B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Management and Entrepreneurship Development

(Common to EC/TC/EI/BM/ML)

Subject Code	: **15ES51**		IA Marks	: 20
Number of Lecture Hours /Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits – 4 (Each module – 10 Hours)

Module -1

Management: Nature and Functions of Management – Importance, Definition, Management Functions, Levels of Management, Roles of Manager, Managerial Skills, Management & Administration, Management as a Science, Art & Profession (Selected topics of Chapter 1, Text 1).

Planning: Planning-Nature, Importance, Types, Steps and Limitations of Planning; Decision Making – Meaning, Types and Steps in Decision Making (Selected topics from Chapters 4 & 5, Text 1).

Module -2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalisation, Committees– Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **Staffing**-Need and Importance**,** Recruitment and Selection Process (Selected topics from Chapters 7, 8 & 11, Text 1).

Directing and Controlling: Meaning and Requirements of Effective Direction, Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioural Approach of Leadership; Coordination-Meaning, Types, Techniques of Coordination; Controlling – Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process (Selected topics from Chapters 15 to 18 and 9, Text 1).

Module -3

Social Responsibilities of Business: Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance (Selected topics from Chapter 3, Text 1).

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship (Selected topics from Chapter 2, Text 2).

Module -4

Modern Small Business Enterprises: Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry (Definition only) (Selected topics from Chapter1, Text 2).

Institutional Support for Business Enterprises: Introduction, Policies & Schemes of Central Level

Institutions, State Level Institutions (Selected topics from Chapter 4, Text 2).

Module -5

Projects Management: A Project. Search for a Business idea**:** Introduction, Choosing an Idea, Selection of product, The Adoption process, Product Innovation, Product Planning and Development Strategy, Product Planning and Development Process. Concepts of Projects and Classification**:** Introduction, Meaning of Projects, Characteristics of a Project, Project Levels, Project Classification, Aspects of a Project, The project Cycle, Features and Phases of Project management, Project Management Processes. Project Identification**:** Feasibility Report, Project Feasibility Analysis. Project Formulation**:** Meaning, Steps in Project formulation, Sequential Stages of Project Formulation, Project Evaluation.

Project Design and Network Analysis: Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences.

(Selected topics from Chapters 16 to 20 of Unit 3, Text 3).

Question paper pattern

- The question paper will have TEN questions.
- Each full question carries 16 marks.
- There will be two full questions (with a maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Principles of Management – P.C Tripathi, P.N Reddy, McGraw Hill Education, 6th Edition, 2017. ISBN-13:978-93-5260-535-4.
2. Entrepreneurship Development Small Business Enterprises- Poornima M Charantimath, Pearson Education 2008, ISBN 978-81-7758-260-4.
3. Dynamics of Entrepreneurial Development and Management by Vasant Desai. HPH 2007, ISBN: 978-81-8488-801-2.

Reference Book:

1. Essentials of Management: An International, Innovation and Leadership perspective by Harold Koontz, Heinz Weihrich McGraw Hill Education, 10th Edition 2016. ISBN- 978-93-392-2286-4.

B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Fundamentals of Signals and DSP

(Common to EI & BM)

Subject Code	: 15EI/BM52		IA Marks	: 20
Number of Lecture Hours /Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits – 4 (Each module – 10 Hours)

Module -1

Introduction to Signals and Systems:

Basic elements of a DSP System, Classification of Signals, Sampling Theorem (statement and problems on Nyquist rate), Discrete Time Signals (Representation, Standard Signals, Classification, and Operations), Discrete Time Systems, Convolution Sum, Cross correlation and Auto correlation of sequences.

Text 1: 1.1.1, 1.2, 1.4.2, 2.1, 2.2, 2.3.3, 2.3.7, 2.6.1.

Module -2

Z- Transform and its Application to analysis of LTI Systems:

Direct Z-Transform, Properties of the Z-Transform, Examples, Inverse Z- Transform by Partial- Fraction Expansion method only, System Function of a LTI System, Causality and Stability (from H(z)).

Realization of Digital System: Direct Form I, Direct form II, cascade form and parallel form

Text 1: 3.1.1, 3.2, 3.4.3, 3.3.3, 3.5.3.

