Department of Instrumentation Engineering

Year-First   **Semester: Second**

IN1221 ELEMENTS OF MEASUREMENT

 IN1221.1 : Distinguish the static & dynamic characteristics of an instrument along with their error types
 IN1221.2 :Understand basic CRO in measurement of voltage and frequency
 IN1221.3 : Use the different meters required for measurement of electric parameters.
 IN1221.4 : Define the operation of power and energy measurement.
 IN1221.5 : Learn the basic AC and DC bridges used for R,L,C measurement.

IN1222 ELEMENTS OF MEASUREMENT LABORATORY

 IN 1222.1 Make electrical connections and analyze the results obtained.
 IN 1222.2 Understand the usage of common electrical measuring instruments and components.
 IN 1222.3 Explain various measurements techniques for industrial and laboratory applications.

IN1223 Introduction to MatLab

IN1223.1 Use the Matlab environment for numerous matrix operations
IN1223.2 Interpret and execute the
IN1223.3 Visualize and plot the data in Matlab
IN1223.4 Write simple code in Matlab
IN1223.5 Develop simple applications

IN1211 INDUSTRIALINSTRUMENTATION

IN1211.1: Select and use required sensor for temperature measurement
IN1211.2: Derive the working principle and characteristics of pressure transducers.
IN1211.3: Apply the appropriate flow sensors in classified applications.
IN1211.4: Choose the appropriate f sensor for different applications like temperature, pressure, level and flow.
IN1211.5: Understand the basic principles of various smart sensors

IN1212 INDUSTRIALINSTRUMENTATION PROJECT/PROGRAMMING LANGUAGES

IN1212.1 Perform the experiments on various transducers and able to draw the conclusion from them
IN1212.2 Make the students aware and operations of basic concept s of measurement different types of transducers
IN1212.3 Constructtheconnectiondiagramforplottingthecharacteristicsofgivensensor/ transducer

Year- Second   **Semester - Third**

IN1315 Industrial Measurement-I

INU1315.1 : Identification of sensors and transducer (Primary and secondary).
INU1315.2 : Demonstrate the working principles of various sensors and transducers
INU1315.3 : Evaluate and classify various sensors and transducers
INU1315.4 : Interpret the characteristics of the transducers/sensors
INU1315.5 : Demonstrate working principle of chemical sensors used in process industry

IN1316 BANKING OPERATION AND MANAGEMENT

IN1316.1 Gain thorough understanding with fundamentals of Banking operation &
Management
IN1316.2 Express the liquidity system in banking
IN1316.3 Explore the credit management system and loan system in banking
IN1316.4 Explore the investment portfolio with good strategy
IN1316.5 Identify the ALM and NPA in banking

IN1301 SENSOR AND TRANSDUCER-I

IN1301.1 : Identify, list, define verity of sensors, transducer (Primary and secondary).
IN1301.2 : Describe, draw, classify and produced sketches, drawings to explain working
principles of various sensors and transducers
IN1301.3 : Evaluate and monitor asses and compare of various sensors and transducers
IN1301.4 : Interpret the characteristics of the transducers/sensors
IN1301.5 : Demonstrate working principle of chemical sensors used in process industry

IN1302 Electronic Devices and circuits

INU1302.1: Illustrate the structure and working operation of basic semiconductor devices.
INU1302.2: Understand how complex devices such as transistors, FET, MOSFET
are modeled.
INU1302.3: Understand how the models are used in the design and analysis of useful
circuits.
INU1302.4: Choose and adapt the required components to construct an amplifier circuit.
INU1302.5: Design and analysis of oscillators

IN1303 DIGITAL ELECTRONICS

IN1303.1 : Explain logic processes and implement logical operations using
combinational logic circuits
IN1303.2 : Explain characteristics of memory and their classification
IN1303.3 :Designconcepts of sequential circuits and to analyze sequential systems in
terms of state machines.

IN1303.4 : Understand how to analyze and organize theProgrammable Devices, PLA, PAL, CPLD and FPGA.
IN1303.5 : Study the structure, function and characteristics of digital logic families.

IN1304 SENSOR AND TRANSDUCER-I LABORATORY

IN1304.1 : To plot characteristics of various transducers and sensors
IN1304.2 : Analyze and interpret data of various measurement
IN1304.3 : Calibrate various type of transducers

IN1305 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

IN1305.1: Analyse the transistor characteristics.
IN1305.2: Design and implement various amplifiers and analyse frequency responses
IN1305.3: Interpret the construction, operation and characteristics of JFET, MOSFET and oscillators.

IN1306 DIGITAL ELECTRONICS LABORATORY

IN1306.1: Design experimental setup for measurement of digital IC parameters & its verification.
IN1306.2: Design, realize and analyze various combinational and sequential circuits
IN1306.3: Select and use latest hardware and software tools for digital system realization

IN1307 INTRODUCTION TO LabView

IN1307.1 Understand Front panel, block diagram, icons, connector panes
IN1307.2 Use the programming structure and datatypes that exist in LabView
IN1307.3 Write and execute the simple programs in LabView

IN1415 INDUSTRIAL MEASUREMENT-II
INU1415.1 Interpret the concepts of signal conditioning circuits for resistive sensors
INU1415.2 To demonstrate working of various resistive, inductive and capacitive transducers
INU1415.3 Illustrate the working principle of velocity and acceleration transducers
INU1415.4 Apply the adequate knowledge of force transducers
INU1415.5 Provide exposure new trends in smart sensors.

IN1416 Strategic Management and Innovation in Banking
IN1416.1 Address the banking and strategy in the context of fast changing environment
IN1416.2 Analysis of the strategy asset management system
IN1416.3 Explore the management of technological innovation in banking
IN1416.4 Demonstrate the digital technology system in banking
IN1416.5 Explore the Corporate social responsibility in banking system

IN1401 AUTOMATIC CONTROL SYSTEM

IN 1401.1 Classify open and closed control systems with their characteristics
IN1401.2 Develop the mathematical model of electrical, mechanical system and Derive the transfer function of given system by using BDR,SFG techniques
IN 1401.3 Analyse the response of first and second-order systems for different standard inputs
IN1401.4 Comment on the stability of control system by using RH Criterion, time domain and frequency domain techniques
IN 1401.5 Represent the control system in State space representation

IN1402 LINEAR INTEGRATED CIRCUITS

IN1402.1 : Understand the concepts of linear integrated circuits.
IN1402.2 : Understand the basic operation of operational amplifier.
IN1402.3 : Design circuit using operational amplifier for various applications.
IN1402.4 : Implement different linear and non- linear applications of operationalamplifier for signal conditioning circuits.
IN1402.5 : Understand and demonstrate the functions of timer, voltage regulator, filters and oscillators.

 IN1403 SENSOR AND TRANSDUCER-II

IN1403.1 Interpret the concepts of signal conditioning circuits for resistive sensors
IN1403.2 To demonstrate working of various resistive, inductive and capacitive transducers
IN1403.3 Illustrate the working principle of velocity and acceleration transducers
IN1403.4 Apply the adequate knowledge of force transducers
IN1403.5 Provide exposure new trends in smart sensors.

IN1404 AUTOMATIC CONTROL SYSTEM LABORATORY

INU1404.1: Plot the transfer function and calculate the Poles and Zeros of Transfer Function
INU1404.2: Analyze the given systems using Time Domain and frequency domain Analysis with the help of software. [MatLab/SciLab]
INU1404.3: Develop mathematical model for electrical systems

IN1405 LINEAR INTEGRATED CIRCUITSLABORATORY

IN1405.1: Design and analyze concepts of linear integrated circuits.
IN1405.2: Develop linear and nonlinear applications of operational amplifier.
IN1405.3: Perform the basic operations of timer, voltage regulator, filter and oscillators.

