JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech. in ELECTRONICS AND INSTRUMENTATION ENGINEERING
III YEAR COURSE STRUCTURE AND SYLLABUS (R18)
Applicable From 2018-19 Admitted Batch

III YEAR I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	EC501PC	Microprocessor & Microcontrollers	3	1	0	4
2	EI502PC	Process Dynamics and Control	3	1	0	4
3	EC503PC	Control Systems	3	1	0	4
4	SM504MS	Business Economics & Financial Analysis	3	0	0	3
5		Professional Elective - I	3	0	0	3
6	EC505PC	Microprocessor & Microcontrollers Lab	0	0	3	1.5
7	EI506PC	Process Control Lab	0	0	3	1.5
8	EN508HS	Advanced Communication Skills Lab	0	0	2	1
9	*MC510	Intellectual Property Rights	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

III YEAR II SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	EI601PC	Industrial Automation	3	1	0	4
2	EC602PC	Digital Signal Processing	3	1	0	4
3	EI603PC	Object Oriented Programming through Java	3	1	0	4
4		Professional Elective - II	3	0	0	3
5		Open Elective - I	3	0	0	3
6	EC604PC	Digital Signal Processing Lab	0	0	3	1.5
7	EI605PC	Industrial Automation Lab	0	0	3	1.5
8	EI606PC	Object Oriented Programming through Java Lab	0	0	2	1
9	*MC609	Environmental Science	3	0	0	0
		Total Credits	**18**	**3**	**8**	**22**

***MC - Environmental Science – Should be Registered by Lateral Entry Students Only.**

Note: Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

Professional Elective – I

EI511PE	Instrumentation Practices in Industries
EI512PE	Operating Systems
EI513PE	Robotics and Automation

Professional Elective - II

EI611PE	Optoelectronics and Laser Instrumentation
EI612PE	Industrial Data Communications
EI613PE	Embedded Systems

EC501PC: MICROPROCESSORS AND MICROCONTROLLERS

B.Tech. III Year I Semester

L	T	P	C
3	1	0	4

Course Objectives:

1. To familiarize the architecture of microprocessors and micro controllers
2. To provide the knowledge about interfacing techniques of bus & memory
3. To understand the concepts of ARM architecture
4. To study the basic concepts of Advanced ARM processors

Course Outcomes: Upon completing this course, the student will be able to

1. Understands the internal architecture, organization and assembly language programming of 8086 processors
2. Understands the internal architecture, organization and assembly language programming of 8051/controllers
3. Understands the interfacing techniques to 8086 and 8051 based systems
4. Understands the internal architecture of ARM processors and basic concepts of advanced ARM processors

UNIT - I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT - II:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT – III:

I/O and Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT –IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT – V:

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP-L138 Experimenter, Donald Reay, WILEY 2012.

EI502PC: PROCESS DYNAMICS AND CONTROL

B.Tech. III Year I Semester

L	T	P	C
3	1	0	4

Course Objectives: Student will be able to

1. **Identify** and monitor process parameters of various processes.
2. **Understand** the principles of controllers, degrees of freedom, and control valves.
3. **Recognize** these principles written in form of mathematical equations for various control applications.
4. **Apply** these equations to analyze problems by making good assumptions and learn systematic engineering method to solve practical process control problems.

Course Outcomes: After completion of the course the student is able to:

1. Apply fundamental knowledge of mathematics to modeling and analysis of fluid flow, level, pressure, temperature problems.
2. Conduct experiments in pipe flows and open-channel flows and interpreting data from model studies to prototype cases. Documenting them in engineering reports.
3. Understand the possible disasters caused by an in correct Design/Analysis in hydraulic, pneumatic engineering system.
4. Apply multi loop control systems in various process industries.

UNIT I

Process Dynamics

Process variables – Load variables – Dynamics of simple pressure, flow, level and temperature process – interacting and non-interacting systems – continuous and batch process – self-regulation – Servo and Regulator operation - problems.

UNIT II

Control Actions and Controllers and Types of Controllers

Basic control actions – characteristics of two position, three position, Proportional, Single speed floating, Integral and Derivative control modes – PI, PD, PID control modes – Problems -types of controllers -Pneumatic, Hydraulic and Electronic Controllers to realize various control actions.