Text 2: 9.2,9.3

Module -3

DFT: Properties and Applications:

Definition and Problems on DFT & IDFT, DFT Properties – Periodicity, Linearity, Time Reversal, Circular Time Shift, Circular Frequency Shift, Circular Convolution, Multiplication of two DFTs & Circular Convolution, Parseval's Theorem, DFT in linear filtering. Introduction to FFT, 8-point DFT Computation using Radix-2 DIT-FFT & DIF-FFT methods only, relevant examples.

Text 1: 7.1.3, 7.2, 7.3.1, 8.1.3.

Module -4

IIR & FIR Filters:

IIR Filters: Low-pass filter specifications, IIR filter Design by Impulse Invariance & Bilinear Techniques, Design of Digital IIR filter by Butterworth approach, Examples. Magnitude response of lowpass Chebyshev Type I, II filter (Theoretical concept only)

FIR Filters: Design of FIR filters – Symmetric and Antisymmetric FIR filters, Design of Linear phase FIR filters by Rectangular Hamming & Hanning windows. Summary of window function characteristics (window shape, transition bandwidth, stop band attenuation, etc.). Implementation of FIR filters by direct form and Single-stage lattice structure only.

Text 1: 10.3.2, 10.3.3, 10.3.4, 9.3.1, 9.3.3, 9.3.4, 10.2.1,10.2.2, 10.2.7, 9.2.1, 9.2.4

Module -5

Multirate Digital Signal Processing & Adaptive Filters:

Introduction, Decimation Process, Interpolation Process, Digital Filter Bank, Adaptive Filters, LMS

adaptive algorithm, Applications, Features & Architectural of TMS320C54XX processor.
Text 2: 15.1,15.2,15.3,15.4,16.2,16.3,16.5,19.2,19.3.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry 16 marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Dimitris G Manolakis, John G. Proakis, "Digital Signal Processing: Principles, Algorithms, and Applications", 4th Edition, Pearson India, 2007.
2. V.Udayashankara, "Modern Digital Signal Processing", Third Edition, PHI 2016

Reference Books:

1. Simon Haykin and Barry Van Veen "Signals and Systems", John Wiley & Sons, 2nd edition
2. S K Mitra, "Digital Signal Processing", 4th Edition, McGraw-Hill, Year
3. Avtar Singh, "Digital Signal Processing Implementation", Brooks Cole

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Process Control Systems

Subject Code	: 15EI53		IA Marks	: 20
Number of Lecture Hours/Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits – 4 (Each module – 10 Hours)

Module -1

Introduction to Process Control and Final Control Operations:

Introduction, Process control principles, Process control block diagram, Control system evaluation, Analog and Digital Processing, Analog data representation.

Final Control: Introduction, Final control operation, Signal conversions, Actuators, Control elements. (Numerical problems on all topics)

Module -2

Controller Principles: Introduction, Process characteristics, Control system parameters, Discontinuous controller modes: Two position, multiposition, floating control modes. Continuous controller modes: Proportional (P), Integral (I), Derivative (D) control modes, Composite controller modes: PI, PD, PID modes. (problems on all types of controller modes**).**

Module -3

Analog Controllers: Introduction, General features, Electronic controllers**,** Error detector, Single mode, Composite controller modes, Pneumatic controllers, Design considerations. (Numerical problems on all topics).

Digital Controllers: Digital electronic methods, Simple alarms, Two position control, Multivariable alarms, Data logging, Supervisory computer control (SDC) and Direct digital control. Sampled data systems, Input data operations. Controller Modes Software-Error, P, I, D, & PID control mode software.

Module -4

Control-Loop Characteristics: Introduction, Control system configurations: single variable and cascade control, Multivariable control system. Control system quality: Definition and measure of quality. Stability: Transfer function and frequency dependence, stability criteria. Process loop tuning: Open-loop transient response method, Ziegler-Nichols method, Frequency response methods. (Numerical problems on all topics).

Basic Instrumentation symbols, Process instrumentation & drawing (P&ID) symbols.

Module - 5

Modeling and Simulation for Plant Automation: Introduction, definition of terms, Need of system modeling, Uses of system simulation, how to build the mathematical model of a plant, Model evaluation and improvement, modern tools for modeling and simulation of systems, application examples, future perspectives.

