



# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Name of Program: Bachelor of Technology in Electronics & Communication

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEC501	EC	Microprocessor, Microcontroller and Interfacing	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

1. To provide basic knowledge of Microprocessor & Microcontroller.
2. To develop the programming skills of 8085 microprocessor & 8051 microcontroller.
3. To provide the knowledge of interfacing of external devices with the 8051 microcontroller.

### Course Outcomes (COs):

After completion of this course the students will be able to-

1. Apply the concept of buses, microprocessor & microcontroller architecture and interrupts
2. Interface memory and I/O devices with microprocessor & microcontroller.
3. Develop assembly language programs efficiently for solving problems.
4. Interface external devices with 8051 microcontroller.
5. Design and develop microcontroller based small system

### Syllabus

#### UNIT I

8 Hrs.

#### 8085 Microprocessor

Introduction to Microprocessors: History, Von-neumann and Harvard architecture, RISC and CISC. 8085 Microprocessor: Pin Description, Register Organization, Flag Register, ALU, Control & Timing Unit, Memory Interfacing, IO Interfacing, Memory-Mapped I/O, Timing diagram for I/O and memory.

#### UNIT II

9 Hrs.

#### Assembly Language Programming of 8085

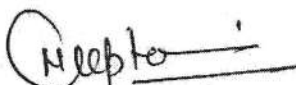
Addressing Modes of 8085 Microprocessor, Instruction Format: Op-code and Operand, Classification of Instructions, Instruction Set: Data transfer, Arithmetic, Logical, Branch and Machine Control, Concept of stack, 8085 interrupts, Development of 8085 Assembly Language Programs: Counter & Delay Programs.


#### UNIT III

9 Hrs.

#### Peripheral Devices

Programmable input/output ports 8255A: Configuration, Modes and Operation. Programmable interval timer 8253, keyboard/display controller 8279, Programmable communication interface 8251 USART, DMA controller 8257.

  
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9 Hrs.

## UNIT IV

### Introduction to Microcontrollers

Introduction, Microprocessors versus Microcontrollers, Microcontroller families, 8051 Microcontroller: Architecture, Pin Description, Register Organization, Special Function Registers, Memory and IO Addressing, Interrupts of 8051.

8 Hrs.

## UNIT V

### 8051 Assembly language Programming

Assembly Language Programming in 8051: Addressing Modes of 8051, Instruction Set: Data Transfer, Arithmetic & Logic Instruction, Branching Instruction. I/O Port Programming, Timer & Counter Programming, Interfacing with LED, 7-Segment Display, LCD & Motor.

### Text Books:

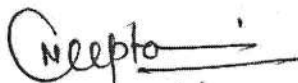
1. Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and application with 8085", 6<sup>th</sup> Edition, Penram International Publishing, 2013.
2. B. Ram, "Fundamentals of Microprocessors and Microcontrollers", 6<sup>th</sup> Edition, Dhanpat Rai Publications, 2010.
3. A.K. Ray & K.M. Bhurchandi, Advanced Microprocessors and Peripheral-Architecture, Programming and Interfacing, 3<sup>rd</sup> Edition Tata McGraw-Hill, 2012
4. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2<sup>nd</sup> edition, Pearson Education, 2008.

### References:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", 3<sup>rd</sup> Edition, Tata McGraw Hill Publishers, 2012.
2. Rajkamal, "Microcontrollers Architecture, programming, interfacing and system design" Pearson education, 2009.
3. Kenneth J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded Systems using Assembly and C" Cengage Learning, 2008
4. Barry B. Brey, "The Intel Microprocessors – Architecture, Programming And Interfacing", 8<sup>th</sup> Edition, Pearson Education, 2008.