UNIT III

Controller Settings and Tuning of Controllers

Evaluation criteria – 1/4th decay ratio, I AE, ISE,ITSE, ITAE - determination of optimum settings for mathematically described process using time response and frequency response-tuning of controllers-process curve reaction method – continuous oscillation method – dampedoscillation method – problems.

UNIT IV

Final Control Elements and Control Valves

I/P Converter, P/I converter - pneumatic, electric and hydraulic actuators – valve Positioned Control valves – characteristic of control valves – valve body – Globe, Butterfly, diaphragm, Ball valves – Control valve sizing – Cavitations, flashing - problems.

UNIT V

Multiloop Control System

Feed forward control – Feed Forward Feedback Controller (FFFBC) – Ratio control – Cascade control – Split range – Multivariable control and examples from distillation column, Boiler system and heat exchanger.

TEXT BOOKS

1. Automatic Process Control – by Eckman D.P., Wiley Eastern Ltd., New Delhi, 1993.
2. Process Control Instrumentation technology by Curtis. D. Johnson, Edition 8, PHI Publishers

REFERENCES

1. Chemical Process Control: An introduction to Theory and Practice – by Stephanopoulos, Prentice Hall, New Delhi, 1999
2. Process Control, Third Edition – Liptak B.G., Chilton Book Company, Pennsylvania, 1995
3. Process control – by Pollard A., Heinemann Educational Books, London, 1971.
4. Process Control – Harriott P, TMH, 1991
5. Process Control – by Patranabis.

EC503PC: CONTROL SYSTEMS

B.Tech. III Year I Semester

L	T	P	C
3	1	0	4

Prerequisite: Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms, Numerical Methods and Complex variables

Course objectives:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the modeling of linear-time-invariant systems using transfer function and state-space representations.
- Understand the concept of stability and its assessment for linear-time invariant systems.
- Design simple feedback controllers.

UNT - I

Introduction to Control Problem: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

UNT - II

Time Response Analysis of Standard Test Signals: Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNT - III

Frequency-Response Analysis: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

UNT - IV

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNT - V

State Variable Analysis and Concepts of State Variables: State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

TEXT BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

SM504MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Objective: To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

UNIT – I: Introduction to Business and Economics

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II: Demand and Supply Analysis

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT- III: Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV: Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT - V: Financial Analysis through Ratios: Concept of Ratio Analysis, Importance, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

EI511PE: INSTRUMENTATION PRACTICES IN INDUSTRIES (PE – I)

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Objectives: Student will be able to

1. **Identify** and quantitatively estimate different materials required for the manufacturing of Cement, Pulp, Paper, food, Power and pharmacy.
2. **Understand** the principles of different manufacturing processes.
3. **Recognize** these principles written in form of mathematical & chemical equations.
4. **Apply** these equations to analyze problems by making good assumptions and learn systematic engineering method to solve practical industrial problems.

Course Outcomes: After completion of the course the student is able to:

1. **Apply** fundamental knowledge of chemistry & instrumentation to modeling and analysis of different Industrial engineering.
2. **Understand** disasters caused by an in correct analysis/design indifferent Industrial engineering system.
3. Students will **demonstrate** a working knowledge of the basic principles of measuring techniques, and demonstrate technical knowledge and skills in the calibration and use of equipment used in different industrial process measurement and control.
4. Students will **demonstrate** a working knowledge of safety practices and skills in trouble-shooting problems used in the measurement and control in industrial processes

UNIT - I

Cement Industries

Corrosion Analyzer Porositester Compressive strength measurement, Blast Furnace Temperature Measurement using Radiation Pyrometers.

UNIT - II

Pulp and Paper Industries

Manufacture of pulp: Raw materials, Pulping processes, Craft pulping, Soda pulping, Sulfite pulping, Semi chemical pulping, Mechanical and Thermo mechanical Pulping.

Manufacture of paper: Wet Processing, Fourdrinier Machine, Coated Papers, Special Papers.

Wet-end Instrumentation:

Pressure: Force Balanced, Bell and Limp or Slack type systems

Temperature: Liquid in Glass, Thermal bulbs, Resistance Bulbs

Liquid Density and Specific Gravity: Fixed Volume, Differential Pressure, Nuclear Radiation Level: Liquid Level- Continuous Purge Instrument, Diaphragm box, Float and Cable, Capacitive.

Solid Level- Diaphragm solids.

Flow: Tapered tube & float type meter, Cylinder & Piston type meter, Weir and Flumes Consistency: Atmospheric with Driven and Atmospheric with Stationary Sensors.

pH: pH Electrode system, types of electrodes.