Multivariable & Intelligent Controllers:

Ratio control, Feed-forward control. Adaptive controller, Optimal control, Predictive control, Artificial intelligent based systems, Expert controller.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16 marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Process Control Instrumentation Technology by C. D. Johnson, 7th Edition, Pearson Education Private Limited, New Delhi 2002. (Modules 1, 2 3 & 4).
2. Computer Based Industrial Control by Krishna Kant, PHI, New Delhi 1997. (Module 5)

Reference Books:

1. Chemical Process Control – George Stephanopoulos, 4th Indian reprint, PHI Ltd., 1997.
2. Process/ Industrial Instruments and Control Handbook by D.M. Considine, 4th Edition, McGraw Hill International Edition, 1993.
3. Process dynamics and control by S.S.Bhagade and G.D.Nageshwar PHI publications New Delhi, 2011.
4. Lessons in Industrial Instrumentation by Tony R. Kuphaldt, Creative Commons Attribution License (open source textbook), Sept. 2008. (for basic instrumentation symbols, 6.5.1, 6.5.2, 6.5.3, 6.5.4, 6.5.9).
5. Instrument Engineers Handbook-Process Control Volume2 by Bela G. Liptak, Chilton Book Company/ Radnor, 3rd Edition, Pennsylyania, 1969.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Biomedical Instrumentation

Subject Code	: 15EI54		IA Marks	: 20
Number of Lecture Hours/ Week	: 04		Exam Marks	: 80
Total Number of Lecture Hours	: 50		Exam Hours	: 03

Credits – 4 (Each module – 10 Hours)

Module -1

Fundamentals of Biomedical Instrumentation: Sources of biomedical signals, Basic Medical Instrumentation system, Performance requirements of medical instrumentation systems. PC based medical instruments, General constraints in design of biomedical instrumentation systems.

Bioelectric Signals and Electrodes : Origin of Bioelectric signals, Types of bioelectric signals-ECG, EEG, EMG, Recording electrodes: Electrode – Tissue interface, polarization, skin contact- impedance, Silver-silver chloride
electrodes, Electrodes for ECG, EEG, EMG, Microelectrodes.

Module -2

Electrocardiograph: Physiology of the heart, Electrical activity of the heart and Electrocardiogram (ECG), Normal & Abnormal cardiac Rhythms, Block diagram-description of an Electrocardiograph, ECG leads, Effects of artifacts on ECG Recordings, Multi- channel ECG machine.

Electroencephalograph: Block diagram description of an Electroencephalograph, 10-20 electrode systems, computerized analysis of EEG.
Electromyograph, Biofeedback instrumentation.

Module -3

Patient Monitoring System: Bedside patient monitoring systems, Central monitors, Measurement of heart rate – Average heart rate meter, Instantaneous heart rate meter, Measurement of pulse rate, Definition of oximeter & Pulse oximeter.

Blood Pressure Measurement: Introduction, Indirect methods of blood pressure measurement: Korotkoff's method, Rheographic method, differential auscultatory technique, Oscillometric technique.

Measurement of Respiration Rate: Impedance pneumography, CO_2 method of respiration rate measurement, Apnoea detectors.

Module -4

Blood Flow Measurement: Electromagnetic blood flow meter- Principle and Square wave electromagnetic flowmeter. Doppler shift blood flow velocity meter, Blood flow measurement by Doppler imaging.

Cardiac Output Measurement: Measurement of continuous cardiac output derived from the aortic pressure waveform, ultrasound method.

Cardiac Pacemakers and Defibrillators: Need for cardiac pacemaker, External pacemaker, Implantable pacemaker, Types of Implantable pacemakers, Programmable pacemakers, Power sources for Implantable pacemaker.
Cardiac Defibrillator: Need for a Defibrillator, DC defibrillator, Pacer-Cardioverter-Defibrillator.

Module -5

Therapeutic Instruments:

Cardiac-assist devices, Pump oxygenators, Total artificial heart, Hemodialysis, Lithotripsy, Ventilators, Infant incubators, Drug infusion pumps, Ambulatory and Implantable Infusion systems, Anesthesia Machines, Electrosurgical unit.

