21 IT IN BUSINESS

Unit I
Business Drivers IT’s Competitive Potential Strategic Alignment Strategic Management and Competitive Strategy

Unit II
Rethinking Business through IT Developing a Competitive Strategy Interorganization Information Systems Business-To-Business Systems Electronic Commerce and Market Systems

Unit III
Forming a Corporate IT Strategy Developing an Information Architecture

Unit IV
Incorporating Business Innovation into the Corporate IT Strategy The Changing Role of IT In International business The Changing Global IT Practices

Unit V
The Impact and value of Information Technology in Competitive Strategy Changing the Focus of Strategy Trends: Beyond 2000

Books Recommended:
TOE –22 ARTIFICIAL INTELLIGENCE IN MANUFACTURING

Unit I: Artificial Intelligence
Definition - Components - Scope - Application Areas; Knowledge - Based Systems (Expert Systems) - Definition - Justification - Structure – Characterization

Unit II: Knowledge Sources
Expert - Knowledge Acquisition – Knowledge Representation - Knowledge Base - Interference Strategies - Forward and Backward Chaining

Unit III: Expert System Languages
ES Building Tools or Shells: Typical examples of Shells. Expert System software for manufacturing applications in CAD, CAPP, MRP, Adaptive control,

Unit IV: Robotics
Robotics, Process control, Fault diagnosis, Failure Analysis; Process Selection, GT etc. Linking expert systems to other software such as DBMS, MIS, MDB.

Unit V: Process control and Office automation

Books Recommended:
3. Introduction to Artificial Manufacturing Export system, Dan. W. Patterson

TOE 23 HEALTH, HOSPITAL AND EQUIPMENT MANAGEMENT

Unit I: HEALTH SYSTEM
Health organization of the country, the state, the cities and the region, Health Financing System, Organization of Technical Section.

Unit II: HOSPITAL ORGANIZATION AND MANAGEMENT
Management of Hospital organization, Nursing section Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transaction Analysis Human relation in Hospital, Importance to Team Work, Legal aspect in Hospital Management.

Unit III: REGULATORY REQUIREMENT AND HEALTH CARE CODES
FDA Regulation, joint commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPC.

Unit IV: EQUIPMENT MAINTENANCE MANAGEMENT

Unit V: TRAINED TECHNICAL PERSONNEL
Function of Clinical Engineer, Role to be performed in Hospital, Man power Market, Professional Registration, Structure in hospital.

Books Recommended:
5. Jacob Kline, Handbook of Bio Medical Engineering, Academic Press, San Diego

**TOE 24 INTRODUCTION TO MEDICAL PHYSICS**

**Unit I: ATOMIC PHYSICS**

**Unit II: INTERACTION WITH LIVING CELLS**
Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

**Unit III: SOMATIC EFFECT OF RADIATION**
Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

**Unit IV: GENETIC EFFECT OF RADIATION**
Threshold of linear dose effect, relationship, factors affecting frequency of radiation induced mutation, Gene controlled hereditary disease, biological effect of microwave and RF wave. Variation in dielectric constant and specific conductivity of tissues. Penetration and propagation of signals effects in various vital organs, Protection standards.

**Unit V: PHOTO MEDICINE**
Synthesis of Vitamin D in early and late cataneous effects, Phototherapy, Photo hemotherapy, exposure level, hazards and maximum permissible exposure.

**LASER PHYSICS** — Characteristics of Laser radiation, Laser speckle, biological effects, laser safety

**Books Recommended:**
TOE – 25 MODERN CONTROL SYSTEM

Unit I: Introduction to control systems
Introduction to control systems, properties of signals and systems. Convolution integral, Ordinary differential equation, Transfer function, Pole zero concepts, effect of pole location on performance specification.

Unit II: State Space analysis
State equations for dynamic systems, State equations using phase, physical and canonical variables, realization of transfer matrices, Solution of state equation, concepts of controllability, observability, Controllability and Observability tests.

Unit III: Discrete time control systems
Sampling theorem, Sampled-data systems, the sample and hold element, pulse transfer function, The Z-transform, stability analysis.

Unit IV: Stability
Liapunov's method, generation of Liapunov’s function, Popov’s criteria, design of state observers and controllers, adaptive control systems, model reference.

Unit V: Optimal Control
Introduction, formation of optimal control problems, calculus of variation, minimization of functions, constrained optimization, dynamic programming, performance index, optimality principles, Hamilton –Jacobian equation, linear quadratic problem, Ricatti II equation and its solution, solution of two point boundary value problem

Text Books:
1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

TOE 26 MECHATRONICS

Unit I: Mechatronics and its scope
Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level. Signal conditioning amplification, filtering & data acquisition.

Unit II: Pneumatic and Hydraulic actuation systems

Unit III: Elements of Microprocessors & Microcontrollers
Elements of Microprocessors & Microcontrollers Programmable logic controllers & Communication interface.

Unit IV: Case Studies of Mechatronic Systems
Industrial Robot and its control Automobile Engine Control Electromechanical disc-control.
Unit V: Veil suspension Control

Books Recommended:

TOE 27 SCADA & ENERGY MANAGEMENT SYSTEM

Unit I: SCADA
Purpose and necessity, general structure, data acquisition, transmission & monitoring. general power system hierarchical Structure. Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels - cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

Unit II: Supervisory and Control Functions
Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc. Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

Unit III: MAN- Machine Communication
Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

Unit IV: Data basis
SCADA, EMS and network data basis. SCADA system structure - local system, communication system and central system. Configuration- NON-redundant- single processor, redundant dual processor. multicontrol centers, system configuration. Performance considerations: real time operation system requirements, modularization of software programming languages.

Unit V: Energy Management Center
Functions performed at a centralized management center, production control and load management economic dispatch, distributed centers and power pool management.

Books Recommended: