

Lesson Plan

Institute: Govt. Polytechnic Kangra, HP

Department: Instrumentation Engg.

Subject: Industrial Instrumentation, Course: Diploma, Duration: 3 years

Faculty: Varun.

Sr. No.	Period	Topic	Details	Instruction Reference	Additional Study Material	Remark
1	18 (1 to 18)	Temperature measurement	<p>Introduction to temperature</p> <p>Temperature Scales and Conversions.</p> <p>Methods of Temperature measurements</p> <ul style="list-style-type: none"> ① Expansion Type - Bimetallic Thermometer, Liquid-in-Glass and Metal thermometer. ② Electrical type <p>RTD: principle, working, construction and types with ranges, Different configurations of RTD: Two wire, Three wire and four wire, Lead wire compensation in RTD applications.</p>	Mechanical measurements by S.P. Venkateshan	Fundamentals of Temperature, pressure and flow measurements by Robert P. Benedict.	

Sr. No.	Period	Topic	Details	Instruction Reference	Additional Study Material	Person
2. 12 (19 to 30)	Level measurement		<p>Thermistor: principle, working, Construction, types, applications.</p> <p>Thermocouple: Different thermal effects (Seebeck, Peltier and Thomson), Working principle (Seebeck effect), Thermocouple construction, Types of thermocouple (only material of constructions and their ranges): J, K, T, E, N, S, R and B Type, Cold junction compensation of thermocouples.</p> <p>Pyrometers: Radiation Pyrometer and Optical pyrometer</p>	do		
			<p>Introduction to level measurement, Methods of level measurements: Direct Method & Indirect methods.</p> <p>Direct methods: Visual level indicator, Hook type level indicator, Float type level indicators.</p> <p>Indirect methods (Hydrostatic Pressure type): Pressure gauge methods, Air Bellows and Air Purge System.</p> <p>Indirect Methods (Electrical Type):</p>	Industrial Instrumentation by K. Krishna Swamy & S. Vijayachari		 Prof(KS) 17/08/2023

Sr No.	Period	Topic	Details	Instruction Reference	Additional Study Material	Remark
3	23 (31 to 53)	Flow measurement	<p>Resistance type, Capacitive type, Gamma ray type (Radiation type) and Ultrasonic type.</p> <p>Introduction to flow measurement, Concept of Volumetric and mass flow rate.</p> <p>Concept of Reynolds number in flow measurement, Different types of flow: Laminar and Turbulent, Bernoulli equation.</p> <p>Methods of flow measurements: Variable Head/ Differential Pressure/ Obstruction type flow meters: (a) Basic operating principles, Concepts of pressure head (b) Primary elements of differential flow meters: Orifice Plate, Venturi tube, flow nozzle and Pilot tube.</p> <p>Variable Area flow meter: Rotameter</p> <p>Electromagnetic flow meter.</p> <p>Ultrasonic flow meter, Turbine flow meter, Mass flow meter</p>	<p>Instrumentation devices and systems by CS Rangan, CR Sarma, VS V Mani</p>	<p>Fundamentals of temperature, pressure & flow measurements by Robert P. Benedict.</p>	

Sr No.	Period	Topic	Details	Instruction Reference	Additional Study Material	Remarks
4	17 (54 to 70)	Pressure measurement	<p>Introduction to pressure and different types of pressure.</p> <p>Methods of pressure measurement:</p> <ul style="list-style-type: none"> ① Manometer - U-tube manometer, Barometer, Inclined manometer and well-type manometer, ② Elastic Pressure transducers: Bourdon tube, Diaphragm and Bellows tube ③ Force Balance Type: Dead weight tester. ④ Electrical type: Strain Gauge Pressure Transducer, Potentiometric Pressure transducer, Capacitive Pressure Transducers and LVDT type pressure Transducers. <p>Measurement of vacuum: Pirani Gauge, Capsule Gauge, McLeod gauge, Thermal conductivity gauge</p>	—do—	—do—	<p>MOD(FB) 17/08/2023</p>