### List of Experiments:

1. Introduction to 8085 & 8051 hardware boards and IDE.
2. Develop programs in 8085 for data transfer operation.
3. Develop programs in 8085 for Arithmetic & Logical Operations.
4. Develop a program in 8085 to find 1's complement and 2's complement of a number.
5. Develop a program in 8085 to find larger number out of two numbers.
6. Develop 8051 Assembly language programs for data transfer from one location to another.
7. Develop 8051 Assembly language programs using Arithmetic/ Logical instructions.
8. Develop 8051 Assembly language program to generate a square wave of 2 KHz frequency.
9. Develop 8051 Assembly language programs for code conversions
10. Develop 8051 Assembly language programs for Timers in different modes.
11. Develop 8051 Assembly language programs for LED & LCD Interfacing
12. Develop 8051 Assembly language programs for motor control.



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**B. Tech/B.Tech+MBA in Mechanical Engineering**

**SEMESTER V**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			L	T	P	CREDITS	THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTME503	DCS	DYNAMICS OF MACHINE	3	1	2	5	60	20	20	30	20

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

To introduce basic principles and applications of (A) Engine Mechanisms, (B) Governor Mechanisms, (C) Balancing of Inertia Forces, Friction and Brakes

**Course Outcomes (COs):**

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student would be able to understand the need of Mechanisms in engine parts.
2. Students would be able to understand basics of Displacement, velocity and acceleration of piston.
3. Students would be able to understand Governor Mechanisms.
4. Students would be able to understand the basics of Balancing of masses.
5. Students would be able to understand utility of Friction in Machine parts.
6. Students would be able to analyze Cam movement.

**Syllabus**

**Unit - I**

**Dynamics of Engine Mechanisms:** Displacement, velocity and acceleration of piston; turning moment on crankshaft; turning moment diagram; Fluctuation of crankshaft speed; Analysis of flywheel.

**Unit - II**

**Governor Mechanisms:** Types of governors, characteristics of centrifugal governors, gravity and spring controlled centrifugal governors; hunting of centrifugal governors; inertia governors.

**Unit - III**

**Balancing of Inertia Forces:** Balancing of rotating masses; Two plane balancing; Determination of balancing masses (graphical and analytical methods); Balancing of rotors; Balancing of internal combustion engines, Single cylinder engines, In-line engines, V-twin



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**B. Tech/B.Tech+MBA in Mechanical Engineering**

**SEMESTER V**

engines, Radial engines, Lanchester technique of engine balancing.

**Unit - IV**

**Friction:** Frictional torque in pivots and collars by uniform pressure and uniform wear rate criteria, Boundary and fluid film lubrication, friction in journal and thrust bearings, concept of friction circle and axis, rolling friction.

**Unit-V**

**Belt drives:** Velocity ratio, limiting ratio of tension; power transmitted; centrifugal effect on belts; maximum power transmitted by belt; initial tension; creep; chain and rope drives.

**Brakes:** Band brake; Band and block brakes, Internal and external shoe brakes.

**Dynamometer:** Different types and their applications.

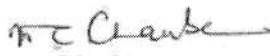
**Dynamic Analysis of Cams:** Response of un-damped cam mechanism (analytical method), follower response analysis by phase-plane method, jump and cross-over shock.

**Reference Books:**


1. "Theory of machines", by Rattan; Publisher: TMH, 2009.
2. "Mechanism and Machine Theory", by Ambekar; Publisher: PHI, 2007.
3. "Theory of Machines", by Thomas Bevan; Publisher: Pearson, 2010.
4. "Theory of Mechanisms and Machines", by Ghosh and Malik; Publisher: East-West Press, 2015.
5. "Kinematics and dynamics of machinery", by Norton RL; Publisher: TMH, 2009.
6. "Theory of Machines", by P.L. Balaney; Publisher: Khanna, 2003.

**List of Experiments**

1. To Perform Experiment on Watt and Porter Governors & also Prepare Performance Characteristic Curves in order to find Stability & Sensitivity.
2. To Perform Experiment on Proell Governor & also Prepare Performance Characteristic Curves in order to find Stability & Sensitivity.
3. To Perform Experiment on Hartnell Governor & also Prepare Performance Characteristic Curves in order to find Stability & Sensitivity.
4. To determine gyroscopic couple on Motorized Gyroscope.
5. To study gyroscopic effects through models.
6. To study Dynamically Equivalent System.
7. To study different types of dynamometers.
8. To study different types of clutch.
9. To study different types of Brakes.
10. To Study dynamic behavior of cam & follower under various operating conditions using CAM Analysis Apparatus.