IN1406 SENSOR AND TRANSDUCER-II LABORATORY

IN1406.1 Examine the characteristics of different transducer

IN1406.2 Identify suitable instruments to meet the requirements of industrial applications

IN1406.3 Apply concepts and methods various measurements in IN1406 through Experiments

IN1411 IOT BASED APPLICATIONS

IN1411.1 : Explain the structure, function and characteristics of Internet of Thing.
IN1411.2 : Identify the communication protocols.
IN1411.3 :Understand design methodology and hardware platforms involved in IoT.
IN1411.4 :Understand how to analyze and organize the data in IoT.
IN1411.5 : Compare IOT Applications in Industrial & realworld.

IN1412 PCB Design and Circuit Simulator

IN1412.1 Explain the basic level knowledge required to understand PCBs
IN1412.2 Identify importance of manufacturing documents.
IN1412.3 Understand the basic concept of how to design PCB for Manufacturing and assembly point of view.
IN1412.4 Interpret the basic concept of fault finding /repair and rework methods in PCB.
IN1412.5 Understand assembly techniques for leaded and SMDs.

Year- Third   Semester - Fifth

INU521 CONTROL SYSTEM DESIGN

Course Outcomes:

On completion of the course, students will be able to:

INU521.1   Describe the basic elements of control system design and System.
INU521.2   Understand the concept of Time response analysis and it's design Specifications**.**
INU521.3   Design lead compensators, lag compensators and lag lead compensators using root locus approach.
INU521.4   Design compensators for feedback control systems given the performance specifications such as the phase margin, gain margin using Bode diagrams.
INU521.5   Design PID controllers for processes.

INU522 UNIT OPERATIONS

Course Outcomes:

On completion of the course, students will be able to:

INU522.1   Knowledge of different heat exchanger equipments & effect of other parameters on them.
INU522.2   Understand concepts of fluid transportation
INU522.3   Demonstrate an understanding of Distillation & Extraction process
INU522.4   Study & Understand the principles of various size reduction methods, conveying equipments, sedimentation
INU522.5   Propose the unit operation sequence and equipment required in different industries

INU523 POWER ELECTRONICS

Course Outcomes:

On completion of the course, students will be able to:

INU523.1 Familiarize with thyristors and Thyristor Commutation Techniques.
INU523.2 Understanding of Phase Controlled Rectifiers.
INU523.3 Understand the working principles of DC Chopper and Inverters.
INU523.4 Analyze the characteristics of Speed control of DC motors.
INU523.5 Design and implement industrial applications of power electronic circuits.

INU 524 DIGITAL SIGNAL PROCESSING

Course Outcomes:

On completion of the course, students will be able to:

INU 524.1   Represent system in direct form I, direct form II, cascade and parallel form
INU 524.2   Implement decimation in time and decimation in frequency FFT algorithms
INU 524.3   Understand and able to design IIR Filter and linear phase FIR filter using
            rectangular, hamming and hanning windows
INU 524.4   Describe the concept of wavelet transform in digital signal processing
INU 524.5   Explain the various features of DSP processors

INU525 ANALYTICAL INSTRUMENTATION

Course Outcomes:

On completion of the course, students will be able to:

INU525.1   Identify, understand and define the fundamentals of Analytical instruments
INU525.2   Sketch various types of flame photometry
INU525.3   Illustrate the elements of Absorption Spectroscopy
INU525.4   Discuss the terms, principle, instrumentation, operation and applications of
            Molecular spectroscopic techniques.
INU525.5   Describe and articulate various aspects of Gas and Liquid Chromatography

Programme Elective-I

INU526(A) AUTOMOTIVE INSTRUMENTATION

Course outcomes:
On completion of the course, students will be able to:

INU526(A).1 Describe knowledge of various of automotive electronics and its evolution.
INU526(A).2 Understand the basic knowledge of Electronic fuel injection and ignition systems.
INU526(A).3 Ability to understand automotive control unit.
INU526(A).4 Understand the overview of Hybrid Electric Vehicle and safety systems employed
            in today's automotive industry
INU526(A).5 Select the basic modelling and control scheme for automotive systems.