Govt Polytechnic Kangra(HP)
Department of Instrumentation Engg
Planned Syllabus(Lesson Plan for Academic Session August 2023)
Subject: Analytical and Biomedical Instrumentation ; Semester: 5th
Planned Theory: 70 hour Planned Practical: 28 Hour

Planned Theory: 70 hour		Planned Practical: 26 hour		
Sr No.	Period No.	Topic	Detail Content	Instruction Reference
1	10 hour(1 to 10)	Introduction	1.1 Elements of an Analytical Instrument 1.2 Properties of Analytes & Techniques used in Analytical Instruments, Types of Analytical Methods 1.3 Electromagnetic Radiation & Optical Spectrum (UV, Visible & IR) 1.4 Radiometry & Photometry- Definition 1.5 Concept of Interaction of Radiation with Matter 1.6 Laws related to Absorption of Radiation: Lambert's Law, Beer's Law & Beer-Lambert law Revision and Discussion	1) <i>Handbook of Analytical Instruments, by R.S. Khandpur, TMH</i> 2) <i>Handbook of Biomedical Instrumentation, by R.S. Khandpur, TMH</i>
2	15hour(11 to 25)	Spectroscopy	2.1 Absorption Instruments & its Various Components: Block Diagram having Sources of Radiation, Optical Components & Detecting System 2.2 UV-Vis Absorption Spectroscopy 2.3 Filter Photometers: Single Beam Filter Photometer & Double Beam Filter Photometer 2.4 UV Spectrophotometers: Single Beam Spectrophotometer & Double Beam Spectrophotometers 2.5 IR Spectrophotometer: Introduction to Infrared Spectroscopy, Basic Components of IR Spectrophotometers: Radiation Sources, Mono-chromators , Slits, Mirrors & Detectors. Double Beam IR Spectrophotometer Revision and Discussion	-Same as above-
3	10 hour (26 to 35)	Flame Emission And Atomic Absorption Spectroscopy	3.1 Flame Photometers: Principle of Flame Photometry, Constructional details of Flame Photometers: Emission System, Selection System & Recording Systems 3.2 Atomic Absorption Spectrophotometer: Atomic Absorption Spectroscopy, Atomic Absorption Spectrophotometer Revision and Discussion	-Same as above-
4	08 hour(36 to 43)	Nuclear magnetic resonance spectroscopy	4.1 Introduction to NMR Spectroscopy 4.2 Principles of NMR: Nuclear Spin, Nuclear Energy Levels, Resonance Conditions, NMR Absorption Spectra, Chemical Shift 4.3	-Same as above-

			Nuclear Magnetic Resonance Spectrometer: Block Diagram, Construction & Working Revision and Discussion	
5	15 hour (44 to 58)	Introduction To Biomedical Instrumentation	5.1 Sources/Origin of Bio-Medical/Bio-Electric Signals 5.2 Generalized Block Diagram of Biomedical Instrumentation System 5.3 Various Types of Bio-Medical Electrodes 5.4 Basics of Pulse Rate Measurement 5.5 Blood Pressure Measurement using Sphygmomanometer & Stethoscope 5.6 Basic Concept of Telemedicine Technology & its Applications Revision and Discussion	-Same as above-
6	12 hour (59to 70)	Biomedical Recorders & Equipments	6.1 ECG: ECG Signal, ECG Machine Block Diagram, ECG Recording Analysis & Applications 6.2 EMG: EMG Signal, EMG Signal, EMG System Block Diagram & Applications 6.3 EEG: EEG Signals, EEG Machine Block Diagram & Applications 6.4 CT Scan: CT Scanner Principle, Block Diagram, Working & Applications 6.5 Pacemakers: Principle of Operation & Need of Pacemakers & Different Types of Pacemakers 6.6 Defibrillators: Principle of Operation & Need of Defibrillators & Different Types of Defibrillators Revision and Discussion	-Same as above-

