UNIVERSITY OF LUCKNOW
FACULTY OF ENGINEERING AND TECHNOLOGY

Evaluation Scheme for B. Tech.
Branch: Electronics and Communication Engineering

SEMESTER - VII

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	EC-701	Mobile and Wireless Communications	3 – 1 – 0	20	10	30	70	100	4
02.	EC-702	VLSI Design	3 – 1 – 0	20	10	30	70	100	4
03.	EC-703	Optical Communication	3 – 1 – 0	20	10	30	70	100	4
04.	EC-704X	Any one from the list (DE-2)	3 – 1 – 0	20	10	30	70	100	4
05.	AS-701/ AS-702	Engineering Economics/ Industrial Management	3 – 0 – 0	20	10	30	70	100	3
	Practical								
06.	EC751	CAD Lab	0 – 0 – 2	-	20	20	30	50	1
07.	EC753	Optical Communication Lab	0 – 0 – 2	-	20	20	30	50	1
08.	EC752	Industrial Training	0 – 0 – 2	-	-	50	-	50	1
09.	EC754	Project	0 – 0 – 3	-	-	150	-	150	2
10.	GP	General Proficiency				50		50	
	Total		**15 – 4 – 9**					**800**	**24**

Abbreviations:

CT - Class Test
TA - Teacher's Assessment
ESE - End Semester Examination
DE - Departmental Elective

Departmental Elective – 2:

EC-7041 Information Theory and Coding
EC-7042 Radar & Satellite Communication
EC-7043 Integrated Circuit Technology
EC-7044 Biomedical Electronics
EC-7045 Electronic Switching

UNIVERSITY OF LUCKNOW
FACULTY OF ENGINEERING AND TECHNOLOGY

Evaluation Scheme for B. Tech.
Branch: Electronics and Communication Engineering

SEMESTER - VIII

S. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CT	TA	Total			
	Theory								
01.	OE-80XX	Any one from the Open Elective list	3 – 1 – 0	20	10	30	70	100	4
02.	EC-801	Digital Image Processing	3 – 1 – 0	20	10	30	70	100	4
03.	EC-802X	Any one from the list (DE-3)	3 – 1 – 0	20	10	30	70	100	4
04.	AS-801/ AS-802	Engineering Economics/ Industrial Management	3 – 0 – 0	20	10	30	70	100	3
	Practical								
05.	EC-851	Digital Image Processing Lab	0 – 0 – 2	-	20	20	30	50	1
06.	EC-852	Project	0 – 0 – 12	-		100	250	350	8
07.	GP-801	General Proficiency				50		50	
	Total		**12 – 3 – 14**					**800**	**24**

Abbreviations:

CT - Class Test
TA - Teacher's Assessment
ESE - End Semester Examination
DE - Departmental Elective
OE – Open Elective

Departmental Elective – 3:

EC-8021 Optical Networks
EC-8022 Embedded System
EC-8023 Advance Instrumentation
EC-8024 Speech Processing
EC-8025 RF system
EC-8026 Real Time System

Open Electives: Refer list of Open Electives in APPENDIX.

EC-701
MOBILE AND WIRELESS COMMUNICATION

L	T	P
3	1	0

Unit I: 08

Cellular System Fundamentals: Overview of Wireless Communication; Frequency Reuse and Cellular Concept; Co-Channel and Adjacent Channel Interferences; Cell Sectoring and Cell Splitting; Handoff Strategies; Channel Assignment Techniques.

Unit II: 08

Propagation Modelling: Propagation Path Loss; Shadowing; Path Loss Models; Multipath Fading; Narrowband Fading Models: Correlation and Power Spectral Density, Envelope and Power Distribution, Level Crossing Rate and Average Fade, Wideband Channel Models: Power Delay Profile, Coherence Bandwidth, Doppler Power Spectrum and Channel Coherence Time.

Unit III: 08

Modulation and Multiple Access Techniques: Performance of Digital Modulation over Wireless Channel; Diversity Techniques; Multiple Access Techniques: Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access, Orthogonal Frequency Division Multiple Access, Hybrid Techniques

Unit IV: 08

Wireless Systems and Standards: Global System for Mobile Communications (GSM); CDMA Cellular System; Evolution of 2G, 3G, 4G Systems and Beyond; Wireless Local Area Network Technology; IEEE 802.11 Standards.

Unit V: 08

Introduction to Mobile Adhoc Networks, Mobile data networks, Introduction to Wireless Networks, Traffic Routing in wireless network, wireless data services, common channel signaling.

Text Books:

1. J. Schiller, , "Mobile Communication", Pearson Education, 2nd Ed.
2. T. S. Rappaport, *Wireless Communications: Principles and Practic*e, Pearson Education India, 2002.
3. R. Pandya, "Mobile and personal communication system", PHI.