Oxidation Reduction Potential (ORP): ORP Electrode system, electrode holders.

Freeness: Continuous Sample and Intermittent Sample Systems.

Dry-end Instrumentation:

Moisture: Conductivity, Resistance, Capacitance, Hygroscopic, Infrared Absorption type systems

Basis Weight: Transmission type, On-Machine type, Off-Machine type and Backscatter type systems

Caliper or Thickness: Contacting type- Electrical, Mechanical and Electro Mechanical, Non-Contacting type

UNIT - III

Petroleum Industries

Unit Operations: Distillation, Drying Separation Measurements in refineries petrochemical industries – Differential pressure transmitter, Thermocouples Infrared Pyrometer, Mass flow meters, Potentiometric level Transmitter, Vacuum Measurement, Near Infrared Analyzer, Hydro Carbon Dew point meter IR Spectrometry, Mass Spectrometry, Flame Ionization Detectors, Chromatography.

UNIT - IV

Nuclear Power Plant

Introduction, The power plant scheme, Pressure, flow and level measurement, Vibration and expansion measurements, Analysis of impurities in cooling water, Flue Gas analysis, Ultrasonic Thermometry, Radiation Pyrometry, Emittance measurement.

UNIT - V

Food Processing and Allied Industries

Chromatography, Spectrometry – Mass Spectrometer, Toxicity meter.

TEXT BOOKS

1. Chemical Process Industries, Austin G.T. Shreeves, McGraw-Hill International student edition, Singapore, 1985
2. Pulp and Paper Industry Technology & Instrumentation, Sankaranarayana, P.E., Kothari's Desk book.

REFERENCES

1. An Introduction to Paper Industry Instrumentation, John R Lavigne, Miller Freeman Publications, California, 1985 Series.
2. Process Measurement and Analysis, Liptak B.G., Third edition, Chilton book Company, 1996.
3. Measurement and Control in Papermaking, Robert J. McGill, Adam Hilger Limited, Bristol, 1980.
4. Process/ Industrial Instruments and Controls Hand Book, Gregory K. McMillan, Doigas M. Considine.
5. Instrumentation in Process Industries, Liptak B.G., Chilton book Company, 1994.

EI512PE: OPERATING SYSTEMS (PE – I)

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix

Course Outcomes:

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computer and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

UNIT - I

Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

UNIT - II

Process and CPU Scheduling - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.

System call interface for process management-fork, exit, wait, waitpid, exec

UNIT - III

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

EI513PE: ROBOTICS AND AUTOMATION

B.Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Objectives: Student will be able to

1. **Classification** by coordinate system and control system
2. **Acquire Knowledge** on Different types Power Sources and Sensors
3. **Classification** of Manipulators, Actuators and Grippers
4. **Acquire Knowledge** on kinematics and Applications of different Robots

Course Outcomes: After completion of the course the student is able to:

1. **Acquire knowledge** on different types of Power Sources (actuators) and Sensors, Classification Of Manipulators, Actuators and Grippers
2. **Acquire knowledge** on different applications of various types of robots.
3. **Analyze** the direct and the inverse kinematic problems and calculate the manipulator dynamics
4. Able to **identify** the applications of robots in different process operations.

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UNIT I: Basic Concepts & Power Sources Fundamentals:
An over view of Robotics, classification of Robots, Robot Components, Robot degreesof freedom, Robot Joints, Robot Coordinates, Robot reference frames, Programming modes, Robot Characteristics.
Actuators:
Characteristics of activating system, comparison of activating system Hydraulic devices, Pneumatic devices, electric motors, magnetostrictive actuators.

UNIT II: Sensors, Manipulators and Grippers
Sensors: Sensors characteristics, Position sensors, velocity sensors, acceleration sensors, torque sensors, micro switches, lighten infrared sensors, touch and tactile sensors, proximity sensors, range finders.

Grippers: Robot end effectors, Classification, drive system for Gripper, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers, Hooks, Scoops and other Miscellaneous Devices, Gripper force Analysis and Gripper Design, Active and passive Grippers.

UNIT III: Kinematics
Matrix representation of translational and Rotational motion – Homogeneous Transformation- DH representation of standard configuration Robots- Inverse Kinematics. Joint space vs. Cartesian space- Basics of Trajectory planning in joint and Cartesian space.