Sr. No.	Period(2 Hour/ student/week)	Detail of ABI Practicals
1	2 Hour	Study of Filter Photometer
2	2 Hour	Study of Flame Photometer
3	2 Hour	Study of Spectrophotometer
4	2 Hour	Study of Heart Rate Monitor
5	2 Hour	Study of ECG Machine
6	2 Hour	Study of EMG Trainer
7	2 Hour	Study of EEG Trainer

Revision

Ritika Sharma
(Ritika Sharma)
Lecturer in Instrumentation Engineering
Govt Polytechnic Kangra(HP)
22 Aug 2023

22 Aug 2023
Approved by HOD(IE) Dated:

GP Kangra	Department: Instrumentation Engineering Subject: Process Control		
	Course: Diploma Duration : 03 Years		
Syllabus Planned	Total Periods: 70 (T) + 28 (P) Theory: 70		

SYLLABUS PLANNED

Sr. No.	Period Nos	Topic Covered	Details	Instruction Reference	Additional Study Recommended	Remarks
1	16 (01-16)	Introduction to Process Control	1.1 Introduction to Process Control 1.2 The Feedback Principle 1.3 Block Diagram Representation of Process Control System 1.4 Various Components/Elements & Terms of Process Control System: Sensor/Transducer, Controller, Final Control Element, Error Detector, Controlled Variable, Process Variable, Set Point, Manipulated Variable, Disturbances 1.5 Process Characteristics: Process Equation, Process Load, Process Lag, Self-Regulation 1.6 Control System Parameters: Error, Control Lag, Dead Time, Cycling, Reverse-Direct Action	Process Control Instrumentation Technology by Curtis D. Johnson (Pearson) & Process Control by Surekha Bhanot (Oxford)	Process System Analysis and Control, by Donald R. Coughanowr (TMH) & Chemical Process Control, by George Stephanopoulos (PHI)	
2	24 (17-40)	Theory of Controllers + Class Test-I	2.1 Introduction & Classification of Controllers 2.2 Discontinuous Controllers: On-Off Controller Mode, Multi-position Controller Mode, Floating Control Mode. -CLASS TEST-I 2.3 Continuous Controllers: Proportional (P) Controller, Integral (I) Controller, Derivative (D) Controller, Proportional-Integral (PI) Controller, Proportional-Derivative (PD) Controller, Proportional- Integral-Derivative (PID) Controller 2.4 Comparison of P, PI, PD & PID Controller Modes	-----do-----	-----do-----	

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			2.5 Response of P, PI, PD & PID Controller for Step, Pulse, Ramp & Sinusoidal Test Inputs 2.6 Important Terminology and Issues related to PID: 2.6.1 Proportional Band, Neutral Zone, Gain, Reset Time, Derivative Time, Parallel PID, Series PID and Real PID		
3	08 (41-48)	Advanced Control Strategies + Class Test-II	3.1 Feed Forward Control -CLASS TEST-II 3.2 Cascade Control 3.3 Ratio Control	-----do-----	-----do-----
4	08 (49-56)	Controller Tuning	4.1 Selection of Control Mode 4.2 Criteria for Good Control: ISE, IAE and ITAE 4.3 Process Reaction Curve 4.4 Ziegler-Nichols Method	-----do-----	-----do-----
5	12 (57-68)	Control Valves	5.1 Introduction to Control Valves 5.2 Control Valve Construction 5.3 Valve Sizing 5.4 Valve Characteristics: Effective Valve Characteristics, Equal Percentage Valve, Quick Opening Valve and Linear Valve, Benefits of Equal Percentage Valve. 5.5 Valve Positioner	-----do-----	-----do-----
6	02 (69-70)	Revision	-Revision & Doubt Clarification.		