INU526(B) INSTRUMENT SYSTEM DESIGN

Course Outcomes:

On completion of the course, students will be able to:

INU526(A).1 To understand the basic design procedure and electronic design guidelines
INU526(A).2   To design temperature, flow instrumentation system
INU526(A).3   To understand the basic need and procedure of reliability engineering
INU526(A).4   To summarize the selection criteria of different sensors according to its
            applications
INU526(A).5   To describe the hazardous area classification

INU526(C) HYDRAULIC AND PNEUMATICS COMPONENTS

Course Outcomes:

On completion of the course, students will be able to:

INU526(C).1   Explain the Fluid power and operation of different types of pumps.
INU526(C).2   Summarize the features and functions of Hydraulic motors, actuators and Flow control valves
INU526(C).3   Develop different types of Hydraulic circuits and systems
INU526(C).4   Design the different pneumatic circuits and systems
INU526(C).5   Understand the functions of hydraulic & pneumatic Controllers

INU526 (D) OPTICAL FIBER COMMUNICATION

Course Outcomes:

On completion of the course, students will be able to:

INU526(D).1   Explain the basic principles of optical fiber, types of optical fiber, optical sources and optical fiber fabrication.
INU526(D).2   Able to describe the working of fiber optic sensors
INU526(D).3   Attain deep knowledge about the Interferometers
INU526(D).4   Understand and apply knowledge of LASERS
INU526(D).5   Apply the knowledge of Wavelength Division Multiplexing Concepts and Components

INU526(E) BIOMEDICAL SIGNAL PROCESSING

Course Outcomes:
On completion of the course, students will be able to:

INU526(E).1   Describe the origin, source and characteristics of biomedical signals,
INU526(E).2   Differentiate, apply the basics of signal processing techniques on biomedical signals
INU526(E).3   Demonstrate proficiency in using the QRS detection algorithm
INU526(E).4   Demonstrate the techniques for EEG waveform signal analysis
INU526(E).5   Discuss, categorize the data reduction techniques

INU526(F) MICROCONTROLLER AND ITS APPLICATION

Course Outcomes:

On completion of the course, students will be able to:

INU526(F).1 Understand Microcontrollers basics
INU526(F).2 Develop and implement Assembly language programs
INU526(F).3 Understand the hardware Interfacing with 8051 to develop a simple microcomputer system
INU526(F).4 Understand the basic serial communication modes of microcontroller and embedded system basics.
INU526(F).5 Develop simple application based projects.

INU527 POWER ELECTRONICS LAB

Course Outcomes:

On completion of the course, students will be able to:

INU527.1   Understanding of Phase Controlled Rectifiers, Chopper, SCR and Inverters.
INU527.2   Analyze the characteristics of Speed control of DC motors.
INU527.3   Design and implement industrial applications of power electronic circuits.

INU528 DIGITAL SIGNAL PROCESSING LAB

Course Outcome: On completion of the course, students will be able to:

INU528.1 Use the Matlab programming efficiently for any DSP signal generation and operations
INU528.2 Design the filters as per the applications
INU528.3 Analyse the signals by using various DSP filtering techniques

INU529 ANALYTICAL INSTRUMENTATION LAB

Course Outcomes:
On completion of the course, students will be able to:
INU529.1   Have a practical hands on experience on Absoprtion Spectroscopic methods
INU529.2   Acquire experience in the purification by performing chromatography
INU529.3   Validate and analysis using spectrometric and microscopic techniques

Year- Third   Semester - Sixth

INU621 PROCESS CONTROL
Course Outcomes:
On completion of the course, students will be able to:

INU621.1 Learn the fundamentals of Process characteristics
INU621.2 Understand the concepts of Dynamic Behavior of systems.

INU621.3 Draw and Explain the basic construction of Controller and Control valve

INU621.4 Learn the Concept of feedback control.