Reference Books:

1. T. L. Singal, "Wireless Communications", McGraw Hill Publications.
2. A. S. Goldsmith, Wireless Communications, Cambridge University Press, 2005.
3. M. Richharia, , "Mobile Satellite communications", Pearson Education
4. W.C.Y. Lee, "Mobile Communication Engineering", McGraw-Hill
5. J.D. Gibson, "Mobile Communication", IEEE Press Hand Book, 2008.
6. G. L. Stuber, "Principles of Mobile Communication", Springer, 3rd Edition, 2011

EC-702
VLSI DESIGN

L	T	P
3	1	0

Unit-I 08

Introduction: VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances

Unit-II 08

MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

Unit-III 08

Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behavior bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.

Unit-IV 08

Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.

Unit-V 08

Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques

Text Book:

1. Sung-Mo Kang &Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis & Design”, TMH, 3rd Edition.

Reference Books:

1. W. Wolf, “Modern VLSI Design: System on Chip”, Third Edition, Pearson, 2002.
2. N. H. E. Weste and K. Eshraghian, “Principles of CMOS VLSI Design”, Person
3. D. A. Pucknell and K. Eshraghian, “Basic VLSI Design: Systems and Circuits”, PHI, 3rd Ed., 1994.
4. D. A. Pucknell and K. Eshraghian, “Basic VLSI Design: Systems and Circuits”, PHI, 3rd Ed., 1994.
5. A. Albert Raj and T. Latha, “VLSI Design”, PHI.

EC-703

OPTICAL COMMUNICATION

L	T	P
3	1	0

Unit-1 Introduction to Optical Fibers 08

Introduction to optical fiber communication system and its advantages, **Optical fiber waveguides**: Ray theory transmission- Total internal reflection, acceptance angle, numerical aperture, skew rays, Optical fiber modes and configurations-Step index fibers, graded index fibers, Single mode fibers- Cut off wavelength, mode field diameter, effective refractive index, **Photonic crystal fibers**- Introduction and photonic band gap fibers, fiber materials and its fabrication.

Unit-2 Transmission Characteristics of Optical Fibers 08

Transmission characteristics of optical fibers: Attenuation, material absorption losses, Linear scattering losses- Rayleigh scattering, mie scattering, Nonlinear scattering losses- Stimulated brillouin scattering, stimulated raman scattering and fiber bend loss, **Dispersions**: Chromatic - Material dispersion, waveguide dispersion, Intermodal dispersions, Overall fiber dispersions- Multimode fibers, single-mode fibers, Polarization-polarization mode dispersion, Nonlinear effects-scattering effects and kerr effects.

Unit-3 Optical Sources and Detectors 08

Optical sources: Light emitting diodes(**LEDs**)- Structures, materials, quantum efficiency, power, modulation, power bandwidth product, **Laser diodes**- Basic concepts, classifications, Semiconductor injection laser- Modes, threshold conditions, external quantum efficiency, laser diode rate equations, resonant frequencies, reliability of LED and ILD. **Optical detectors**- PIN photo detectors, Avalanche photo detectors, detector response time, temperature effect on avalanche gain, comparison of photo detectors.

Unit-4 Optical Receiver, Measurement and Coupling 08

Optical receivers: Fundamental receiver operation, digital signal transmission, error sources, receiver configuration, digital receiver performance, probability of error, quantum limit, analog receivers. **Optical fiber measurements**- Fiber attenuation measurement, fiber dispersion measurement, fiber cut off wavelength measurement, fiber numerical aperture measurement, **Optical fiber connectors**- Joints, couplers and isolators.

Unit-5 System Transmission and Optical Networks 08

Link design- Point to point links, power penalties, error control, Multichannel transmission techniques, WDM concepts and components overview. Optical network concepts and topologies, SONET/SDH.

Text Books:

1. Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th Edition., 2010
2. John M. Senior, “Optical Fiber Communication”, Second Edition, Pearson Education, 2007.

Reference Books:

1. Ramaswami, Sivarajan and Sasaki “Optical Networks”, Morgan Kaufmann, 2009.
2. J. Gower, "Optical Communication System", Prentice Hall of India, 2001.
3. Govind P. Agarwal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
4. S.C. Gupta, "Text Book of Optical Fiber Communication & Its Applications", Prentice Hall(India).

EC-7041

INFORMATION THEORY AND CODING

L	T	P
3	1	0

Unit I 08

Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measures for Continuous Random Variables, Source Coding Theorem, Huffman Coding, The Lempel-Ziv Algorithm, Rate Distortion Function, Optimum Quantizer Design,

Channel Capacity and Coding: Introduction, Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem, The Shannon Limit, Random Selection of Codes.

Unit II 08

Linear Block Codes for Error Correction: Introduction to Error Correcting Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes, Hamming Codes, Optimal Linear Codes, Cyclic Codes, Introduction to Cyclic Codes.

Unit III 08

Polynomials: The Division Algorithm for Polynomials, A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Fire Code, Golay Codes, Cyclic Redundancy Check (CRC) Codes

Introduction to BCH Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials in Terms of Minimal Polynomials, Some Examples of BCH Codes, Decoding of BCH Codes Reed-Solomon Codes, Implementation of Reed-Solomon Encoders and Decoders Nested Codes,

Unit IV

Convolutional Codes: Introduction to Convolutional Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolutional Codes (Analytical Representation), Notions for Convolutional Codes, The Generating Function, Matrix Description of Convolutional Codes, Viterbi Decoding of Convolutional Codes, Distance Bounds for Convolutional Codes, Performance Bounds, Known Good Convolutional Codes, Turbo Codes, Turbo Decoding.