  
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## Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

### B.Tech (Mechatronics)

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTMT 501		Applied Hydraulics and Pneumatics	60	20	20	30	20	3	1	2	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST Mid Sem. Test.

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Educational Objectives (CEOs):

- To impart knowledge of Applied Hydraulics & Pneumatics.

#### Course Outcomes (COs):

Upon completion of the course, students will be able:

- To Use Fluid Power Engineering and Power Transmission System.
- To implement automation of Machine Tools and others Equipments in Fluid Power System.

#### Syllabus

##### UNIT I

8hrs.

Introduction to fluid power, Types, advantages & applications of fluid power, Properties of hydraulic fluids , General types of fluids ,Fluid power symbols. Basics of Hydraulics,Applications of Pascal's Law, Laminar and Turbulent flow ,Reynolds's number ,Darcy's equation ,Losses in pipe, valves and fittings.

##### UNIT II

12hr.

Sources of Hydraulic Power: Pumping theory, Pump classification, construction and working of pumps ,pump performance ,Variable displacement pumps,Fluid Power Actuators: Linear hydraulic actuators,Types of hydraulic cylinders:Single acting, Double acting, special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators ,Fluid motors.

##### UNIT III

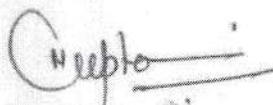
10hr.

Construction of Control Components : Directional control valve, 3/2 way valve ,4/2 way valve ,Shuttle valve ,check valve ,pressure control valve, pressure reducing valve, Flow control valve : Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers: Types of accumulators, intensifier Applications of Intensifier.

##### UNIT IV

10hr.

Pneumatic Components: Properties of aircompressors,Filter, Regulator, Lubricator Unit ,Air control valves, Quick exhaust valves, pneumatic actuators. Fluid Power Circuit Design, Speed



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control circuits, synchronizing circuit, Penumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.

### UNIT V

12hr.

Servo systems :Hydro Mechanical, Electro hydraulic and proportional valves. Fluidics :Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.

### Text Books:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2005.
2. Majumdar S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw-Hill, 2001.

### Reference Books:

1. Srinivasan.R, "Hydraulic and Pneumatic controls", Vijay Nicole, 2006.
2. Shanmugasundaram. K, "Hydraulic and Pneumatic controls", Chand & Co, 2006.

### List of Experiments:

1. Design and testing of Pressure Control Hydraulic Circuit.
2. Design and testing of Flow Control Hydraulic Circuit.
3. Implementation and testing of Directional Control Hydraulic Circuit.
4. Implementation and testing of Pressure Control pneumatic Circuit.
5. Design and testing of Flow Control pneumatic Circuit.
6. Development and analysis of Directional Control pneumatic Circuit.
7. Development and analysis of circuits with Logic Control.
8. Implementation and testing of Circuits with Timers.
9. Design of circuits with programmed Logic sequence using an optional PLC in electro hydraulic trainer.
10. Demonstration of P/I and I/P Converter.

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# Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

## Name of Program: Bachelor of Technology in Robotics and Automation

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA501	EC	Robotic Engineering	60	20	20	0	0	3	0	0	3

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

The goal of the Robotics course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

### Course Outcomes (COs):

1. To develop the student's knowledge in various robot structures and their workspace.
2. To develop student's skills in performing spatial transformations associated with rigid body motions.
3. To develop student's skills in perform kinematics analysis of robot systems.
4. To provide the student with knowledge of the singularity issues associated with the operation of robotic systems.
5. To provide the student with some knowledge and skills associated with robot control

### Syllabus:

#### UNIT I

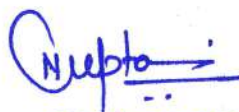
10 Hrs.