INU621.5 Analyze and Design of Advanced Control systems

INU622 INDUSTRIAL AUTOMATION
Course Outcomes:

On completion of the course, students will be able to:

INU622.1 Describe various blocks, need of Industrial automation

INU622.2 Demonstrate the various functions of PLC and write small programs using PLC

INU622.3 Summarize DCS and SCADA systems

INU622.4 Describe various functions, programming features of Virtual Automation software and Distributed control system

INU622.5 Explore and use the industry grade virtual automation software for small industrial application

INU623 INTERNET OF THINGS
Course outcomes:

On completion of the course, student will be able to

INU623.1   To explain the structure, function and characteristics of Internet of Things.

INU623.2   To develop fundamentals of Arduino Uno

INU623.3   To recognize various devices, sensors and applications

INU623.4   To understand the design of the various IoT Applications.

INU623.5   To identify the communication protocols

INU624 ELECTRICAL MACHINES AND DRIVES
Course Outcomes:

On completion of the course, student will be able to

INU624.1 Understand the working principles, classifications of dc and ac electrical machines.

INU624.2 Analyze the characteristics, controls, power stages and applications of dc machine and ac machines.

INU624.3 Understand the basic principles, operation and construction of Synchronous Machines.

INU624.4 Understand different speed control methods in D.C and A.C motors using drivers.

INU624.5 Understand the characteristic of load and selection of derive in industrial sectors.

Open Elective-I

INU625 (A) BASIC INSTRUMENTATION
Course Outcomes:

On completion of the course, student will be able to

INU625(A).1   Analyze static and dynamic characteristics of a measurement system
INU625(A).2   Explain the principle and working with schematic diagrams of pressure sensors and transducers.
INU625(A).3   Describe the principle and working with schematic diagrams of level sensors and transducers.
INU625(A).4   Understand the principle and working with schematic diagrams of flow sensors and transducers.
INU625(A).5   Solve preliminary design problems based on various sensors & transducers

INU625 (B) BIOMEDICAL INSTRUMENTATION
Course Outcomes: On completion of the course, students will be able to:

INU625(B).1   Define and apply the engineering principles to Medical engineering
INU625(B).2   Describe mechanisms, anatomy and physiology of various systems of the Human body
INU625(B).3   Demonstrate the measurements on and interpretation of data from ECG,EMG, EEG waveform
INU625(B).4   Categorize different biomedical imaging systems and summarize the safety aspects in biomedical instrumentation
INU625(B).5   Work in interdisciplinary team as per scope of their respective program/branch specific applications in Biomedical Engineering

INU625(C) AUTOMATIC CONTROL SYSTEM

Course Outcomes:
On Completion of this course, students will able to

INU625(C).1 Understand control system concept, basic control configurations and types of control systems.
INU625(C).2 Review of Laplace transform and learn how to represent system using mathematical model.
INU625(C).3 Perform Time domain analysis of control systems
INU625(C).4 Give comment about stability of control systems.
INU625(C).5 Analyze frequency response analysis of control systems.

Program Elective-II

INU626 (A) DIGITAL CONTROL

Course Outcomes:
On Completion of this course, students will able to

INU626(A).1 Illustrate the fundamental concepts of discrete time control system.
INU626(A).2 Understand the Pulse Transfer Function , digital PID Controllers and digital filter.
INU626(A).3 Design the Discrete Time Control System.
INU626(A).4 Analyze the concept of state space analysis of Discrete Time Control System.
INU626(A).5 Understand the concept of Pole Placement.