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PLANNED SYLLABUS COVERAGE (Theory)

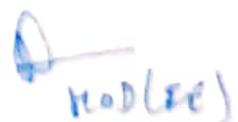
GP Kangra SYLLABUS COVERAGE	Department: Instrumentation Engineering	Subject : Control System-II				
	Course : Diploma	Duration: 3 Yrs.				
	Total Period: 70 (5 per week*14 weeks)					
Sr. No.	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended	Remai ns
1	18 HRS (1-18)	Stability	Concept of Stability in s domain, Classification of Stability (BIBO stability and asymptotic stability), pole- zero plots in s domain, response term contributed by different types of poles, stability analysis by Hurwitz criterion and Routh array, determination of marginal gain and oscillation frequency using Routh array, concept of relative stability and its analysis using Routh array.	Control systems Engineering by Nagrath and Gopal; 6th edition; New Age International Publications	Internet	
2.	18 HRS (19-36)	Root locus	Definition, magnitude and angle conditions, construction rules, determination of system gain at any point on root locus (from magnitude condition and by graphical method), root locus of systems with dead time: Concept, approximation of dead time and construction rules. CT I .	Control Systems Engineering by SK Bhattacharya, 2nd edition; Pearson Education	-----do-----	
3.	18 HRS (37-54)	Frequency domain analysis of control systems	Response of control systems to sinusoidal inputs, frequency domain specifications of a second order system (resonant frequency, resonant peak), correlation between time domain and frequency domain specifications. CT II .	Modern Control Engineering by Katsuhiko Ogata, 5th edition; PHI publications	-----do-----	
4.	16 HRS (55-70)	Stability	Concept of gain margin, phase	Feedback Control systems by R.A.Barapte, Techmax Publication, 2008	-----do-----	

(1) FAD (4e)

analysis in frequency domain using Bode plot	margin and bandwidth, stability analysis, dead time, gain and phase cross-over frequency, Determination of transfer function from asymptotic Bode plot.	-----do-----	-----do-----	
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Approved Date: 27/08/2023	HOD Sign. 
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GP Kangra		Department: Instrumentation Engg. Subject: Intro to Machine Learning			
SYLLABUS COVERAGE		Course : Diploma		Duration: 3 Yrs.	
Total Periods: 56			Theory : 56		
Sl No	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended
1	8	Introduction	1.1 What is Machine Learning 1.2 Examples of machine learning applications a) Unsupervised Learning b) Supervised Learning c) Reinforcement Learning 1.3 Issues in Machine Learning 1.4 Perspectives of Machine Learning	Machine Learning by Tom M. Mitchell	Internet: nptel.ac.in
2	10	Concept Learning	2.1 Introduction 2.2 Concept Learning Task 2.3 Concept Learning as search 2.4 Inductive bias a) A biased hypothesis space b) An unbiased learner 2.5 The LIST- Then eliminate algorithm 2.6 CANDIADATE-ELIMAINATAION learning algorithm	-do-	
3	10	Decision tree	3.1 Introduction 3.2 Decision Tree representation 3.3 Appropriate problems for decision Tree Learning 3.4 The basic Decision Tree Learning algorithm 3.5 Issues in Decision Tree Learning	-do-	
4	11	Bayesian and Instance based Learning	4.1 Bayesian Learning 4.1.1 Introduction 4.1.2 Bayes Theorem 4.1.3 Bayes Theorem and Concept Learning 4.1.4 Bayesian Belief Networks 4.2 Instance- Based Learning 4.2.1 Introduction 4.2.2 k-NEAREST NEIGHBOR LEARNING 4.2.3 Locally Weighted Regression 4.2.4 Case- Based Reasoning	-do-	
5	9	Genetic Algorithm		-do-	


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6	8	Artificial Neural Networks (09)	<p>5.1 Introduction 5.2 Genetic Algorithms 5.3 Genetic Programming 5.4 Models of Evolution and Learning</p> <p>6.1 Introduction 6.2 Neural Network Representation 6.3 Perceptrons 6.4 BACKPROPAGATION Algorithm</p>	-do-		
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Approved		HOD Sign.
Date:	11/08/2023	