Brief History, Types of robots, Overview of robot subsystems, resolution, repeatability and accuracy, Degrees of freedom of robots, Robot configurations and concept of workspace, Mechanisms and transmission, End effectors and Different types of grippers, vacuum and other methods of gripping. Pneumatic, hydraulic and electrical actuators, applications of robots, specifications of different industrial robots.

#### UNIT II

9 Hrs.

Rotation matrices, Euler angle and RPY representation, Homogeneous transformation matrices, Denavit-Hartenberg notation, representation of absolute position and orientation in terms of joint parameters, direct kinematics.

  
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### UNIT III

8 Hrs.

Inverse Kinematics, inverse orientation, inverse locations, Singularities, Jacobian, Trajectory Planning: joint interpolation, task space interpolation, executing user specified tasks.

### UNIT IV

9 Hrs.

Static force analysis of RP type and RR type planar robots, Dynamic analysis using Lagrangian and Newton-Euler formulations of RR and RP type planar robots, , Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, Computed torque control, force control, hybrid control.

### UNIT V

9 Hrs.

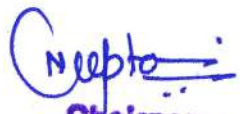
Sensors and controllers: Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder. Robot vision: image processing fundamentals for robotic applications, image acquisition and preprocessing. Segmentation and region characterization object recognition by image matching and based on features.

### Text Books:

1. Nagrath and Mittal, "Robotics and Control", Tata McGraw-Hill, 2003.

### References:

1. Spong and Vidhyasagar, "Robot Dynamics and Control", John Wiley and sons, 2008.
2. Fu. K.S, Gonzalez, R.C., Lee, C.S.G, Robotics, control, sensing, Vision and Intelligence, McGraw Hill International, 1987
3. Harry Asada & Slotline "Robot Analysis& Control" , Wiley Publications, 2014

  
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Name of Program: Bachelor of Technology in Electronics & Communication

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL			L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*					
BTEC515	EC	Data Communication and Computer Networks	60	20	20	30	20	3	1	2	5	

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Objectives:

1. Introduce the concept of communication protocols and give an overview of Data Communication Standards.
2. Allow the student to gain expertise in specific areas of networking such as the design and maintenance of individual networks.

### Course Outcomes:

Student will be able to:

1. Understand the principles of Open Systems and the Transport/Application protocols, which facilitate them.
2. Analyze the services and features of the various layers of data networks.
3. Explain the importance of data communications and the Internet in supporting business communications and daily activities.

### Syllabus:

#### UNIT I

08 Hrs.

Introduction: data communications, network criteria, categories of networks, network performance and transmission impairments, network devices, protocols and standards, data representation, data transmission, transmission modes, transmission media, LAN topologies, network models, layered tasks, the OSI model, TCP/IP protocol suite, addressing, encoding, switching technique and multiplexing.

#### UNIT II

10 Hrs.

Data link control, point-to-point and multi-point links, flow control techniques, error control techniques, HDLC as a bit oriented link control protocol, Ethernet, fast Ethernet, gigabit Ethernet, token ring, token bus, FDDI, multiple access protocols-pure and slotted aloha, wireless LANs: IEEE 802.11 and Bluetooth, introduction to virtual circuit switching including frame relay, X.25.

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## UNIT III

10 Hrs.

Network layer design issues, routing versus forwarding, static and dynamic routing, unicast and multicast routing, distance-vector, link-state, shortest path computation, dijkstra's algorithm, congestion control algorithms, network layer protocols (IP, ICMP, ARP, RARP, DHCP, BOOTP), IP addressing, IPv4, IPv6.

## UNIT IV

10 Hrs.

UDP, TCP and SCTP, multiplexing with TCP and UDP, principles of congestion control, Approaches to congestion control, Quality of service, flow characteristics, techniques to improve QoS.