UNIT IV: Low level and high-level vision
Image acquisition, Illumination Techniques, Imaging Geometry, Some Basic Relationships between Pixels, Segmentation, Description, Segmentation and Description of 3-D Structures, Recognition, Interpretation.

UNIT V: Robot Applications
Material Transfer and Machine loading/unloading: General Considerations in Robot Material Handling, Material Transfer application, Machine loading and unloading. Liquid handling and pumping.
Processing operations: Spot welding, Continuous Arc Welding, Spray Coating, other processing operations using Robots.
Assembly and Inspection: Assembly and Robot Assembly automation, Parts Presentation methods, Assembly operations, compliance and the Remote Center Compliance (RCC) Device, Assembly system configuration, Adaptable-Programmable assembly system, Designing for Robotic Assembly, Inspection Automation.

TEXT BOOKS:

1. Mikell. P, Weiss.G. M, Nage. l R. N and Odraj .N.G, ll*Industrial Robotics"*, McGraw Hill Singapore, 1996.
2. Ghosh, ll*Control in Robotics and Automation: Sensor Based Integration"*, Allied Publishers, Chennai, 1998.

REFERENCES:

1. Deb. S.R, ll*Robotics technology and flexible Automation"*, John Wiley, USA 1992.
2. Asfahl. C.R, —*Robots and manufacturing Automation"*, John Wiley, USA 1992.
3. Klafter. R. D, Chimielewski. T. A, Negin. M, —*Robotic Engineering – An integrated approach"*, Prentice Hall of India, New Delhi, 1994.

EC505PC: MICROPROCESSORS AND MICROCONTROLLERS LAB

B.Tech. III Year I Semester

L	T	P	C
0	0	3	1.5

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32 Bit Data.
  2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (6 weeks)

- Introduction to IDE
  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of 8051.
  3. Serial Communication from / to 8051 to / from I/O devices.
  4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer0 8051 in 8bit Auto reload Mode and Connect a 1HZ Pulse to INT1 pin and Display on Port0. Assume Crystal Frequency as 11.0592 MHZ

Cycle 3: Interfacing I/O Devices to 8051(5 Weeks)

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

TEXT BOOKS:

1. Advanced Microprocessors And Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
2. The 8051 **Microcontrollers**: Architecture, Programming & Applications by Dr. K. Uma Rao, Andhe Pallavi, Pearson, 2009.

EI506PC: PROCESS CONTROL LAB

B.Tech. III Year I Semester

L	T	P	C
0	0	3	1.5

Course Objective: To provide better familiarity with the Theoretical concepts studied.

Course Outcomes: Upon completing these course students shall be able realize the process and different controls applied to each process.

Minimum Twelve experiments should be conducted.

1. Study of Electronic controllers.
2. Control valve characteristics (Different types).
3. Control of Flow process
4. Interacting and Non- interacting systems.
5. Control of Temperature process
6. Process tuning – Process reaction curve method.
7. Tuning of PID controller
8. Operation of flow loop in plant.
9. Pneumatic actuator.
10. Hydraulic actuator.
11. Multi loop control systems – Ratio Control.
12. Multi loop control systems – Cascade Control.
13. Feed-forward control.

EN508HS: ADVANCED COMMUNICATION SKILLS LAB

B.Tech. III Year I Semester

L	T	P	C
0	0	2	1

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

*MC510: INTELLECTUAL PROPERTY RIGHTS

B.Tech. III Year I Semester

L	T	P	C
3	0	0	0

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

EI601PC: INDUSTRIAL AUTOMATION

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Course Objectives: Student will be able to

1. It is to **provide** and **ensure** a comprehensive understanding of using personal computers in measurement and control instrumentation.
2. **Learn** the process of collecting information/ data through PC from real world sources.
3. **Learn** remote and networked data acquisition and operating system.
4. **Learn** programmable logic controllers, and its application.

Course Outcomes: After completion of the course the student is able to:

1. Understand the main functional units in a PC and be able to explain how they interact. They should know different bus types, and on this basis be able to distinguish account for different generations of PCs.
2. Understand the basics of PLC and its programming.
3. Apply different PLC functions to applications.
4. Learn the basics of SCADA.

UNIT - I

Review of Computer Instrument Communication: Personal Computer, Overview of operating System, I/O Ports, Plug-in-slots, PCI bus, Operators Interface. Computer Interfacing for Data Acquisition and Control – Interfacing Input Signals, Output system with continuous actuators. Data Acquisition and Control using Standard Cards: PC expansion systems, Plug-in Data Acquisition Boards; Transducer to Control room, Backplane bus – VXI.

