LESSON PLAN

GP Kangra

Department: Instrumentation Engg. **Subject:** D.S.P.

Name of the faculty: Karan Singh Thakur

Course : Diploma **Duration:** 3 Yrs. **Session:** January-June 2020

SYLLABUS COVERAGE

Total Periods: 64 **Theory :** 64

Sr No.	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended	Remarks
1	1-14 (14)	Introduction	1.1 What is DSP? 1.2 Basic Elements of DSP and its requirements 1.3 Advantages of Digital over Analog Signal Processing and limitations of Digital Signal Processing 1.4 Application of Digital Signal Processing 1.5 Classification of Discrete Time Signals 1.6 Basics of Standard Test Signals 1.7 Sequence Operation of Discrete Time Signals: Time Shifting, Time Scaling and Amplitude Scaling and Folding 1.8 Properties and Classification of Discrete Time System 1.9 LTI System, Impulse Response .	Introduction to Digital Signal Processing by Johhny R. Johnson; Englewood Cliffs, NJ : Prentice Hall, c1989	www.nptel.com	
2.	15-24 (10)	Z Transform	2.1 Introduction to Z Transform 2.2 Z Transform of various Standard Signals and their Region of Convergence 2.3 Properties of Z Transform 2.4 Inverse Z Transform 2.5 LTI System Analysis: Pole Zero Plot; System Transfer Function; Causality and Stability; Difference Equation 2.6 Analog Filter Design	-do-		
3.	25-36 (12)	Discrete Fourier Transform	3.1 DTFT: Introduction and its properties 3.2 Relationship of DTFT and DFT 3.3 DFT of Standard Signals 3.4 Cyclic Property of Twiddle factor 3.5 Properties of DFT 3.6 Relationship between DFT and Z Transform	-do-		
4.	37-50	Fast Fourier	4.1 Introduction			

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	(14)	Transform	4.2 Radix-2 FFT Algorithm 4.3 Radix-2 Decimation in Time Algorithm (DIT FFT) 4.4 Radix-2 Decimation in Frequency (DIF) FFT Algorithms 4.5 Computation of Inverse DFT (IDFT) using FFT Algorithms	-do-		
5.	51-64 (14)	Filter Designing	5.1 Introduction 5.2 Transfer Function of FIR Filter 5.3 FIR Filter Structure: Direct Form; Cascade Form; Structure of Linear phase FIR Filters 5.4 IIR Filter Structure: Direct Form; Cascade Form; Parallel form 5.5 FIR Filter Design: Properties of commonly used Windows; Gibb's Phenomenon; Filter Design using any one Window Method 5.6 IIR Filter Design: Impulse Invariance Method; Bilinear Transformation Method.	-do-		

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Lesson Plan

GP Kangra	Department: Instrumentation Engineering	Subject : PLC & SCADA	
	Course : Diploma	Duration: 3 Yrs.	
SYLLABUS COVERAGE	Name of the faculty : Vikal Sharma Total Period: 64	Theory : 64	

Sr. No.	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended	Remark
1	10 (1-10)	**Introduction to PLC**	1.1 Relays based logic circuits 1.2 Limitations of relays based logic circuit 1.3 Concept of PLC, 1.4 Advantages of PLCs over electromagnetic relays based logic circuit 1.5 Different programming languages used in PLC 1.6 PLC specifications.	Basic Instrumentation System & Programmable Logic Controller by Dr. Umesh Rathore (S.K. Kataria Publication)	Programmable Logic Controllers and Industrial Automation by Madhuchhanda Mitra (PHI)	
2	10 (11-20)	**Architectural Detail and Working of PLC**	2.1 Basic operation and principle of working of PLC 2.2 Architectural details of PLC 2.3 Input & Output Modules in PLC 2.4 Opto-isolation Circuit in PLC and its need 2.5 Memory structures in PLC 2.6 HMI (Human Machine Interface) used in PLC system 2.7 Power supply requirements in PLC	-------do------	-------do------	
3	16 (21-36)	**Instruction Set**	3.1 Addressing in PLC: I/O Address 3.2 Basic instructions: Examine ON, Examine OFF, Latch/Unlatch, Output Energize, Hold ON. 3.3 Timer instructions: On delay timer, Off delay timer, retentive/non-retentive timers, resetting of timers. 3.4 Counter instructions: Up Counter, Down Counter, resetting of counters. 3.5 Sequencers. 3.6 Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal.	-------do------	-------do------	