Unit V

Trellis Codes Modulation: Introduction to TCM, The concept of Coded Modulation, Mapping by Set Partitioning, Ungerboeck's TCM Design Rules, TCM Decoder, Performance Evaluation for AWGN Channel, Computation of dfree, TCM for Fading Channel.

Text Books:

1. Ranjan Bose, "Information Theory, Coding & Cryptography", Tata McGraw Hill

Reference Books:

1. J. H. Van Lint**,** "Introduction to Coding Theory", Springer
2. John G. Proakis, "Digital Communications", McGraw Hill
3. P. S. Sathyanarayana, "Probability Information and Coding Theory", Dynaram Publications, Bangalore
4. Robert G. Gallager, "Information Theory and Reliable Communication", Wiley
5. Shu Lin and Daniel J. Costello, "Error Correcting Codes", Prentice Hall (India).
6. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill
7. Lecturers of NPTEL.

EC-7042
RADAR AND SATELLITE COMMUNICATIONS

L	T	P
3	1	0

Unit-I 08

Elements of Satellite Communication look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

Unit-II 08

Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

Unit-III 08

Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and non geostationary,

Unit-IV 08

Introduction to Radar: Basic Radar, the Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross- Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency.

Unit-V 08

MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancellers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.
Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low- Angle Tracking, Tracking in Range,

Text

1. B. Pratt, A. Bostian, “Satellite Communications”, Wiley India.
2. D. Roddy, “Satellite Communications”, TMH, 4th Ed.
3. Merrill I. Skolnik, “Introduction to Radar Systems” Third Edition.

Reference Books:

1. S. D. Ilcev, “Global Mobile Satellite Communication”, Springer
2. R. Pandya, “Mobile and Personal Communication Systems and Services”, PHI.
3. J.C. Toomay and Paul J. Hannen “Principles of Radar” Third Edition.

EC-7043
INTEGRATED CIRCUIT TECHNOLOGY

L	T	P
3	1	0

Unit-I 08

Introduction to IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations.
Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.

Unit-II 08

Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.

Unit-III 08

Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.

Unit-IV 08

Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.

Unit-V 08

VLSI Process Integration: Fundamental Considerations for IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication

Text Book:

1. S. M. Sze, “VLSI Technology”, 2ndEdition, McGraw –Hill Publication.
2. S.K. Ghandhi, “VLSI Fabrication Principles”, 2ndEdition, Willy-India Pvt. Ltd.

Reference Books:

1. Stephen A. Campbell, “The Science & Engineering of Microelectronic Fabrication” Oxford University Press.
2. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford Univ Press.
3. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.

EC-7044
BIOMEDICAL ELECTRONICS

L	T	P
3	1	0

Unit I 08

Introduction: The age of Biomedical Engineering, Development of Biomedical Instrumentation, Man–Instrumentation system, Components, Physiological system of the body, Problem encountered in measuring a living system.

Transducers: The Transducers & Transduction principles, Active transducers, Passive Transducers, Transducer for Biomedical Applications.

Unit II 08

Sources of Bioelectric potentials: Resting & Action potentials, propagation of active potential, The Bioelectric potentials-ECG, EEG, EMG, and Invoked responses.

Electrodes: Electrode theory, Biopotential Electrodes–Microelectrodes Body surface electrodes, Needle Electrodes, Biochemical Transducers, Reference electrodes, PH electrodes, Blood Gas electrodes.

Unit III 08

Cardiovascular Measurements: Electrocardiography – ECG amplifiers, Electrodes & leads, ECG recorders - Three channel, Vector Cardiographs, ECG system for stress testing, Continuous ECG recording (Holter recording), Blood pressure measurement, Blood flow measurement, Heart sound measurements.

Patient Care & Monitoring - Elements of Intensive Care monitoring, patient monitoring displays, Diagnosis, Calibration & Repairability of patient monitoring equipment, pacemakers & Defibrillators.

Unit IV 08

Measurements in Respiratory system: Physiology of respiratory system Measurement of breathing mechanics - Spiro meter, Respiratory Therapy equipments: Inhalators ventilators & Respirators, Humidifiers, Nebulizers & Aspirators.

Diagnostic Techniques: Ultrasonic Diagnosis Echocardiography, Echo Encephalography, Ophthalmic scans, X-Ray & Radio-isotope Instrumentation, Computerized Axial Tomography Scanners.

Unit V 08

Introduction to Bio-Medical Signals:

Classification, Acquisition and Difficulties during Acquisition, Electroencephalography, Electromyography, & electro-retinography, Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.

Bio Telemetry: The components of Biotelemetry system Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Physiological Effects of Electric Current Safety of Medical Electronic Equipments, Shock hazards from Electrical equipment and prevention against them.