Patient Safety: Electric shock hazards, Leakage currents, Electrical safety analyzer, Testing of Biomedical equipment

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16 marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Handbook of Biomedical Instrumentation - R.S.Khandpur, 2nd Edition, Tata McGraw- Hill, 2003 (Module 1, 2, 3, 4 & Module 5- Patient Safety)
2. Medical Instrumentation: Application and Design – John G Webster, 3rd Edition, John Wiley & Sons, 2006. (Module 5- Therapeutic Instruments)

Reference Book:

1. Biomedical Instrumentation & Measurement - Leslie Cromwell, Fred J Weibell & Erich A Pfeiffer, 2nd Edition, Prentice Hall of India, 2001.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

VLSI Design

(Common to EI, BM & ML)

Subject Code	: 15EI/BM/ML551		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Moore's law, speed power performance, nMOS fabrication, CMOS fabrication: n-well, p-well processes, BiCMOS, Comparison of bipolar and CMOS.

Basic Electrical Properties of MOS And BiCMOS Circuits: Drain to source current versus voltage characteristics, threshold voltage, transconductance.

Module -2

Basic Electrical Properties of MOS And BiCMOS Circuits: nMOS inverter, Determination of pull up to pull down ratio, nMOS inverter driven through one or more pass transistors, alternative forms of pull up, CMOS inverter, BiCMOS inverters, latch up.

Basic Circuit Concepts: Sheet resistance, area capacitance calculation, Delay unit, inverter delay, estimation of CMOS inverter delay, driving of large capacitance loads, super buffers, BiCMOS drivers.

Module -3

MOS and BiCMOS Circuit Design Processes: MOS layers, stick diagrams, nMOS design style, CMOS design style, design rules and layout, λ - based design.

Scaling of MOS Circuits: scaling factors for device parameters, limitations of scaling.

Module -4

Subsystem Design and Layout-1 : Switch logic pass transistor, Gate logic inverter, NAND gates, NOR gates, pseudo nMOS, Dynamic CMOS, example of structured design, Parity generator, Bus arbitration, multiplexers, logic function block, code converter.

Subsystem Design and Layout-2 : Clocked sequential circuits, dynamic shift registers, bus lines, subsystem design processes, General considerations, 4-bit arithmetic processes, 4-bit shifter.

Module -5

Design Process-Computational Elements: Regularity, design of ALU subsystem, ALU using adders, carry look ahead adders, Multipliers, serial parallel multipliers, Braun array, Bough – Wooley multiplier.

Memory, Register and Aspects of Timing: Three Transistor Dynamic RAM cell, Dynamic memory cell, Pseudo- Static RAM, JK Flip-flop, D Flip-flop circuits, RAM arrays, practical aspects and testability: Some thoughts of performance, optimization and CAD tools for design and simulation.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks

- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Basic VLSI Design -3rd Edition Douglas A Pucknell, Kamaran Eshraghian, Prentice Hall of India publication, 2005.

Reference Books:

1. CMOS Digital Integrated Circuits, Analysis And Design, 3rd Edition, Sung – Mo (Steve) Kang, Yusuf Leblbici, Tata McGraw Hill, 2002.
2. VLSI Technology - S.M. Sze, 2nd edition Tata McGraw Hill, 2003.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Aeronautical Instrumentation

Subject Code	: 15EI552		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Aircraft Instruments: Introduction-Qualitative and quantitative displays, basic T grouping of instruments, basics of Altitude Director Indicator (ADI) &Horizontal Situation Indicator.

Air Data Instruments: Pneumatic type and air data computers, International Standard Atmosphere (ISA), combined pitot-static probe, separate static probe, air speed indicator, instantaneous vertical speed indicator.

Module -2

Altimeters, **Air Data Warning System:** Mach warning system, altitude alerts system, airspeed warning system.

Module -3

Directional Systems: Earth's total magnetic field, horizontal and vertical components of total field direct reading compass and its limitations, fluxgate detector units. gyro stabilized direction indicating systems.

Module -4

Gyroscopic Flight Instruments: types of gyros-mechanical, ring laser gyros, fiber optic gyros and their limitations, basic mechanical gyro and its properties namely rigidity and precision, gyro horizon, direction indicator, turn and bank indicator.