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4	16 (37-52)	**Ladder Logic Programming**	Introduction to Ladder Logic programming, Ladder logic programming examples based on basic instructions, timer and counter instructions. Simple Applications of PLCs: 4.1 Bottle filling Process 4.2 Traffic Light Control 4.3 Material handling 4.4 Elevator 4.5 Oven Control 4.6 Stirred tank reactor (Process Control) 4.7 Forward/reverse control of motor using PLC	-------do------	-------do------	
5	12 (53-64)	**DCS & SCADA**	5.1 Introduction & History of DCS 5.2 Hierarchical Architecture of DCS 5.3 System Elements of DCS(Field Station, Intermediate Station and Central Computer Station) 5.4 Advantages and Disadvantages of DCS 5.5 Definition of SCADA 5.6 Major elements of SCADA 5.7 Advantages and Disadvantages of SCADA 5.8 Application areas of SCADA 5.9 Comparison of PLC, SCADA and DCS	Process Control - Principles & Applicatiions by Surekha Bhanot (Oxford)	Instrument Engineer's Handbook: Bela G. Liptak	

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LESSON PLAN

GP Kangra	Department: Instrumentation Engineering	Subject :VI	
	Course : Diploma	Duration: 3 Yrs.	
SYLLABUS COVERAGE	Name of the faculty : Vikal Sharma Total Period: 64	Theory : 64	

Sr. No.	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended	Remarks
1	15 (01-15)	**Introduction to Virtual Instrumentation System**	1.1 Instrumentation System a). Traditional Instrumentation b). Virtual Instrumentation c). Comparison between Traditional and Virtual Instrumentation System 1.2 Software based Instrumentation System 1.3 Programming a). Graphical Programming b). Structured Programming 1.4 Software Based Instrumentation 1.5 Various application of virtual Instrumentation in different domains 1.6 Introduction to Intelligent Instrumentation	Virtual Instrumentation by Jovitha Jerome (PHI)	LabVIEW for everyone by Jeffrey Travis & Jim Kring (National Instruments Virtual Instrument Series)	
2	08 (16-23)	**Introduction to LabVIEW**	2.1 Introduction to LabVIEW 2.2 Component of LabVIEW 2.3 Role of Hardware in virtual Instrumentation system 2.4 Role of Software in virtual Instrumentation system 2.5 Introduction to data flow programming.	------do-----	------do-----	
3	18 (24-41)	**LabVIEW Environment**	3.1 Introduction a). VI b). Sub-VI 3.2 Local Variable and Global variable 3.3 Repetition/Loop a). For loop b). While loop 3.4 Array a). 1-D b). 2-D	------do-----	-------do-------	

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			3.5 Charts and graphs 3.6 Structure a). Case Structure b). Sequence Structure 3.7 Introduction to Formula Node 3.8 String a). Creating string control and indicator b). String function c). Editing, formatting and parsing string 3.9 Introduction to File input/output			
4	12 (42-53)	**Data Acquisition Methods**	4.1 Introduction to analog input/output (AIO) 4.2 Introduction to digital input/output (DIO) 4.3 Introduction to counter 4.4 Introduction to timer 4.5 Basic of analog to digital designs 4.6 Interfacing methods of Data Acquisition (i.e. DAQ) Hardware 4.7 Introduction to software structure to interface DAQ hardware to LabVIEW 4.8 Use of Data Sockets for networked communication and controls	-----do-----	------do------	
5	11 (54-64)	**Communication between PC and DAQ hardware**	5.1 Introduction to PC buses : ISA, EISA, VME, PCI, IEEE488 & USB 5.2 PC interface: Expansion bus, RS232 & RS485	-----do-----	------do------	