Text Books:

1. Leslie Cromwell, Fred J. Welbell and Erich A. Pfeiffer, “Biomedical Instrumentation and Measurements”, Prentice Hall (India).

Reference Books:

1. R. S. Khandpur, “Biomedical Instrumentation”, Tata McGraw-Hill.
2. Willis J. Tompkins, “Biomedical DSP: C Language Examples and Laboratory Experiments for the IBM PC”, Prentice Hall (India).
3. D. C. Reddy, “Biomedical Signal Processing”, McGraw-Hill

EC-7045
ELECTRONIC SWITCHING

L	T	P
3	1	0

Unit-I 08

Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.

Unit-II 08

Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.

Unit-III 08

Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.

Unit-IV 08

Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling.

Unit-V 08

Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.

Text Books:

1. Thiagarajan Viswanathan, “Telecommunication switching System and networks”, PHI.
2. J.E. Flood, “Telecommunication switching, Traffic and Networks”, Pearson education.
3. J.C. Bellamy, “Digital Telephony”, John Wiley, 3rdEd.

AS–701
ENGINEERING ECONOMICS

L	T	P
3	0	0

Unit-1 **08**

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of economics, relation between science, engineering, technology and economics; Meaning of demand, determinants of demand, shifts in demand, law of demand, price elasticity of demand &types, income elasticity, cross price elasticity, determinants of elasticity and uses and importance of elasticity.

Unit-2 **08**

Concept of Supply: Law of supply, factors affecting supply, and elasticity of supply. Demand forecasting: introduction, meaning and forecasting, methods or techniques of demand forecasting, criteria for good demand forecasting and demand forecasting for a new product.

Unit-3 **08**

Cost Analysis: Introduction, types of costs, cost-output relationship: cost function, cost-output relationships in the short run, and cost-output relationships in the long run; Short run and long run, break- even analysis; Production functions: laws of variable proportions, law of returns and economies of scale: internal and external.

Unit-4 **08**

Market Structure: Market structure perfect competition, imperfect competition – monopolistic, oligopoly and duopoly sorbent features of price determination and various market conditions.

Unit-5 **08**

Nature and characteristics of Indian economy: Concepts of LPG, elementary concepts of national income, inflation and business cycles ,concept of N.I and measurement, meaning of inflation, types and causes and phases of business cycle investment decisions for boosting economy(national income and per capital income).

Text Books:

1. Premvir Kapoor, "Sociology and Economics for Engineers", Khanna Publishing.
2. D. Salvatore, “Principles of Microeconomics”, Oxford University Press.
3. A. Koutsoyiannis, “Modern Microeconomic”, Macmillan Education Ltd.

Reference Books:

1. D. N. Dwivedi, “Principles of Microeconomics”, Pearson Education.
2. F. A. Cowell, “Microeconomic Principles and Analysis”, Oxford University Press.
3. J. L. Riggs, “Engineering Economics”, McGraw Hills.

AS–702
INDUSTRIAL MANAGEMENT

L	T	P
3	0	0

Unit-1 **08**

Introduction: Concept and scope of industrial management. **Productivity:** definition, measurement, productivity index, types of production system and industrial ownership.

Unit-2 **08**

Functions of Management: Taylor's scientific management theory, Fayol's principles of management, social responsibilities of management, introduction to human resources management: nature of HRM, functions and importance of HRM.

Unit-3 **08**

Work Study: Introduction, definition, objectives, steps in work study; **Method study:** Definition, objectives, steps of method study; **Work measurement:** Purpose, types of study: Stop watch methods steps: Allowances, standard time calculations, work sampling, production planning and control inventory control: inventory, cost, models of inventory control: EOQ, ABC, VED.

Unit-4 **08**

Quality Control: Statistical quality control, control charts for variables and attributes, acceptance sampling: single sampling- double sampling plans and introduction to TQM.

Unit-5 **08**

Project Management: Project network analysis, CPM, PERT and project crashing and resource leveling.

Text Books:

1. Gideon Halevi, "Industrial Management- Control and Profit: A Technical Approach" Springer.
2. A.P. Verma and N. Mohan "A Textbook of Industrial Management" S.K. Kataria & Sons.
3. S. K. Sharma, Savita Sharma "Industrial Engineering and Organization Management", Kataria and Sons.

Reference Books:

1. S.C. Sharma & T.R. Banga, "Engineering Management" (Industrial Engineering & Management), Khanna Book Publishing Co.
2. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd.
3. Paneer Selvam, "Production & Operation Management", PHI.

EC-751
CAD LAB

L	T	P
0	0	2

Perform at least five experiments from each sections.

A. CONTROL SYSTEM LAB - I

List of Experiments:

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox or its equivalent open source freeware software like Scilabusing Spoken Tutorial MOOCs.
2. Plot the pole-zero configuration in s-plane for the given transfer function.
3. Determine the transfer function for given closed loop system in block diagram representation.
4. Plot unit step response of given transfer function and find delay time, rise time, peak time and peak overshoot.
5. Determine the time response of the given system subjected to any arbitrary input.
6. Plot root locus of given transfer function, locate closed loop poles for different values of k. Also find out W_d and W_{nat} for a given root.
7. Create the state space model of a linear continuous system.
8. Determine the State Space representation of the given transfer function.
9. Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.
10. Plot Nyquist plot for given transfer function and to discuss closed loop stability. Also determine the relative stability by measuring gain and phase margin.