INU626(B) ADVANCE SENSORS

Course Outcomes: Upon Completion of this course, students will able to

INU626(B).1 : Describe the fabrication processes including surface micromachining, bulk micromachining, and LIGA.(understand)
INU626(B).2 : Understand the Precision Manufacturing Applications
INU626(B).3 : Apply the knowledge of different semiconductor gas & biosensors for various application
INU626(B).4 : Understand the working of MEMS systems including their applications and advantages
INU626(B).5 **:** Demonstrate the Networking of Smart Sensor System

INU626(C) POWER PLANT INSTRUMENTATION

Course outcomes: Upon Completion of this course, students will able to

INU626(C).1 To describe the power generation scenario
INU626(C).2 To analyze the steam turbines & condensers along with their working principles & types
INU626(C).3 To recognize the layout, component details of hydroelectric power plant and nuclear power plant
INU626(C).4 To emphasize the fundaments of solar & wind power plants
INU626(C).5 To realize different method of energy conversion & importance of Instrumentation in power plants

INU626(D) MECHATRONICS
Course outcomes:
On Completion of this course, students will able to

INU626(D).1 : Recalling the basic techniques, skills and modern tools in mechatronics engineering technology.
INU626(D).2 : Understand the basics of Data acquisition and sensors
INU626(D).3 : Apply concepts of Electrical actuator systems , motors, Hydraulic and pneumatic, robotic systems of mechatronics.
INU626(D).4 : Analyze principles of Mechatronic Systems in Control Architectures
INU626(D).5 : Illustrate Case studies.

INU626(E) BIOMEDICAL IMAGE PROCESSING
Course Outcomes:

On completion of the course, students will be able to:

INU626(E).1   Apply the fundamental concept of digital image processing
INU626(E).2   Choose and implement the Image enhancement techniques in the spatial domain and frequency domain for different biomedical applications
INU626(E).3   Categorize, evaluate the various image segmentation and compression techniques
INU626(E).4   Describe the imaging techniques used for biomedical applications

INU626(E).5   Able to differentiate between X-Ray, CT, US, MRI images
INU626 (F) MEASUREMENT DATA ANALYSIS

Course Outcomes:

On completion of the course, students will be able to:

INU626(F).1   Apply need of experimental designs
INU626(F).2   Identify the main elements of a measurement system
INU626(F).3   Investigate the performance of measurement systems
INU626(F).4 Study the tools of probability
INU626(F).5 Examine different type of distributions & uncertainty methods

INU627 PROCESS CONTROL LAB

Course Outcomes:

On completion of the course, students will be able to:

INU627.1: Understand the Design concept of an ON-OFF and PID controller for different processes.
INU627.2: Draw and Explain the basic characteristics Control valve.
INU627.3: Analyze and Design of Advanced Control systems.

INU628 INDUSTRIAL AUTOMATION LAB

Course Outcomes:

On completion of the course, students will be able to:

INU628.1 Identify and configure various modules of PLC
INU628.2 Develop small programs using PLC
INU628.3 Develop small programs using Virtual automation software

INU629 INTERNET OF THINGS LAB
Course Outcomes
After completion of the course students will be able to

INU629.1   Knowledge of arduino programming concepts
INU629.2   Study of the applications of arduino programming
INU629.3   Explore and understand interfacing techniques for daily applications

INU 630 MINOR PROJECTS
Course Outcomes : After completion of the course students will be able to

INU630.1   The Instrumentation techniques/engineering principles for specific application
INU630.2   Design and develop Small Instrumentation project based on hardware and software
INU630.3   for engineering systems.
INU630.4   Carry out budget ,time planning ,presentation of the project to evaluators
INU630.5   Do effective trouble-shooting of the mini project

Year- Four   **Semester - Seventh**

INU721 PROJECT ENGINEERING MANAGEMENT

Course outcomes: On completion of the course, students will be able to

INU721.1 To learn the ethical responsibilities of practicing engineering managers and the impact of their decisions with in a global and societal context
INU721.2 Apply systems engineering to solve technical and operational problems to meet human ergonomics
INU721.3 Analyze systems and operations using both qualitative and quantitative tools and perspectives.
INU721.4 Evaluate drawing related problems by applying their knowledge of science and engineering.
INU721.5 Acquire the skills to manage creative teams and project processes with effective time management & efficient working

INU722   BIOMEDICAL INSTRUMENTATION
Course Outcomes: On completion of the course, students will be able to