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LESSON PLAN

GP Kangra	Department: Instrumentation Engineering,	Subject: MTS	
	Course : Diploma	Duration: 3 Yrs.	
Syllabus Coverage	Total Period: 64,	Theory : 64, Practical: 26	
	Name of the faculty: Varun,	Session: January-April, 2020	

Sr. No.	Period Nos	Topic	Details	Instruction Reference	Additional Study Recommended	Remark
1	20 (1-20)	Introduction	Importance/ Scope of maintenance, Objective of plant maintenance, Functions of plan maintenance department, Safety at workplace, Computerized maintenance management information system (CMMIS/CMMS), Types of maintenance: Planned and Unplanned Maintenance, Breakdown Maintenance, Preventive maintenance - Periodic Maintenance (Time based maintenance) & Predictive maintenance (Condition based maintenance), Comparison between preventive and breakdown maintenance; planned and unplanned maintenance.	Industrial Machinery Repair: Best Maintenanc e Practices Pocket Guide by Ricky Smith, R. Keith Mobley		
2	10 (21-30)	Maintenance Plans	Tools and spares required, listing, procurement and storage, Maintenance plans, checklists, machine schedules and maintenance manuals, history- sheet, equipment log-book, breakdown intimation slip, job order, work order.	-do-		
3	10 (31-40)	Maintenance Records	Need for maintaining records, responsibility of preparing and storing records, time-frames for maintaining records, Importance in keeping the plant running, Effective maintenance and cost savings, Motivation factors in timely maintenance.	-do-		

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4	15 (41-55)	Component Testing	Component Symbols and Line Diagrams (Electrical, Electronics, Mechanical), Location of faults, checking, Replacement of different fuses, lamps and lamps holders, switches, cables, cable connectors, relays, Identification and testing of variable components, diodes, Transistors (Active/Passive Components).	Troubleshooting Electronic Equipment: Includes Repair and Maintenance by Dr R.S. Khandpur		
5	9 (56-64)	Energy And Environment Management	Concept of energy conservation, neat and clean environment, Energy saving Measures and Devices Air, Water, Noise Pollution, Laws and Acts for Environment, Fire and Prevention (Classification, Types of fire and fire extinguishers)	The Fire Extinguisher by Miranda Pearson		

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Instrumentation Engg.

Lesson Plan (Session: January- May 2020)
Subject:- Industrial Electronics; Semester: 6th
Planned Theory: 16 weeks *4 hours/week= 64 hours, Planned Practical: 32 Hours

Sr No.	Lecture No.	Topic	Detailed Contents	Instruction Reference/ Additional Study Recommended
1	07 hours (1-07)	**Thyristors**	working principle-V-I characteristics and ratings, turn on methods, Natural and forced turn off methods, MOSFET and IGBT.	**Industrial Electronics and Control by Biswanath Paul**
2	10 hours (08-17)	**Heat Dissipation in thyristors**	2.1 Internal power dissipation and need for heat sinks in thyristors. 2.2 Definition of following terms and their relationship with the power dissipation of the device (no derivation). a) Heat sink efficiency b) Heat sink transfer co-efficient c) Heat dissipating area of a heat sink. 2.3 Concept of thermal resistance of heat sinks. 2.4 Various types of heat sinks and techniques of mounting device on heat sinks.	**J.M.D. Murphy, F.G. Turnbull, Power Electronic Control of ac Motors, Pergamon**
3	12 hours (18-29)	**Principle of operation and working of the following switching circuits, using SCRs and Triacs**	3.1 Automatic Battery charger 3.2 Voltage regulator a) Uncontrolled voltage regulator b) Controlled voltage regulator 3.3 Emergency light 3.4 Alarm circuit 3.5 Time delay relay circuit 3.6 Circuits for over voltage and over current	**Thyristor DC Drives, P.C. Sen** Do
4	10 hours (30-39)	**Controlled rectifiers**	Explanation of controlled single and three phase halfwave and fullwave bridge rectifier for the resistive and inductive load.	Do
5	08 hours (40-47)	**Application of phase controlled rectifications and AC phase control circuits in:**	5.1 Illumination Control using TRIAC 5.2 Fan speed control using SCR 5.3 Temperature Control 5.4 Speed control of dc and small ac motors	Do
6	10 hours (48-57)	**Principles of operation of Basic inverter circuits.**	Basic series and parallel commutated inverters	Do