B. DIGITAL SIGNAL PROCESSING LAB

List of Experiments:

1. To study about DSP Processors and architecture of TMS320C6713 DSP processor.
2. To implement IIR filter (LP/ HP) on DSP Processors.
3. Introduction to MATLAB and Code Composer Studio or its equivalent open source software.
   OR
   Introduction to Scilab Open Source Software (Using Spoken Tutorial MOOCs)
4. Write a Program for the generation of basic signals such as unit impulse, unit step, ramp, exponential, sinusoidal and cosine.
5. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.
6. To implement FFT algorithm.
7. Verify Blackman and Hamming windowing techniques.
8. Implement IIR Butterworth analog Low Pass for a 4 KHz cut off frequency.
9. Verify Circular Convolution using code composer studio.
10. Verify Linear convolution of two sequence using code composer studio.
11. To implement Tone Generation.

Spoken Tutorial (MOOCs): Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

EC-753

OPTICAL COMMUNICATION LAB

L	T	P
0	0	2

LIST OF EXPERIMENTS:

Note: At least 10 experiments are to be performed from the following.

1. To setup and study fiber optic analog link for voice transmission.
2. To setup and study fiber optic digital link for measuring maximum bit rate supportable.
3. To measure the losses in an optical fiber communication link.
4. To estimate the Numerical Aperture of the optical fiber.
5. To Study of V-I & P-I characteristics of LASER diodes and intensity modulation and demodulation.
6. To study the Manchester Coding/Decoding used in the OFT Trainer.
7. To measure dispersion in optical fiber using trainer kit.
8. Characterization of WDM MUX and DEMUX.
9. Analysis of LED spectral distribution using optsim.
10. Optical receiver design using optsim.
11. EDFA design using optsim.
12. WDM design using optsim.

EC-801
DIGITAL IMAGE PROCESSING

L	T	P
3	1	0

Unit-I 08

Introduction and Digital Image Fundamentals: Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image processing Systems, Sampling and Quantization, Resolution, Human Visual System, Classification of Digital Images, Image Types, Applications of Digital Image Processing.

Unit-II 08

Image Transforms: Introduction, Need for Transform, Image Transforms, Fourier Transform 2D Discrete Fourier Transform, Discrete Cosine Transform, Hadamard Transform, Haar Transform, Slant Transform, Karhunen-Loeve Transform Transform (KL Transform) and Singular Value Decomposition.

Unit-III 08

Image Enhancement: Introduction, Point Operations, Spatial Domain Methods, Frequency Domain Methods, Spatial Filtering, Low Pass Filtering, High Pass Filtering, Homomorphic Filtering, Histogram Modeling and Equalization, Colour Image Enhancement.

Unit-IV 08

Image Restoration: Introduction, Image Observation Models, Degradation Models, Formulation of Discrete Linear Operators, Inverse & Wiener filtering,

Image Analysis: Spatial Features, Transform Features, Edge Detection, Boundary Detection, Sementation, Textures.

Unit-V 08

Image Compression: Introduction, Interpixel and Psycho visual redundancy. Pixel coding, Predictive coding, Transform coding, Image Compression Models, Error free Compression, Lossy Compression, Image Compression Standards.

Text Books:

1. S. Jayaraman, S. Esakkirajan and T. Veera Kumar, "Digital Image Processing", McGraw Hill Education, 2016.
2. Rafael C. Gonzalez and Richard E Woods, "Digital Image Processing", Pearson, 3rd Ed. 2009.
3. Anil K. Jain, "Fundamentals of Digital Image Processing", PHI.
4. J. S. Lim, "Two-dimensional Signal and Image Processing", PHI.

Reference Books:

1. Alasdair Mc Andrew, "Introduction to Digital Image Processing", Cengage learning, 2009
2. W.K. Pratt, "Digital Image Processing", PHI.
3. B. Chanda and Dwijesh Dutta Majumdar, "Digital Image Processing", PHI.
4. Madhuri A. Joshi, "Digital Image Processing: An Algorithmic Approach" PHI.

EC-8021
OPTICAL NETWORKS

L	T	P
3	1	0

Unit-I 08

Introduction to Optical Networks- Principles and Challenges and its Generation, Characteristics of Optical Fiber in nonlinear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters,

Unit-II 08

Optical Amplifiers, Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing, Spectral efficiency, Crosstalk, Introduction of Soliton systems.

Unit-III 08

SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of aSONET/SDH Infrastructure, Ethernet. Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS.WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.