UNIT - II

Programmable logic controller (PLC) basics: Definition, Overview of PLC systems, input/output modules, Power supplies and Isolators.

Basic PLC programming: Programming On-Off inputs/ outputs. Creating Ladder diagrams, Basic PLC functions, PLC Basic Functions, register basics, timer functions, counter functions.

UNIT - III

PLC intermediate and advanced functions: Arithmetic functions, Number comparison functions, Skip and MCR functions, data move systems. Utilizing digital bits, sequencer functions, Matrix functions. PLC Advanced functions: Analog PLC operation, Networking of PLC,

UNIT - IV

Application of PLC: Controlling of Robot using PLC, PID control of continuous processes, Continuous Bottle-filling system, Batch mixing system, 3-stage air conditioning system, Automatic frequency control of Induction heating

Related Topics: Alternate programming languages. Auxiliary commands and functions. PLC installation, troubleshooting and maintenance. Field bus: Introduction, concept. HART protocol: Method of operation, structure, and applications. Smart transmitters, smart valves and smart actuators.

UNIT V

Scada Basics: Computer Process interface for Data Acquisition and control – Computer control loops. – Supervisory Digital Control (SCADA) - introduction and brief history of SCADA – SCADA Hardware and software – Landlines for SCADA – use of modems in SCADA – SCADA with LAN

TEXT BOOKS

1. Programmable Logic Controllers – Principles and Applications, John. W. Webb Ronald A Reis, Fourth edition, Prentice Hall Inc., New Jersey, 1998.
2. Computer Control of Processes – M. Chidambaram. Narosa 2003

REFERENCES

1. Introduction to Programmable Logic Controllers - Gary Dunning Thomson Delmar Learning Second Edition Second reprint 2003.
2. PC Based Instrumentation and Control Third Edition by Mike Tooley; Elsevier.
3. PC Interfacing and Data Acquisition Techniques for Measurement, Instrumentation and Control. By Kevin James; Elsevier.
4. Practical Data Acquisition for Instrumentation and Control Systems by John Park and Steve Mackay.
5. Programmable Logic Controllers, Second edition, Frank D. Petruzella, Mc Graw Hill, New York, 1997.

EC602PC: DIGITAL SIGNAL PROCESSING

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Prerequisite: Signals and Systems

Course Objectives:

1. To provide background and fundamental material for the analysis and processing of digital signals.
2. To understand the fast computation of DFT and appreciate the FFT processing.
3. To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specifications.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects**.**

Course Outcomes: Upon completing this course, the student will be able to

1. Understand the LTI system characteristics and Multirate signal processing.
2. Understand the inter-relationship between DFT and various transforms.
3. Design a digital filter for a given specification.
4. Understand the significance of various filter structures and effects of round off errors

UNIT I:

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

UNIT II:

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT III:

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT IV:

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT V:

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS:

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

REFERENCES:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

EI603PC/EC611PE: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech. III Year II Semester

L	T	P	C
3	1	0	4

Course Objectives:

1. Introduces Object Oriented Programming Concepts Using The Java Language
2. Introduces The Principles Of Inheritance And Polymorphism; And Demonstrates How They Relate To The Design Of Abstract Classes.
3. Introduces The Implementation Of Packages And Interfaces.
4. Introduces Exception Handling, Event Handling and Multithreading.
5. Introduces The Design Of Graphical User Interface Using Applets And Swings.

Course Outcomes:

1. Develop Applications for Range of Problems Using Object-Oriented Programming Techniques
2. Design Simple Graphical User Interface Applications.

UNIT - I:

Object Oriented Thinking and Java Basics: Need for OOP Paradigm, Summary of OOP Concepts, Coping with Complexity, Abstraction Mechanisms, A Way of Viewing World – Agents, Responsibility, Messages, Methods, History of Java, Java Buzzwords, Data Types, Variables, Scope and Life Time of Variables, Arrays, Operators, Expressions, Control Statements, Type Conversion and Casting, Simple Java Program, Concepts of Classes, Objects, Constructors, Methods, Access Control, This Keyword, Garbage Collection, Overloading Methods and Constructors, Method Binding, Inheritance, Overriding and Exceptions, Parameter Passing, Recursion, Nested and Inner Classes, Exploring String Class.