Module -5

Engine Instruments: pressure measurement (EPR), Temperature measurement (EGT), capacitance type volumetric fuel quantity indicator, densitometer, fuel quantity indicator by weight. Engine speed measurement, torque measurement, integrated impellor type flow meter.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Aircraft Instruments and Integrated Systems- EHJ Pallet, Longman Scientific & Technical, 1992.

Reference Books:

1. Aircraft Instrumentation and Systems -S. Nagabhushana & L.K. Sudha, IK International
2. Aircraft Systems: Mechanical, electrical, and avionics subsystems integration - Ian Moir and Alla Seabridge, Third Edition, John Wiley & Sons, Ltd., 2008.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Remote Sensing and Telemetry

Subject Code	: 15EI553		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Introduction: Sun and Atmosphere, concept of signatures, remote sensing system, why observe earth from space? remote sensing – A Historic perspective, Indian remote sensing programme , the earth observation evolution – the paradigm shift legal and ethical aspects, electromagnetic radiation, velocity of EM radiation polarization coherent radiation, propagation of EM waves from one medium to another, attenuation, quantum of EM radiation ,thermal radiation, source of EM Radiation for remote sensing.

Module -2

Remote Sensors – Classification of remote sensors, optical – infrared sensors, photographic camera, television cameras, opto - mechanical scanners, opto-mechanical scanners operated from satellites, pushbroom cameras, hyper-spectral imager, measuring the third dimension, image quality aspects.

Microwave Sensors: Antenna, passive microwave sensors, active microwave sensors, side looking radar, scatterometer , platforms, principles of satellite motion, locating a satellite in space, types of Orbit, Orbital perturbations, the spacecraft, global positioning system(GPS).

Module -3

Data Reception and Data Products: Data formats, ground segment organization, data product generation, referencing scheme, data products output medium, IRS data products, special processing, data analysis, visual image analysis, digital classification, classification accuracy.

Module -4

Telemetry System: Introduction, fundamental of RF telemetry, basic telemetry, system components of coding resolution, pulse code modulation, PCM multiplexing and conversion, PCM data transmission, PCM PSD system. Theoretical comparison of telemetry systems.

Module -5

Applications of Remote Sensing for Earth Resources Management: Agriculture, forestry application, land cover/land use mapping water resources, snow and glacier, wetland management, marine fisheries, remote sensing for earth system science studies, geographical information system(GIS), date model, data entry data analysis example – urban land use suitability, spatial data infrastructure.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books: **1. Fundamentals of Remote Sensing** – by George Joseph, second Edition, Universities press, 2005.
Reference Books: **1. Advanced Remote Sensing** - Liang, Shunlin, Academic Press (an imprint of Elsevier), 2012.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Product Design Technology and Ergonomics

Subject Code	: 15EI554		IA Marks	: 20
Teaching Lecture Hours/ Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Introduction To product Design: Asimow's Model : Definition of product Design, Design by Evaluation, Design by Innovation, Essential Factors of Product Design, Flow and Value Addition in the Production-Consumption Cycle. The Morphology of Design (The seven Phase), Primary Design phase and flowcharting, role of Allowance, Process Capability.

Module -2

Product Design Practice and Industry: Introduction, Product Strategies, Time to Market, Analysis of the Product, The three S's, Standardization, Renard Series (Preferred Numbers), Simplification,
The Designer: The designer and His Role, Myth and Reality, The Industrial Design Organization, Basic Design Consideration, Problems faced by Industrial Designer, Procedure adopted by Industrial Designers,

Module -3

Productivity: Definition of productivity, individual enterprises, task of management Productivity of materials, land, building, machine and power.
Measurement of productivity, factors affecting the productivity, productivity improvement programs.

Module -4

Work Study: Definition, objective and scope of work study. Human factor in work study, Work study and management, work study and supervision, work study and worker.
Introduction to Work Measurement: Definition, objective and benefit of work measurement, Work measurement techniques

Module -5

Ergonomics: Introduction, Areas of study under Ergonomics, System approach to Ergonomics model, Man-Machine System. Components of Man-Machine System, Work capabilities of Industrial Worker.
Study of Development of Stress in Human body and their consequences, Computer based ergonomics.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Product Design and Manufacturing - A.C. Chitale and R.C. Gupta - PHI.