Unit-IV 08

WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution

Unit-V 08

Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations- SONET/SDH core Network

Text Books:

1. R. Ramaswami and K. N. Sivarajan, “Optical Networks a Practical perspective”, Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, “Optical Networks: Third Generation Transport Systems”, Pearson Educations

Reference Books:

1. Biswanath Mukherjee, “Optical WDM Networks”, Springer 2006

EC-8022

EMBEDDED SYSTEMS

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Unit I 08

Introduction to Embedded system, Embedded System Project Management, ESD and Codesign issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.

Unit II 08

8051 Microcontroller: Microprocessor V/s Micro-controller, 8051 Microcontroller: General architecture; Memory organization; I/O pins, ports & circuits; Counters and Timers; Serial data input/output; Interrupts. 8051 Instructions: Addressing Modes, Instruction set: Data Move Operations, Logical Operations, Arithmetic Operations, Jump and Call Subroutine, Advanced Instructions. 8051 Interfacing and Applications: Interfacing External Memory, Keyboard and Display Devices: LED, 7-segment LED display, LCD.

Unit III 08

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Unit IV 08

Brief general architecture of AVR, PIC and ARM microcontrollers, JTAG: Concept and Boundary Scan Architecture. Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

Unit V 08

Advanced Processor: (only architectures) 80386, 80486 and ARM (References)

RTOS: Tasks, states, Data, Semaphores and shared data, Operating system, services, Message queues, Mailboxes.

Communication basics: Microprocessor Interfacing, I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel Protocols and wireless protocols.

Real world Interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Keyboard, Latch Interconnection, PPI.

TEXT BOOKS:

1. K. V. Shibu, “Introduction to Embedded Systems”, McGraw Hill.
2. E. Mazadi, “The 8051 Microcontroller And Embedded Systems Using Assembly And C”, Pearson Education India, 2007

REFERENCE BOOKS:

1. Kenneth Hintz and Daniel Tabak, “Microcontrollers (Architecture, Implementation and Programming)”, TMH 2005.
2. Raj Kamal, “Embedded Systems”, TMH, 2006.
3. K. Ayala, “The 8051 Microcontroller”, 3rd Ed., Thomson Delmar Learning, 2007.
4. Frank Vahid and Tony Givargis, “Embedded System Design”, John Wiley.

EC-8023
ADVANCED INSTRUMENTATION

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Unit-I 08

Measurement of Non Electrical Quantities: Measurement of Temperature: Absolute, Thermodynamic Scale, Bimetallic Element, Fluid Expansion Systems, Pressure: Manometers, Ring Balance Manometer & Bell Type Manometer, Bellows Element, Bourdon Tube Elements, Force: Helical Spiral Springs, Cantilever Beams, Loads Cells, Liquid Level: Float Element, Level to Pressure Converters, Level to force Converters Flow.

Unit-II 08

Passive Electrical Transducers: Resistive: Resistance Thermometers, Resistive Displacement Transducer, Resistive Strain Transducer, Resistive Pressure Transducer, Inductive: Inductive Thickness Transducers, Inductive Displacement Transducers, Eddy Current Type Inductive Transducers, Capacitive: Capacitive Thickness Transducers, Capacitive Displacement Transducer.

Unit-III 08

Active Electrical Transducers: Thermo Electric Transducers, Piezo-Electric Transducers: Force Transducers, Strain Transducers, Torque Transducers, Pressure Transducers, Photo Electric Transducers, Digital Transducers: Digital Displacement Transducers, Digital Tachometers.

Unit-IV 08

Telemetry and Data Acquisition System: Telemetry: Introduction & Characteristics, Land Line Telemetry, Radio Telemetry, Components of an Analog Data Acquisition System, Components of an Digital Data Acquisition System, Types of Multiplexing Systems, Uses of Data Acquisition Systems, Use of Recorders in Digital Systems, Modern Digital Data Acquisition System

Unit-V 08

Advanced Measuring Instruments: Data Loggers, Digital Read Out Systems, Digital Input Output devices, Digital Storage Oscilloscope, Spectrum Analyzer, Logic Analyzer, Microwave Instruments: Vector Network analyzer, power meter, Instrument Interfacing

Text Books:

1. Thomas E. Kissell, "Industrial Electronics Applications for Programmable Controllers, Instrumentation and Process Control and Electrical Machines and Motor Controls", PHI
2. A. K. Shawhney, "Electrical & Electronic Measurement & Measuring Instruments", Dhanpat Rai & Co.
3. E. O. Doebelin, "Measurement Systems", McGraw Hill.
4. D. B. S. Murty, "Transducers & Instrumentation", Prentice Hall (India).
5. M. M. S. Anand, "Electronic Instruments & Instrumentation Technology", Prentice Hall (India)

Reference Books:

1. W. D. Cooper, and A. D. Helfrick, "Modern Electronic Instrument & Measurement Techniques", Prentice Hall (India).
2. William C. Dunn, "Fundamentals of Industrial Instrumentation and Process Control", TMH
3. Douglas O. J. DeSá, "Applied Technology and Instrumentation for Process Control", Taylor & Francis
4. J. Michael Jacob, "Industrial Control Electronics Applications and Design", Prentice Hall
5. Bela G. Liptak, "Process Measurement and Analysis", Butterworth Heinemann
6. William G Andrew and H. B. Williams, "Applied Instrumentation in the Process Industries Vol.: 1, 2 and 3", Gulf Publishing.