UNIT - II:

Inheritance, Packages and Interfaces: Hierarchical Abstractions, Base Class Object, Subclass, Subtype, Substitutability, Forms of Inheritance- Specialization, Specification, Construction, Extension, Limitation, Combination, Benefits of Inheritance, Costs of Inheritance. Member Access Rules, Super Uses, Using Final with Inheritance, Polymorphism- Method Overriding, Abstract Classes, The Object Class.

Defining, Creating and Accessing a Package, Understanding Classpath, Importing Packages, Differences between Classes and Interfaces, Defining an Interface, Implementing Interface, Applying Interfaces, Variables in Interface and Extending Interfaces, Exploring Java.IO.

UNIT - III:

Exception Handling and Multithreading: Concepts of Exception Handling, Benefits of Exception Handling, Termination or Resumptive Models, Exception Hierarchy, Usage of Try, Catch, Throw, Throws and Finally, Built in Exceptions, Creating Own Exception Sub Classes.

String Handling, Exploring Java.Util, Differences between Multi-Threading and Multitasking, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Interthread Communication, Thread Groups, Daemon Threads.

Enumerations, Autoboxing, Annotations, Generics.

UNIT - IV:

Event Handling: Events, Event Sources, Event Classes, Event Listeners, Delegation Event Model, Handling Mouse and Keyboard Events, Adapter Classes.

The AWT Class Hierarchy, User Interface Components- Labels, Button, Canvas, Scrollbars, Text Components, Check Box, Check Box Groups, Choices, Lists Panels – Scrollpane, Dialogs, Menubar, Graphics, Layout Manager – Layout Manager Types – Border, Grid, Flow, Card and Grid Bag.

UNIT - V:

Applets: Concepts f Applets, Differences between Applets and Applications, Life Cycle of an Applet, Types of Applets, Creating Applets, Passing Parameters to Applets.

Swing: Introduction, Limitations of AWT, MVC Architecture, Components, Containers, Exploring Swing- Japplet, Jframe and Jcomponent, Icons and Labels, Text Fields, Buttons – The Jbutton Class, Check Boxes, Radio Buttons, Combo Boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java the Complete Reference, 7th Edition, Herbert Schildt, TMH.
2. Understanding OOP with Java Updated Edition, T. Budd, Pearson Education.

REFERENCES:

1. An Introduction to Programming and OO Design using Java, J. Nino and F.A. Hosch, John Wiley & Sons.
2. An Introduction to OOP, Third Edition, T. Budd, Pearson Education.
3. Introduction to Java Programming, Y. Daniel Liang, Pearson Education.
4. An Introduction to Java Programming and Object-Oriented Application Development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary Cornell, Eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, eighth Edition, Pearson Education

EI611PE: OPTOELECTRONICS AND LASER INSTRUMENTATION (PE – II)

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Course Objectives: Student will be able to

1. **Understand** the principles of optics and lasing action, Design of lasers.
2. **Apply** the knowledge of Optics to fibers and understand the different industrial applications of Optical Fibers.
3. **Learn** the various applications of Lasers in Instrumentation.
4. **Understand** the Opto-Electronic devices and their principles of operation along with their applications.

Course Outcomes: After completion of the course the student is able to:

1. Apply fundamental knowledge of Optics and lasers to design application specific optical fiber.
2. Apply Lasers in Instrumentation for the measurement of Industrial parameters like Pressure, Temperature, and Level and find the solutions for the errors.
3. Understand the advantages of using Lasers in the measurements.
4. Understand the applications of Lasers in medicine.

UNIT - I

Optical Fibers and Their Properties

Introduction to optical fiber - fiber characteristics - principles of light propagation through a fiber - Different types of fibers and their properties - Losses in the optical fiber - Dispersion - advantages and disadvantages of optical fibers.

UNIT - II

Opto-Electronic Components

Optical sources: LED, LD - Optical detectors: PIN, APD - Electro-optic, Magneto optic and Acousto-optic Modulators.

UNIT - III

Industrial Applications of Optical Fibers

Interferometer method of measurement of length – Moire fringes – Measurement of pressure, Temperature, Current, Voltage, Liquid level and Strain - fiber optic Gyroscope – Polarization maintaining fibers – Applications, Bio-Medical Applications in Endoscopy.