2. Introduction to work study, ILO - III Revised Edition, 1981
3. Work Study and Ergonomics - S Dalela and Sourabh, – Chand Publishers - 3rd edition.

References Books:

1. Product Design & Development – Karl T. Ulrich & Steven D., Epinger, TataMcGraw Hill - 3rd Edition, 2003.
2. Human Factors in Engineering Design - S Sanders and E J McCormick, McGraw Hill - 6th Edition.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Computer Organization

(Common to EI, BM & ML)

Subject Code	: 15EI/BM/ML561		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Basic Structure of Computers: Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. Machine Instructions and Programs: Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines.

Module -2

Input / Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.

Module -3

Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage.

Module -4

Arithmetic: Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers and Operations.

Module -5

Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control. Embedded Systems and Large Computer Systems: Examples of Embedded Systems, Processor chips for embedded applications, Simple Microcontroller. The structure of General-Purpose Multiprocessors.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.
-

Text Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.

Reference Books:

1. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester – III (Elective-I)

Material Science

Subject Code	: 15EI562		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Crystallography: Forces between atoms, bonding in solids, ionic, covalent and metallic bonding; Fundamental concepts of crystals, lattice points and space lattice, crystal systems, Bravais lattices, directions, planes and Miller indices, atomic packing fraction, structure of simple cubic, body centered cubic (CsCl), face centered cubic (NaCl), hexagonal closed packed (HCP), diamond structure; X-ray diffraction, Bragg's law.

Module -2

Characterization Techniques: X-ray diffraction, powder X – ray diffractometer, construction and working, crystalline phase analysis, fundamentals of transmission electron microscopy and scanning electron microscopy(SEM), study of crystal structure using TEM, study of microstructure using SEM, scanning electron microscopy with EDS, construction and working, grain size and chemical analysis atomic force microscopy, construction and working, scanning tunneling microscope, construction and working.

Module -3

Crystal Imperfections: Point defects, vacancies and self-interstitials, impurities in solids, dislocations, linear defects, interfacial defects, bulk or volume defects edge and screw dislocation.

Mechanical Behaviour: Elastic behaviour of metals, stress-strain relation, Hooke's law, atomic model of elastic behaviour, plasticity, ductile and brittle materials, tensile strength, hardness, fatigue, creep, fracture, types of fracture.

Module -4

Diffusion and Phase Transformation in Solids: Fick's laws of diffusion, experimental determination of diffusion coefficient, Kirkendall effect, atomic model of diffusion. Time scale of phase changes, nucleation and growth, nucleation kinetics, applications, solidification and crystallization, glass transition.

Module -5

Nanoscience: Overview of nanotechnology, quantum effect, nanotechnology in nature, energy levels in nano-films, nano-wires and nano-dots. Growth techniques, physical vapor deposition, ball milling, lithography techniques, properties at nanoscale, size dependence, structural, chemical, optical, mechanical, electrical and magnetic properties. Applications of Nanomaterials: Sensors and actuators, catalysis, biomedical, advanced electronic materials, current challenges and future trends, safety and societal implications.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.

- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. V. Raghavan, Materials Science and Engineering: A First Course, Prentice Hall of India, 2007.
2. Charles P. Poole, Frank J. Owens, Introduction to Nanotechnology, John Wiley and Sons, 2007.

Reference Books:

1. S. O. Pillai, Solid State Physics, New Age International, 2008.
2. M. Arumugam, Materials Science, Anuradha Agencies, Kumbhakonam, 2007.
3. RakeshRathi, Nanotechnology: Technology Revolution of 21st Century, S. Chand, 2009.

B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Operating Systems
(Common to EI & BM)

Subject Code	**: 15EI/BM563**		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Introduction to Operating Systems: What operating systems do, Computer System Organization, Architecture and Operations, Process Management, memory management, Storage Management, Protection and Security, Computing Environments.

Operating system structures: OS Services, User-OS Interface, System calls, System programs, OS structure, System Boot.

Text: 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8, 1.9, 1.11, 2.1, 2.2, 2.3, 2.5, 2.7, 2.10.

Module -2

Process Management

Processes: Process concept, Process scheduling, Operation on processes, Inter process communication.