EC-8024
SPEECH PROCESSING

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Unit-I 08

Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.

Unit-II 08

Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using auto correlation function.

Unit-III 08

Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.

Unit-IV 08

Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomor phicvocoder.

Unit-V 08

predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.

Text Books:

1. R. L. Rabiner and R.W. Schafer, “Digital Processing of speech signals”, Pearson Education.
2. B. Gold and Nelson Morgon, “Speech and audio signal processing”, Wiley India Edition

Reference Books:

1. Shūzō Saitō and Kazuo Nakata,“Fundamentals of speech signal processing”, Academic Press Inc
2. Sadoaki Furui,“Digital Speech Processing: Synthesis and Recognition”, CRC Press
3. A. R. Jayan, “Speech and Audio Signal Processing”, PHI
4. Vishnu Narayan Saxena, “Speech Signal Processing: Using MATLAB”, Create space Independent Pub
5. Ian Vince McLoughlin, “Speech and Audio Processing: A MATLAB-based Approach”, Cambridge University Press

EC-8025
RF SYSTEMS

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Unit-I 08

Introduction: Importance of RF and Microwave Concepts and Applications- and Units Frequency Spectrum, RF and Microwave Circuit Design, Dimensions - RF Behavior of Passive Components: High Frequency Resistors, High Frequency Capacitors, High Frequency Inductors, General Introduction, Types of Transmission Lines-Equivalent Circuit representation.

Unit-II 08

The Smith Chart: Introduction, Derivation of Smith Chart, Description of two types of smith chart, Z-Y Smith chart, Distributed Circuit Applications, Lumped Element Circuit Applications.

Unit-III 08

Single and Multiport Networks: Basic Definitions, Interconnecting Networks.
Scattering Parameters: Scattering Parameters: Definition, Meaning, Chain Scattering Matrix, Conversion between S- and Z-parameters, Signal Flow Chart Modelling.

Unit-IV 08

Stability and Gain Considerations – RF Design RF Source, Transducer Power Gain, Additional Power Relations-Stability Considerations: Stability Circles, Unconditional Stability, Stabilization Methods-Unilateral and Bilateral Design for Constant Gain, Noise Figure Circles, Constant VSWR Circles.

Unit-V 08

RF Filters, Amplifiers and Oscillators Design Generalization-Basic Resonator and Filter Configurations: Low Pass, High Pass, Band Pass and Band Stop type Filters, Filter Implementation using Unit Element and Kuroda's Identities Transformations. Small Signal Amplifiers, Design of different types of amplifiers (NBA, HGA, MGA, LNA, MNA, BBA), Design of Large Signal Amplifiers Oscillator vs Amplifier Design, Design procedure of Transistor Oscillators.

Text Books:

1. Mathew M. Radmanesh, “Radio Frequency & Microwave Electronics”, Pearson Education Asia, Second Edition,
2. Reinhold Ludwig and Powel Bretchko,” RF Circuit Design – Theory and Applications”, Pearson Education Asia, First Edition.

References Books:

1. Joseph J. Carr, “Secrets of RF Circuit Design”, McGraw Hill Publishers, Third Edition.
2. Ulrich L. Rohde and David P. New Kirk, “RF Microwave Circuit Design”, John Wiley & Sons USA, 2000.
3. Roland E. Best, “Phase - Locked Loops: Design, simulation and applications”, McGraw Hill Publishers.
4. Devendra K. Misra, “Radio Frequency and Microwave Communication Circuits - Analysis and Design” John Wiley & Sons, Inc.
5. Jon B. Hagen, "Radio Frequency Electronics", Cambridge university press.
6. James Hardy, "High Frequency Circuit Design", Resto Publishing Co., New York.
7. Ian Hickman, "RF Hand Book", Butter Worth Heinemann Ltd., Oxford.
8. Ulrich L. Rohde and T. T. N. Bucher, "Communication Receivers", Mc Graw-Hill, New York.

EC-8026
REAL TIME SYSTEM

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Unit-I 08

Introduction to Real Time System Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modeling/verifying design tools (UML, state charts, etc.,).

Unit-II 08

Embedded Hardware for Real Time System Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts

Unit-III 08

Embedded Hardware – On chip Peripherals and Communication protocols Role of peripherals for Real time systems, On-Chip peripherals& hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI &UART. Introduction to the CCS IDE: its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.

Unit-IV 08

Embedded Software and RTOS Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.

Unit-V 08

Introduction to TI C2000: Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. Programming: demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS to introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI

RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI

Text:

1. Jane W. S. Liu, “Real-Time Systems”, Prentice Hall Publication
2. C. M. Krishna, “Real Time Systems” Mc-Graw Hill Publication.
3. Hamid A. Toliyat and Steven G. Campbell, “DSP based Electromechanical Motion Control” CRC Press Publication.
4. Jean J. Labrosse, “Embedded System Design blocks”, CMP books Publication
5. John H. Davies, “MSP430 Microcontroller Basics”, Newnes Publication.