INU722.1   Define and apply the engineering principles to medical engineering
INU722.2   Interpret mechanisms, anatomy and physiology of various systems of the Human body
INU722.3   Demonstrate the measurements on and interpretation of data from ECG, EMG, EEG waveform
INU722.4   Apply the knowledge of non electrical parameter measurements in biomedicalengineering
INU722.5   Categorize the biomedical equipments along with their technical and safety aspects

Programme Elective-III

723(A) PROCESS MODELING AND OPTIMIZATION

Course Outcomes : On completion of the course, students will be able to

    INU723(A).1 DetermineMathematical Models of specific chemical process
    INU723(A).2 Analyze the Mechanical and Chemical systems
    INU723(A).3 Identifythe characteristics physical processes.
    INU723(A).4 Define constraints of Optimization.
    INU723(A).5 Devlope the optimization techniques for different processes

723(B) ENVIRONMENTAL INSTRUMENTATION

Course Outcomes: On completion of the course, students will be able to

INU723(B).1 Identify various sources of pollution and pollutants.
INU723(B).2 Interpret different waste water treatment measurement techniques
INU723(B).3 Demonstrate instrumentation methodologies for environment monitoring
INU723(B).4   Analyze water quality monitoring and waste water treatment
INU723(B).5   Adapt the instrumentation required for air pollution monitoring

723(C) MODERN CONTROL THEORY

Discuss usage of static space in control system engineering.

Analyze dynamics of a linear system by State Space Representation.

Determine the stability of a linear system using pole-placement technique.

Design state observers

Realize the structure of a discrete time system

INU724 (A) NEURAL AND FUZZY BASED CONTROL

Introduce the fuzzy set theory of feed forward neural networks.

Provide adequate knowledge about feedback neural networks.

Establish the concept of fuzziness involved in various systems

Acquire comprehensive knowledge of fuzzy logic control

Apply adequate knowledge of application of fuzzy logic control to real time systems

INU724 (B) BATCH PROCESS CONTROL

Course Outcomes: On completion of the course, students will be able to

INU724(B).1 Acquired knowledge of standards used for Batch process control.
INU724(B).2 Establish of control schemes for different batch process.
INU724(B).3 Develop a deep understanding of the application of statistical techniques to process control.
INU724(B).4 Study Design of batch control systems and the concepts upon which they are based.
INU724(B).5 Describe some case study of batch control system

INU724 (C) BUILDING AUTOMATION

Course Outcomes: On completion of the course, students will be able to
INU724(C).1 To introduce the concept of Building automation system
INU724(C).2 To understand the communication standard and BAS protocols
INU724(C).3 To study the distinguished Building Management Security systems
INU724(C).4 State of art technique for green building
INU724(C).5 To develop the integration of building management systems for intelligent automation

Programme Elective-V
INU725 (A) COMMUNICATION PROTOCOL
Course Outcomes: On completion of the course, students will be able to

INU725(A).1 Summarize the different network architectures and protocols.
INU725(A).2 Get aware of TCP/IP protocols.
INU725(A).3 Identify various network security technologies and protocols
INU725(A).4 Learn Serial data communications interface standards
INU725(A).5 Distinguished the Fieldbus, ProfiBus and Foundation Fieldbus.

INU725 (B) ROBOTICS
Course Outcomes: On completion of the course, students will be able to

INU725(B).1 Get aware with history, evolution and anatomy of robot.
INU725(B).2 Apply machine vision for robotic application
INU725(B).3 Impart knowledge about kinematic and dynamic analysis of robot manipulators.
INU725(B).4 Write the program for basic robotic actions
INU725(B).5 Develop localization and path planning algorithms for mobile Robot navigation.

INU725 (C) SPEECH SIGNAL PROCESSING
Course Outcomes: On completion of the course, students will be able to:

INU725(C).1 Model speech production system and describe the fundamentals of speech.
INU725(C).2 Extract and compare different speech parameters.
INU725(C).3 Choose an appropriate statistical speech model for a given application.
INU725(C).4 Design a speech recognition system.
INU725(C).5 Use different speech synthesis techniques.