UNIT - IV

Laser Fundamentals

Introduction to lasers - Laser characteristics – Laser configuration – Three level and four level lasers – Q-switching – Mode locking – Types of lasers: Solid lasers, Gas lasers, Liquid lasers and Semiconductor lasers

UNIT - V

Laser instrumentation

Industrial applications of lasers – Lasers for measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect - Bio-medical applications, Holography: Principle, Methods, Holographic Interferometers and applications.

TEXT BOOKS:

1. Optical Fiber Communication – Principles and Practice', J.M. Senior, Prentice Hall of India, 1985.

2. Lasers: Theory and Applications – by Thyagarajan K. and Ghatak A.K., Plenum Press

REFERENCES:

1. Optical Fibre Communication and Sensors ‘, M. Arumugam, Anuradha Agencies, 2002.
2. Understanding Fiber Optics, 4th or 5th edition; Jeff Hecht; Prentice Hall publishers
3. Optical Fibre Communication ‘, G. Keiser, McGraw Hill, 1995.
4. Monte Ross, Laser Applications ‘, McGraw Hill, 1968
5. Introduction to Opto Electronics ‘, J. Wilson and J.F. B. Hawkes, Prentice Hall of India, 2001.

EI612PE: INDUSTRIAL DATA COMMUNICATIONS

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Course Objectives:

1. To introduce the principals of analog and digital communication systems involving different modulation demodulation schemes.
2. To provide insight about networks, topologies, and the key concepts used in instrumentation industries.
3. To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
4. To understand the principles, key protocols, design issues, and significance of each layer in ISO and TCP/IP.
5. To know the basic concepts of network security and its various security issues related with each layer.

Course Outcomes: Upon completing this course, the student will be able to

1. To remember and describe how the physical, data link, and network layers operate in a typical data communication system.
2. To understand the setting of network environment with all the necessary data communication components, procedure, conflicting issues and resolution techniques that make it functional.
3. To apply the operation and technique of various communication protocols such as multiple access protocols, TCP, UP, FTP, etc.
4. To analyze the services and features of the various layers of data networks
5. To evaluate communication protocols for route calculations and be able to perform such calculations of data transmission.
6. To create suitable transmission route for different internetworking devices.

UNIT - I

Communication Concepts: Serial and Parallel Transmission, data organization: signals, digital standard signals, data organization: communication codes, error coding, protocol concepts.

Amplitude Modulation: AM wave equation, spectrum, power relation, generation methods, high-level modulation, low level modulation, DSBSC and SSB Modulation, SSB generation methods, ISB, VSB.

Frequency Modulation: Mathematical Representation of FM, frequency spectrum of FM, generation methods of FM (Direct, Indirect Methods), effects of noise on FM, noise triangle, pre-emphasis and de-emphasis, phase modulation, compare AM, FM, PM, frequency division multiplexing.

UNIT - II

Communication Models: ISO OSI Model, mail analog, OSI model, IEEE 802 Models.

Serial Communication Standards: Basic concepts, TIA/EIA standards, interface signal functions, PC serial communications

UNIT - III

Local Area Networks: Layer 1 the physical layer, topologies, transmission media, 802 and industrial LANs, wireless LANs 802.11, Hub, bridge, Ethernet switch, router, IEEE 802.3/Ethernet: A layer 1 and layer 2 standard 10BASE5, 10BASE2, 10BASE-T, 10GbE-10 gigabit Ethernet over fiber, 10 GbE-10 gigabit Ethernet over copper

Internetworking: Layer 2 internetworking equipment, layer 3 devices, routing topologies, managed switches, gateways.

Wide Area Networks: wireless transmission, carrier concepts, wireless modems, modem types, WAN digital lines, cable modems, WANs for mobile and hinterlands.

UNIT - IV

Industrial networks and field buses: Industrial network requirements, HART, Control Net, EtherNet/IP, PROFIBUS/PROFINET, Foundation Fieldbus, Ethernet-TCP/IP, Modbus RTU protocol, IEC 61850.

UNIT - V

Cybersecurity: Overview, security vulnerabilities, methods of attack, risk analysis, IACS countermeasures, firewalls, network address translation, monitoring network traffic, hardening, internet and VPN countermeasures, network management and security, IEC/ANSI/ISA-62443 cybersecurity standards, ISA secure certification program.