## UNIT V

07 Hrs.

Domain name system , domain name space, dynamic domain name system, electronic mail and file transfer, WWW, HTTP, SNMP, overview of digital signature and digital certificates technology, cryptography – basic concepts, public/private key encryption.

### Text Books:

1. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, Fourth Edition, 2011.
2. Andrew S. Tanenbaum, "Computer Networks", Pearson education, Fourth Edition, 2009.

### References:

1. Prakash C. Gupta, "Data Communications and Computer Networks", PHI, Second Edition, 2014.
2. Ajit Pal, "Data Communications and Computer Networks", PHI, First Edition, 2014.
3. Wayne Tomasi , "Introduction to Data communications and Networking", Pearson education, First Edition, 2009.

### List of Experiments:

1. To study of Different Types of Network Equipment's.
2. To perform data transmission using RS-232 Interface.
3. To perform Synchronous and Asynchronous transmission.
4. To perform Parallel and Serial transmission.
5. To implement Ring topology using DB-9.
6. To implement cross cable connection and straight cable connection.
7. To study of network IP.
8. To implement & simulate various types of routing algorithm using Network Simulator.
9. To simulate STOP AND WAIT Protocols on NS-2.
10. To simulate various Routing Protocol on NS-2.
11. To simulate various Network Topologies on NS-2.
12. To configure routers, bridges and switches and gateway on NS-2.

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## B.Tech (Electronics and Instrumentation)

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI611		Data Acquisition System	60	20	20	30	20	3	1	2	5

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Q/A – Quiz/Assignment/Attendance, MST Mid Sem. Test.

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### Course Educational Objectives (CEOs):

1. To know about the types of transducers and display systems associated with it.
2. To understand the function of Data Acquisition system .
3. To gain information about data acquisition, data logging and application of sensors in condition based monitoring.
4. To learn about communication devices used in Data Acquisition system .

### Course Outcomes (COs):

The students will be able to

1. Summarize the working and construction of sensors measuring various physical parameters.
2. Outline operations of various data acquisition and transmission systems.
3. Distinguish smart sensors from normal sensors by their operation and construction.
4. Classify various sensing methods used in condition monitoring.

## SYLLABUS

### UNIT I

7hr.

Introduction to Display System: Seven segment, Dot matrix, Multiplexed, Code converter, LCD(construction, principle), Plasma and vapor displays, OLED , Discharge tubes, application of display systems.

### UNIT II

9hr.

Recorders: Galvanometric type, Null type, Potentiometer type, Strip Chart and circular charttype ,Magnetic tape recorder, principle & operation, Digital tape recorders, Optical storage disk, recorders applications in data acquisition system. Computer control introduction: Need of computer in a control system-Functional block diagram of a computer control system, Data loggers-Supervisory computer control.

### UNIT III

9hr.

General Telemetric Systems: land line & RF telemetry, voltage, current and Position telemetry with feedback mechanism, RF telemetry, Amplitude modulation , Frequency modulation , Pulse

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modulation, pulse amplitude modulation, pulse code modulation, telemetry with time and frequency division multiplexing, telemetry hardware.

## UNIT IV

9hr.

Data Acquisition System (DAS): single channel and multi channel, SuperVisory control and data acquisition system (SCADA), Introduction to PLC: Sequential and programmable controllers, Architecture, Programming of PLC, Relay logic, Ladder logic and its IEEE standard..

## UNIT V

9hr.

Data transfer techniques: DMA controller and data transfer in DMA mode, Serial data transmission methods, RS - 232C: specifications connection and timing , RS-422, RS-423 applications GPIB/IEEE-488 standard digital interface use, Local Area networks and its standard, Universal serial bus design with its application , Foundation –Fieldbus, ModBus, TCP/IP.

