Final syllabus for IN 451 Instrumentation System Design

Sr	Examination S2020	Course Contents for the Examinations of S2020
1	ISE-II	Concept and Design of venture based flow system , Rota meter ,study of I/P ,P/I convertors, Smart transmitters .DP transmitter and applications ,Concept of reliability, MTBF ,MTTF, MTTR,Lifecycle,Bathtub curve, Probability distribution, ,Availability,Wwibull distribution
2	Self Study	Design of Control panels and controllers Type ,Ergonomics in design of control ,control room layout, Pneumatic controllers using flapper nozzle mechanism, Electronics controller (continuous ,discontinuous)using op-amp,
3	ESE	General transducer design consideration, testing the transducer and selection criterion of transducer, Instrument types and performance characteristics for general design of instruments, design of temperature systems(RTD,THERMOCOUPLE,THERMISTORS)and signal conditioning related to it, basic design aspects for orifice plates Concept and Design of venture based flow system , Rota meter ,study of I/P ,P/I convertors, Smart transmitters .DP transmitter and applications ,Concept of reliability, MTBF ,MTTF, MTTR,Lifecycle,Bathtub curve, Probability distribution, ,Availability, Wwibull distribution Pneumatic controllers using flapper nozzle mechanism,ElectronicsPIDcontroller.
4	Practical Exam	Based upon the following experiments and conceptual knowledge the oral will be conducted only 1Draw, Explore and study the Instrumentation symbols 2Design the simple electronics circuit for measurement of temperature by usingRTD ,Thermistor, Thermocouple as a temperature sensor 3Design the Temperature measurement system by using RTD 4Measurement and Calculation of Pressure profile , Energy across the venturimeter,rotameter,orifice

IN 452 PROCESS INSTRUMENTATION

Sr.	Examination S2020	Course Contents for the Examinations of S2020
1	**ISE-II**	Elements of the feedback Loop, Block Diagram, Response to Set-point changes and Disturbances, Control Performance Measures, Selection of Variables for Control Approach to Process Control. Factors in Controller tuning, determining Tuning Constants for Good Control Performance, Correlations for tuning Constants, Fine Tuning of the controller tuning Constants. The performance of feedback Systems.
2	**Self Study**	**Multi Loop control** Basic principles and working Implementation issues of Cascade control, Feed forward control,feedback-feedforward control, Ratio control, Selective Control, Split range control. Examples and any special features of the individual loop and industrial applications.
3	**ESE**	Process Characteristics and basic terms in process,Method of finding time constant,degree of freedom,Characteristics of physical systems process variable-types,Dynamic elements in control loop Analysis of control loop,Tuning methods for controller,Characteristics of valve and its transfer function. Elements of the feedback Loop, Block Diagram,Selection of Variables for Control Approach to Process Control. Multi Loop control:Feedforward control,cascade control,ratio ,split range,override control .
IN456 PROCESS INSTRUMENTATION LAB		
	ICA+ESE	1. Level measurement by DP transmitter 2. Study of open loop,closed loop,ON-OFF control,Proportional Integral and PID control loop for the following applications A. Pressure control loop B. Level control loop C. Temperature control loop D. Flow control loop 3. Study and analysis for valve characteristics: Tuning of PID controller using reaction curve 4. Study of Cascade control loop for level or temperature 5. Calculation of time constant for given process

IN453D NEURAL NETWORK & FUZZY LOGIC INSTRUMENTATION	
ISE-II	Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzification,
Self Study	Fuzzy Controller, Preliminaries, basic construction of fuzzy controller, analysis of static and dynamic properties of fuzzy controller, Industrial applications and Case studies
TH ESE	**Introduction Neural Networks** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro- associative memory. **Back propagation networks** Perceptron model, solution, single layer artificial neural network, multilayer perceptron model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting backpropagation training, applications **Introduction Fuzzy Logic** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Fuzzy Membership & Rules Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzification **Fuzzy Controller:** Preliminaries, basic construction of fuzzy controller, analysis of static and dynamic properties of fuzzy controller,Industrial applications.
IN457D NEURAL NETWORK & FUZZY LOGIC INSTRUMENTATION LAB	
ICA+PR ESE	Write a program to implement single layer perception algorithm. Write a program for various activation functions used in neural network Write a program to implement delta learning rule Write a program to generate standard membership function Write a program to perform fuzzy set operations To Study various defuzzification techniques To study fuzzy logic controller using fuzzy logic toolbox Applications and analysis of process using fuzzy PID system

IN454C AUTOMOTIVE INSTRUMENTATION	
ISE-II	**Electronic fuel injection and ignition systems** Introduction, carburetor control system, throttle body ignition and multi-port and point fuel injection, advantages of electronic ignition system, types of solid state ignition system and their principle of operation, electronic spark timing control system.
Self Study	**Ergonomics and safety** Driver information system, lighting system component, battery monitoring and control, air conditioning, steering control techniques, automatic gear control system, Emission Standards.
TH ESE	**Fundamentals and automotive electronics** Introduction to Automobile industry and plant. Open loop and closed loop system component for electronic engine management. Vehicle motion control, current trends in modern automobiles. **Electronic fuel injection and ignition systems** Introduction, carburetor control system, throttle body ignition and multi-port and point fuel injection, advantages of electronic ignition system, types of solid state ignition system and their principle of operation, electronic spark timing control system. **Engine control system** Engine cranking and warm up control, acceleration enrichment De acceleration leaning and idle speed control, integrated engine control system, exhaust emission control system, engine performance testing automobile chassis electronic control system, principle of electronic braking, automatic transmission electronic control circuit, cruise control circuit, the electronic steering control theory, ABS, ASR, ESP and other electronic control method.