Reference:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication

Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication

AS–801
ENGINEERING ECONOMICS

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Unit-1 **08**

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of economics, relation between science, engineering, technology and economics; Meaning of demand, determinants of demand, shifts in demand, law of demand, price elasticity of demand &types, income elasticity, cross price elasticity, determinants of elasticity and uses and importance of elasticity.

Unit-2 **08**

Concept of Supply: Law of supply, factors affecting supply, and elasticity of supply. Demand forecasting: introduction, meaning and forecasting, methods or techniques of demand forecasting, criteria for good demand forecasting and demand forecasting for a new product.

Unit-3 **08**

Cost Analysis: Introduction, types of costs, cost-output relationship: cost function, cost-output relationships in the short run, and cost-output relationships in the long run; Short run and long run, break- even analysis; Production functions: laws of variable proportions, law of returns and economies of scale: internal and external.

Unit-4 **08**

Market Structure: Market structure perfect competition, imperfect competition – monopolistic, oligopoly and duopoly sorbent features of price determination and various market conditions.

Unit-5 **08**

Nature and characteristics of Indian economy: Concepts of LPG, elementary concepts of national income, inflation and business cycles ,concept of N.I and measurement, meaning of inflation, types and causes and phases of business cycle investment decisions for boosting economy(national income and per capital income).

Text Books:

4. Premvir Kapoor, "Sociology and Economics for Engineers", Khanna Publishing.
5. Salvatore D, “Principles of Microeconomics”, Oxford University Press.
6. Koutsoyiannis A, “Modern Microeconomic”, Macmillan Education Ltd.

Reference Books:

4. Dwivedi DN, “Principles of Microeconomics”, Pearson Education.
5. Cowell, FA, “Microeconomic Principles and Analysis”, Oxford University Press.
6. Riggs J L, “Engineering Economics”, McGraw Hills.

AS–802
INDUSTRIAL MANAGEMENT

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Unit-1 **08**

Introduction: Concept and scope of industrial management. **Productivity:** definition, measurement, productivity index, types of production system and industrial ownership.

Unit-2 **08**

Functions of Management: Taylor's scientific management theory, Fayol's principles of management, social responsibilities of management, introduction to human resources management: nature of HRM, functions and importance of HRM.

Unit-3 **08**

Work Study: Introduction, definition, objectives, steps in work study; **Method study:** Definition, objectives, steps of method study; **Work measurement:** Purpose, types of study: Stop watch methods steps: Allowances, standard time calculations, work sampling, production planning and control inventory control: inventory, cost, models of inventory control: EOQ, ABC, VED.

Unit-4 **08**

Quality Control: Statistical quality control, control charts for variables and attributes, acceptance sampling: single sampling- double sampling plans and introduction to TQM.

Unit-5 **08**

Project Management: Project network analysis, CPM, PERT and project crashing and resource leveling.

Text Books:

4. Gideon Halevi, "Industrial Management- Control and Profit: A Technical Approach" Springer.
5. A.P. Verma and N. Mohan "A Textbook of Industrial Management" S.K. Kataria & Sons.
6. S. K. Sharma, Savita Sharma "Industrial Engineering and Organization Management", Kataria and Sons.

Reference Books:

4. S.C. Sharma & T.R. Banga, "Engineering Management" (Industrial Engineering & Management), Khanna Book Publishing Co.
5. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd.
6. Paneer Selvam, "Production & Operation Management", PHI.

EC-851

DIGITAL IMAGE PROCESSING LAB.

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List of Experiments using MATLAB

It is recommended that students should not use inbuilt function of Image Processing Toolbox.

Software Used: MATLB

List of Experiments

1. Introduction to MATLAB and Image Processing Toolbox in MATLAB.
2. Program to Read and Show an Image.
3. Program for Image conversion models (RGB to gray, RGB to YCbCr, RGB to HIS)
4. Program for adding different noises to an Image (Impulse Noise, Gaussian Noise).
5. Write Program of the following
   1. Affine Transformation 2.Quantization
   3. Histogram& Histogram Equalization 4. Histogram Specification
6. Program for following Image Filters :
   1. Convolution 2.Unsharp masking
   3. DFT 4.Median Filtering
   5. Weiner Filter 6. Vector Median Filter
7. Program for following Image Filters
   1. Average Filter 2.Median Filter
   3. Laplacian filter 4. Gaussian Blurring
8. Program for following Edge Detection operators:
   1. Prewitt 2. Sobel Filter
   3. Laplacian operator 4. Canny Edge Detector
9. Program for following Image Transform:
   1. DFT 2. DCT
   3. SVD 4. K-L Transform
10. Program for JEPG Compression
11. Program for following Image Morphology terms:
    1. Erosion 2. Dilation
    3. Hit Miss Transform 4.Connected Components
12. Program for analysis low pass and high pass Wavelet Filter Coefficients for

    Daubechies-2, 4 and 8 wavelets of an Image