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7	07 hours (58-64)	**Principle of working**	dc Chopper & ac Cyclo convertor circuit using SCR and its applications.	Do

Sr. No.	Period(2 hours per student/week)	Detail of Practical
1	5hours	V-I characteristics of SCR
2	5hours	Observation of wave shape and measurement of voltage relevant points of an SCR based single phase halfwave controlled rectifier circuit using resistive Load.
3	5hours	Observation of wave shapes and measurement of voltages at relevant points of an SCR based single phase full wave controlled rectifier circuit RC Load.
4	5hours	Observation of wave shapes and measurement of voltage at relevant points of an SCR based single phase controlled bridge rectifier circuit
5	6hours	Observation of wave shapes and measurement of voltage at relevant point in a triac based AC phase control circuit used for lamp intensity/motor control.
6	6hours	Study of inverter.

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Govt. Polytechnic Kangra (HP)
Department of Instrumentation Engg
Planned Syllabus (Lesson Plan for Academic Session Jan to May 2020)
Subject: **Industrial Automation & Robotics**; Semester: 6th
Planned Theory: 16 week *4 hour/week=64 hours Practical: 16week*2 hours/week=32hours

Sr. No.	Period No.	Topic	Detail Content	Instruction Reference
1	(8 Hrs) 1 to 8	**Introduction**	Robotics and automation, Robot anatomy, Classification of robots, Specification of robots: DOF, Joints and axes, Load carrying capacity, resolution, accuracy, repeatability, precision etc.	Robotics and automation handbook by Thomas R. Kurfess, Publication CRC Press
2	(14Hrs) 9-22	**Kinematics**	Introduction, The direct Kinematics and Inverse kinematic for three and four degrees of freedom Robot arms. Kinematic equation using homogeneous Transformations.	Modern Control Engineering by Katsuhiko ogata, Publication Pearson
3	(18Hrs) 23-40	**Driver, Actuator and Control**	Introduction to driver and actuator system Different types of driver and actuator system Hydraulic driver and actuator system Pneumatic driver and actuator system Electrical driver and actuator system	
4	(10Hrs) 41-50	**Robot End effectors/Grippers**	Introduction, Classification of end effectors, Drive system for Grippers, Mechanical, Magnetic, Vacuum, Adhesive Grippers, Gripper force analysis and gripper design (Basic elementary level). Active and Passive grippers	

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5	(6Hrs) 51-56	**Robot Sensors**	Introduction to Analog Sensors Different types of analog sensors Introduction to Digital Sensors Different types of Digital sensors Selection of sensors for specific application Sensor signal conditioning	
6	(8Hrs) 57-64	**Robotic Applications**	International scenario for implementing robots in commercial sectors International scenario for implementing robots in industrial sectors Applications of robots in different industrial processes like welding, painting, furnaces, pick and place, hazards and safety aspects.	

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08/01/2020

Approved by HOD/IC
Instrumentation Engineering Deptt.
Govt. Polytechnic Kangra (HP)

Dated: 08 January 2020

Lesson Plan
Govt. Polytechnic Kangra
Subject: Industrial Automation & Robotics
6th Sem Instrumentation Engg. Deptt.
Session Jan-May 2020

Sr. No.	Planned Hours per student	Details of Practical
1	6 Hrs	Demonstration of use of hydraulic system based actuator and final control element available in your lab.
2	4 Hrs	Study based on direct kinematics.
3	4 Hrs	Study based on inverse kinematics.
4	4 Hrs	Demonstration of use of pneumatic system based actuator and final control element available in your lab.
5	4 Hrs	Demonstration of use of electrical system based actuator and final control element available in your lab.
6	6 Hrs	Observe the variation in a process which utilizes Proportional, Proportional-Integral and Proportional-Integral-Derivative controller and analyse results of above mentioned different controllers.
7	4 Hrs	To study the gripper/ end effecter kinematics of robotic hand.

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08/01/2020

Lecturer Instrumentation Engineering

Dated: 08 January 2020

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08/01/2020
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