### Text Books:

1. Murty D V S, "Transducers & Instrumentation", PHI, New Delhi (2016)
2. Sawhney A K, "Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai and Sons.(2015)

### References:

1. H S Kalsi " Electronic Instrumentation" TMH, New delhi (2012)
2. Patranabis-Principles of Industrial Instrumentation 3rd Ed., TMH(2009)
3. D.Roy Choudhury and Shail B.Jain, Linear Integrated circuits, New age International Pvt. Ltd, 2003.

### List of Experiments:

1. To learn about basics of LabView and its HMI(Human Machine Interface).
2. To Study the Various Palettes Used in LabView to create virtual instruments.
3. To perform and Study of Creation of Virtual Instruments, (Creation of Random Wave Analyzer.)
4. Implement Virtual Instrument (Random Wave Analyzer)& Control its Wave plot Speed by adding Time Delay.
5. Develop Virtual Instrument (Random Plot Analyzer) and also add a function that will calculate the mean values of Plot.
6. Design a HMI of PLC using LabView.
7. Develop HMI using LabView for Fahrenheit (°F) to Celsius (°C).
8. Design a table to create data logging.
9. Write a program for table of 2 using loop.
10. Design a HMI to display sine wave

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Name of Program: Bachelor of Technology in Robotics and Automation

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA512	EC	Industrial Automation	60	20	20	30	20	3	1	2	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;  
\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

### Course Educational Objectives (CEOs):

Provides the knowledge of the industrial automation, computer aided measurement and control system, PLC, SCADA and DCS

### Course Outcomes (COs):

Students will able to:

1. Understand the requirement of Computer in Industrial Automation and its benefits.
2. Implement Programmable Logic Controller and its various applications.
3. Apply various types of Industrial Sensors and Distributed control systems for industrial automation.

### Syllabus:

#### UNIT I

8 Hrs.

**Introduction:** Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, types and benefits of Automation, Introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: Modbus and Profibus.

#### UNIT II

9 Hrs.

**Automation components:** Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, power electronics devices DIAC, TRIAC, power MOSFET, IGBT, SMPS, SCR. Introduction of DC and AC servo drives for motion control.

#### UNIT III

8 Hrs.

**Computer aided measurement and control systems:** Role of computers in measurement and control, Elements of computer aided measurement and control, man-machine interface, computer aided process control hardware, process related interfaces, Communication and networking, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Internet of things (IoT) for plant automation.

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## UNIT IV

9 Hrs.

**Programmable logic controllers:** Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using PLC for Industrial automation, Application of PLC to process control industries.

## UNIT V

8 Hrs.

**Distributed Control System:** Overview of DCS, DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers, Features of DCS, Advantages of DCS.

### Text Books:

1. S.K. Singh, "Industrial Instrumentation and Control" McGraw Hill Education; Third Edition, 2017
2. C.D. Johnson, "Process Control Instrumentation Technology", Pearson, Eighth Edition, 2014
3. Gary Dunning, "Programmable logic controller", Delmar Cengage Learning, Third Edition 2005
4. "Introduction to Computer Based Control Systems", IDC Technologies, 2012

### References:

1. "Introduction to Computer Based Control Systems", IDC Technologies, 2012
2. Andrew Parr, "Industrial control handbook", Newnes, Third edition, 1998
3. S. K. Singh, "Computer aided process control", PHI, 2004.
4. Webb and Reis, "Programmable logic controllers", Prentice Hall of India, 2002
5. Madhuchhanda Mitra and Samarjit Sen Gupta, "Programmable Logic Controllers (PLC) and Industrial Automation", Penram International Publishing India Pvt. Ltd. 2007

### List of Experiments

1. Design and implementation of ladder Logic with PLC.
2. Design a ladder logic for sequential batch process control system using PLC.
3. Study hardware and software platforms for DCS.
4. Simulate analog and digital function blocks.
5. Study , understand and perform experiments on timers and counters.
6. Logic implementation for traffic Control Application.
7. Logic implementation for Bottle Filling Application .
8. Tune PID controller for heat exchanger using DCS.
9. To control single acting ,double acting cylindrical valve using PLC.
10. To control X-Y position table through PLC programming.

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