Threads – Overview, Multithreading models, Threading issues.

CPU scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, real time scheduling.

Text: 3.1, 3.2, 3.3, 3.4, 4.1, 4.3, 4.6, 6.1, 6.2, 6.3, 6.6

Module -3

Process Synchronization: Background, The critical section problem, Peterson's Solution, Synchronization hardware, Mutex Locks, Semaphores, Classical problems of synchronization, Monitors.

Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock.

Text: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 7.1, 7.2, 7.3, 7.4, 7.5, 7.5, 7.6, 7.7.

Module -4

Memory management:

Main Memory: Background, Swapping, Contiguous, allocation, Paging.

Virtual memory: Background, Demand paging, Copy-on-write, Page replacement.

Text: 8.1, 8.2, 8.3, 8.5, 9.1, 9.2, 9.3, 9.4.

Module -5

Storage Management:

Mass storage structure: Overview of mass storage structure, Disk structure, Disk scheduling, Disk management, Swap space management.

File System Interface: File concept, Access methods, Directory and Disk structure, File system mounting, Protection.

File System Structure: File system structure, File system implementation, Directory implementation, Allocation methods, and free space management.

Text: 10.1, 10.2, 10.4, 10.5, 10.6, 11.1, 11.2, 11.3, 11.4, 11.6, 12.1, 12.2, 12.3, 12.4, 12.5

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. Operating System Concepts-by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, **9th Edition**, John Wiley &Sons 2016 (India Edition).

Reference Books:

1. Operating system concepts and design- Milan Milankovic, 2nd Edition, McGraw Hill 1992.
2. Operating systems- Harvey M Deital Addison Wesley 1990.
3. Operating Systems concepts based approach, D.MDhamdhere, Tata McGraw Hill 2002.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Fundamentals of Nanotechnology

Subject Code	: 15EI564		IA Marks	: 20
Number of Lecture Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 40		Exam Hours	: 03

Credits – 3 (Each module – 8 Hours)

Module -1

Foundations in Nanosciences : Introduction, Scientific Revolutions, Basic Science behind Nanotechnology, Nanometer: How Big or Small, Nanotechnology, Materials at Nano scale, Quantum Confinement in Nanomaterial , Rationale behind the Downsizing of the Materials , Size and Shape Matter.

Module -2

The Rising Carbon in the Nanoworld : Introduction, Carbon: The Versatile Element in the Nanoworld, Graphite, Diamon, Fullerenes, Graphene, Carbon Nanotubes.

Module -3

Prime Materials in Nanotechnology: Introduction, Nanomaterial: Natural and Man Made, Semiconductor Nanomaterial, Ceramic Nanomaterial, Polymers and Composites, Metal Nanoparticles, Biomaterials.

Module -4

Nano scale Characterization: Introduction, Scanning Electron Microscope, Transmission Electron Microscope, Scanning Tunneling Microscope , Atomic Force Microscope , X-Ray Diffraction , Raman Spectroscopy.

Module -5

Nanotech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Energy Applications, Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology.

Question Paper Pattern:

- The question paper will have TEN questions.
- Each full question carry16marks
- There will be TWO full questions (with maximum of THREE sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text Books:

1. M.A. Shah, K.A. Shah, "Nanotechnology: The Science of Small", Wiley India, ISBN 13: 9788126538683

Reference Books:

1. Charles Poole, Frank Owens, "Introduction to Nanotechnology", Wiley India, Student Edition
2. Mark A. Ratner, Daniel Ratner, "Nanotechnology: A Gentle Introduction to the Next Big Idea", 2003, Prentice Hall.

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Signal Conditioning Circuits and Data Acquisition Lab

(Common to EI, BM & ML)

Subject Code	: 15 EI/BM/ML L57	IA Marks	: 20
Number of Practical Hours/Week	: 03	Exam Marks	: 80
Total Number of Practical Hours	: 42	Exam Hours	: 03

Credits - 2

Revised Bloom's Taxonomy Levels: L1 – Remembering, L2 – Understanding, L3 – Applying, L4 –Analyzing, L5 – Evaluating, and L6 - Creating