Open Elective –II
INU726 (A) INDUSTRIAL AUTOMATION
Course outcomes: On completion of the course, students will be able to

INU726(A).1 Describe the basic Knowledge about the Industrial automation and its features
INU726(A).2 Implement the basic programming skills (LAD, FBD, SFC) of PLC
INU726(A).3 Compare the DCS with PLC, SCADA system
INU726(A).4 Explore the communication standards and protocols in Industrial Automation
INU726(A).5 Distinguish different architectures of DCS makes

INU726 (B) INTRODUCTION OF MACHINE VISION
Course outcomes: On completion of the course, students will be able to

INU726(B).1   Introduce students to the basic concepts, tools and techniques of Machine Learning
INU726(B).2 Develop skills of using recent machine learning software
INU726(B).3 Analyze and evaluate the different ML models.
INU726(B).4 Implement ML algorithms to solve real life problems.
INU726(B).5 Develop ML models using hypothesis

INU726 (C) MECHATRONICS
Course outcomes: On Completion of this course, students will able to

INU626(D).6 : Introduce the basic elements of mechatronics
INU626(D).7 : Summarize the different sensors & its usage in data acquisition system
INU626(D).8 : Compare the Electrical, Mechanical Actuator systems.
INU626(D).9 : Use Mechatronic Systems in Robotic.
INU626(D).10   : Study PLC and its application in Mechatronics.

INU727PROJECT ENGINEERING MANGEMENT LAB

Course Outcome:

INU727.1   Draw the Process & Instrument diagram

INU727.2   Prepare documents required for SAT-FAT of a project

INU727.3   Study different symbols used in P&I diagram

INU728 BIOMEDICAL INSTRUMENTATION LABORATORY

Course Outcome

INU728.1 Explain the basic functions and operations on Biomedical Equipments

INU728.2 Measure and calculate the basic health parameter like , Heart Rate, BP ,RR etc

INU728.3 Explain the waveform pattern and interpret the ECG,EEG, EMG waveform in engineering aspects

Year- Four   **Semester - Eighth**

Programme Elective –VI
INU821(A)   SMART MATERIALS
Course Outcomes : On completion of the course, students will be able to

INU821(A).1   Desribe the different smart materials and its basics
INU821(A).2   Analyze the High-band width, low strain smart sensors.
INU821(A).3   Examine the Smart actuators
INU821(A).4   Study Smart composites
INU821(A).5   Aware advances in smart structures & materials

INU821(B)   ARTIFICIAL INTELLIGENCE
Course Outcome : On completion of the course, students will be able to

   INU821(B).1 Describe the knowledge of basic fundamentals of Artificial Intelligence
   INU821(B).2 Explain the reasoning methodology
   INU821(B).3 Represent the decision tree and classification
   INU821(B).4 Design a classifier using the representation and classifier types
   INU821(B).5 Illustrate the application of Artificial Intelligence

INU821(C)   PROCESS EQUIPMENT DESIGN
Course Outcome: On completion of the course, students will be able to

INU821(C).1 To summarize the different equipments used in process industry.
INU821(C).2 To study the operation of heat exchanger, evaporator & distillation columns in
                 instrumentation system
INU821(C).3 To understand the basic need design consideration
INU821(C).4 To illustrate equipment design with mechanical concept
INU821(C).5 To learn the safety consideration in equipment design

INU822(A)   PROJECT and SEMINAR OR (B)INDUSTRY INTERNSHIP PROJECT
Course Outcomes: On completion of the course, students will be able to

INU822.1 Identify and compare technical and practical issues related to the instrumentation
                 and allied areas.
INU822.2   Develop a well organized report technical writing and critical thinking skills
INU822.3 Demonstrate the ability to describe, interpret and analyze technical issues related to
                 problem