TEXT BOOK:

1. Lawrence M. Thompson and Tim Shaw, “Industrial Data Communications”, ISA Fifth Edition.

REFERENCE BOOKS:

1. G. Kennedy, Electronic Communication Systems, McGraw Hill, New Delhi
2. D. Roddy and J. Coolen, Electronic Communications, Prentice-Hall of India Private Limited, Third Edition, 1984
3. S. Tanennbaum, “Computer Networks”, Fourth Edition, Prentice Hall of India, New Delhi, 2002.
4. W. Stallings, “Data and Computer communication, Sixth Edition, Pearson Education, New Delhi, 2001.
5. Comer, “Computer Networks and Internets”, Second Edition, Pearson Education, 2001.
6. Behrouz A. Forouzen, “Data Communication and Networking” Fourth Edition, McGraw Hill Publications, 2007.

EI613PE: EMBEDDED SYSTEMS

B.Tech. III Year II Semester

L	T	P	C
3	0	0	3

Prerequisite: Microprocessors and Microcontrollers; Computer Organization and Operating Systems

Course Objectives:

6. To provide an overview of Design Principles of Embedded System.
7. To provide clear understanding about the role of firmware.
8. To understand the necessity of operating systems in correlation with hardware systems.
9. To learn the methods of interfacing and synchronization for tasking.

Course Outcomes: Upon completing this course, the student will be able to

7. To understand the selection procedure of Processors in the embedded domain.
8. Design Procedure for Embedded Firmware.
9. To visualize the role of Real time Operating Systems in Embedded Systems.
10. To evaluate the Correlation between task synchronization and latency issues

UNIT -I:

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:

Typical Embedded System: 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 -III:

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets,
Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

TEXT BOOK:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

EC604PC: DIGITAL SIGNAL PROCESSING LAB

B.Tech. III Year II Semester

L	T	P	C
0	0	3	1.5

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

Note: - Minimum of 12 experiments has to be conducted.

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

EI605PC: INDUSTRIAL AUTOMATION LAB

B.Tech. III Year II Semester

L	T	P	C
0	0	3	1.5

Course Objectives

1. To make students **proficient** with PLC and SCADA programming
2. To make students create **interface** between PLC and SCADA
3. To make students **implement** PLC and SCADA for real time systems

Course Outcomes: After completion of the course the student is able to:

1. **Write** PLC and SCADA programs for desired application.
2. **Implement** PLC and SCADA control to real times systems.
3. **Design** and **create** seamless interface between PLC and SCADA mincing the real industrial application.

PLC: Programming and applications

1. Overview of PLC systems, input/output modules, Power supplies and Isolators
2. Simulation: Creating Ladder diagrams for arbitrary applications
3. Basic Functions: register, timer, counter
4. Interfacing PLC with at least two real time process (Pressure Level)
5. Networking of PLC
6. Process Controllers and Loop Tuning using PLC

SCADA: Programming and Applications

1. Introduction to SCADA system, Industrial Application of SCADA
2. Remote Terminal Units programming
3. SCADA programming
4. Interfacing of SCADA and PLC
5. Remote Operation Monitoring using SCADA
6. Real time implementation of SCADA System to a process (DC Motor-RPM Control; Stepper Motor-Angular Displacement and Linear Displacement through Rack Pinion)
7. Implementation of SCADA interfaced PLCs to Flow Process Station
8. Implementation of SCADA interfaced PLCs to pH control system Process Station
9. Implementation of SCADA interfaced PLCs to split control system Process Station
10. Implementation of SCADA interfaced PLCs to Temperature Process Station
11. SCADA programming to simultaneously monitor and control the pH control system process Station, the split control system process Station and Temperature process station
12. Monitoring and evaluation of PLC network using SCADA.

EI606PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

B.Tech. III Year II Semester

L	T	P	C
0	0	2	1

Course Objectives:

- To write programs using abstract classes.
- To write programs for solving real world problems using java collection frame work.
- To write multithreaded programs.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands on experience with java programming.

Course Outcomes:

- Able to write programs for solving real world problems using java collection framework.
- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.

Note:

- Use Linux and MySQL for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform.
- The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Programs:

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3. A) Develop an applet in Java that displays a simple message.
   b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a Java program for the following:
   i) Create a doubly linked list of elements.
   ii) Delete a given element from the above list.
   iii) Display the contents of the list after deletion.
7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message

with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.

8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
10. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

*MC609: ENVIRONMENTAL SCIENCE

B.Tech. III Year II Semester

L	T	P	C
3	0	0	0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-

economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.