Laboratory Experiments: **Note:** Standard design procedure to be adopted Students should build the circuit using discrete components and ICs (models are not to be used)	**Revised Bloom's Taxonomy (RBT)Level**
1. To design and implement • Inverting Amplifier and Inverting Attenuator • Non-Inverting Amplifier and Voltage Follower	L3, L4
2. To realize • Full wave Precision rectifier	L3, L4
3. To design and implement • Butterworth I order Low-pass filter • Butterworth II order High-pass filter	L3, L4
4. To design and implement • RC Phase shift oscillator • Wein Bridge oscillator	L3, L4
5. To realize • ZCD • Positive and Negative Voltage level detectors	L3, L4
6. To design and implement • Astable Multivibrator using 555 timer • Mono-stable Multivibrator using 555 timer	L3, L4
7. To realize • Sample and Hold circuit using discrete components	L3, L4
8. To realize • Programmable Gain Amplifier using Analog Mux	L3, L4
9. To design and implement • 4 bit R-2R DAC using discrete components	L3, L4
10. To design and implement • 8-bit DAC using IC (DAC 0800)	L3, L4
11. To design and implement • 8-bit ADC using IC (ADC 0809)	L3, L4
12. To design and implement • 3 bit Flash ADC using ICs	L3, L4

Conduct of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
4. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Reference Books:

1. "Linear Integrated Circuits", D. Roy Choudhury and Shail B. Jain, 4th edition, Reprint 2010, New Age International.
2. "Op - Amps and Linear Integrated Circuits", Ramakant A. Gayakwad, 4th edition, PHI.
3. "A course in Electrical & Electronic Measurements & Instrumentation", A K Sawhney, Dhanpat Rai Publications, 19th edition, 2011.
4. "Operational Amplifiers and Linear Integrated Circuits", Robert. F. Coughlin &Fred. F. Driscoll, PHI/Pearson, 2006
5. "Op - Amps and Linear Integrated Circuits", James M. Fiore, Thomson Learning, 2001
6. "Design with Operational Amplifiers and Analog Integrated Circuits", Sergio Franco, TMH, 3e, 2005

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B.E. Electronics and Instrumentation Engineering (EI)
Choice Based Credit System (CBCS)
Semester - V

Digital Signal Processing Lab

Subject Code	: 15EIL58		IA Marks	: 20
Number of Hours/Week	: 03		Exam Marks	: 80
Total Number of Lecture Hours	: 1I+2P		Exam Hours	: 03

Credits -2

USING ONLY MATLAB / SCILAB/OCTAVE	
1	Verify the Sampling theorem.
2	Determine linear convolution, Circular convolution and Correlation of two given sequences. Verify the result using theoretical computations.
3	Determine the linear convolution of two given point sequences using FFT algorithm.
4	Determine the correlation using FFT algorithm.
5	Determine the spectrum of the given sequence using FFT.
6	Design and test FIR filter using Windowing method (Hamming Hanning and Rectangular window) for the given order and cut-off frequency.
7	Design and test Butterworth 1st and 2nd order low & high pass filter.
8	Design and test Chebyshev 1st and 2nd order low & high pass filter.
USING DSP KIT / EMULATORS FROM TI/ ADSP SHARC/ MOTOROLA	
9	Linear convolution of two given sequences.
10	Circular convolution of two given sequences
11	Computation of N-point FFT of a given sequence.
12	Implementation of an FIR filters to meet given specifications.
13	Implementation of an IIR filters to meet given specifications.

Reference Books:

1. Roberto Cristi, "Modern Digital Signal Processing", 2003, Nelson Engineering
2. Vinay K. Ingle (Author), John G. Proakis, "Digital Signal Processing Using MATLAB", 3rd Edition, CL Engineering.
3. V.Udayashankara, "Modern Digital Signal Processing", Third Edition, PHI 2016
4. John Proakis, Dimitris G Manolakis, "Digital Signal Processing Principles", Algorithms and Application", PHI, 3rd Edition (2000).
5. S K MITRA, "Digital Signal Processing", 4th Edition, McGraw-Hill.
6. Avtar Singh, S. Srinivasan, "Digital Signal Processing Implementation", Brooks Cole.
7. S. Salivahana, A.Vallavaraj, Gnanapriya, "Digital Signal Processing", McGraw-Hill, 2nd Edition (2000).