STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examination for

IVth SEMESTER DIPLOMA IN INSTRUMENTATION & CONTROL ENGINEERING

(Effective form Session 2020-2021 Batch)

THEORY

S. No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION SCHEME							
			Periods per week	Hours of Exam	Teacher Assessment (TA) Marks (A)	Class Test (CT) Marks (B)	End Semester Exam. (ESE) Marks (C)	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Electrical Machine & Control	2040401	03	03	10	20	70	100	28	40	03
2.	Consumer Electronics	2021402	03	03	10	20	70	100	28	40	03
3.	Digital Communication Systems	2021403	03	03	10	20	70	100	28	40	03
4.	Electronic Equipment Maintenance	2021404	03	03	10	20	70	100	28	40	03
5.	Industrial & Automation	2040405	03	03	10	20	70	100	28	40	03
Total: 15							350	500			15

PRACTICAL

S.No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION SCHEME					
			Periods per week	Hours of Exam	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal (A)	External (B)			
6.	Electric Machine & Control Lab	2040406	02 50% Physical 50% Virtual	03	15	35	50	20	01
7.	Digital Communication Systems Lab	2021407	02 50% Physical 50% Virtual	03	07	18	25	10	01
8.	Industrial Automation Lab	2040408	02 50% Physical 50% Virtual	03	07	18	25	10	01
9.	MATLAB	2020409	02 50% physical 50% Virtual	03	07	18	25	10	01
Total: 08							125		04

TERM WORK

S.No	SUBJECTS	SUBJECT CODE	TEACHING SCHEME	EXAMINATION SCHEME				
			Periods per week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
10.	Essence of Indian Knowledge and Tradition (TW)	2021410	02	07	18	25	10	01
11.	Microprocessor & its Application Lab (TW)	2021411	02	07	18	25	10	01
12.	Minor Project (TW)	2021412	04	15	35	50	20	02
13.	Block Chain through Moocs / Swaym / Others (TW)	2021413	02	07	18	25	10	01
Total-			10			125		05
Total Periods per week of each duration One Hour = 33						Total Marks:750		24

ELECTRICAL MACHINE AND CONTROL

Subject Code 2040401	Theory			No of Period in one session : 50			Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
				CT	:	20	

RATIONALE:-

The students are well conversant with the electric and magnetic field and circuit, electro-magnetic induction, D.C. and A.C. circuits, based on related electric and magnetic theories. They also know about electrical components and materials, Now the Electrical Machine is being introduced for IVth Semester Diploma in Electrical & Electronics Engineering to impart the knowledge of D.C. & A.C. machines, which play vital roles even in this era of electronics in different industries throughout the world.

The topics of requisites and construction of D.C. machines, generators, D.C. & A.C. motors, converters, special motors and electro plating have been included in the content. Which will give full insight of electrical equipment's in their practical life.

Topics have been divided into sub-topics in order to facilitate the students to understand the subject matters properly. Tentative no. of lectures has been allotted for each topic and sub-topic, so that the whole syllabus may be covered easily in the academic year.

OBJECTIVES: -

The thorough study of these topics will enable the students know fully about D.C. machines, their operation, maintenance and proper connection and hence will enable him to work as a good supervisor and also to efficiently monitor the works of operators under him. The topics of special motors used and that of electroplating will provide full insight of practical use of electrical equipments.

Contents: Theory		Hrs	Marks
Unit-1	**Requisites and Construction of D.C. Machines** 1.1 Armature winding: Pole-pitch, Conductor coil and winding elements, coil span, coil-pitch, pitch of winding, back pitch, front pitch, resultant pitch, commutator pitch. 1.2 Single layer winding, lap and wave winding, use of lap and wave windings.	[15]	
Unit-2	**D.C. Generator** 2.1 Types of generator, E.M.F. equation of generator. 2.2 Losses and efficiency of a generator, condition for maximum efficiency. 2.3 Generator characteristics: No load curve of self-excited generator, How to find critical resistance, How to draw O.C.C. at different speeds, critical speed, voltage build-up of a shunt generator, condition for voltage build-up.	[15]	

Unit-3	**D.C. Motor** 3.1 Significance of back E.M.F. voltage equation of a motor, armature torque, shaft torque. 3.2 Characteristics of series shunt and compound motors. 3.3 Losses and efficiencies of a motor. 3.4 Speed control of a D.C. motor: Speed control of a series motor, speed control of a shunt motor, merits and demerits of a rheostatic control method, series. Parallel control. Simple problems. 3.5 Testing of D.C. Motors : NO-load test (Swin Burne's test) of D.C. shunt motor, back to back test (Hopkinson's test), retardation test of a series motor. 3.6 Necessity of a starter : Shunt motor starter: 3-point starter, 4-point starter.	**[15]**	
Unit-4	**A.C Motor** 4.1 Speed control of induction motors : control from stator side, control from rotor side. 4.2 Direct On-Line starter, star-Delta starter and Autotransformer starter.	**[05]**	
	Total	**50**	

Recommended Books:-

Sl.No	Title/Publisher	Author
1.	Theory of Direct Current Machinery, TMN editions	Alexander S.Langsdorf
2.	A text-Book of Electrical Technology, Vol-II	B.L. Theraja
3.	Electrical Machinery, Khanna Publications	P.S. Pimbhra
4.	Electrical mic Katauliya & Son's	J.B. Gupta

CONSUMER ELECTRONICS
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021402	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Maintain various consumer electronic appliances/equipments.**

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	**Audio Fundamentals and Devices** Basic characteristics of sound signal, Audio level metering, decibel level in acoustic measurement Microphone & Types, speaker types & working principle, Sound recording principle & types.	12
Unit II	**Audio Systems** CD player, home theatre sound system, surrounding sound, Digital console block diagram, working principle, applications, FM tuner , ICs used in FM tuner TDA 7021T , PA address system.	12
Unit III	**Television Systems-** Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution, Composite video signal, Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance, Different types of TV camera, Transmission standards.	14
Unit IV	**Television Receivers and Video Systems-** PAL-D colour TV receiver, Digital TVs:- LCD, LED , PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface, Digital Video, SDI, HDMI Multimedia Interface , Digital Video Interface, CD and DVD player.	12

Unit V	**Home / Office Appliances** Diagrams, operating principles and controller for FAX and Photocopier, Microwave Oven, Washing Machine, Air conditioner and Refrigerators, Digital camera and cam coder.	**10**
	TOTAL	**60**

References:

S. No.	Title of Book	Author	Publication
1.	Consumer Electronics	Bali S.P.	Pearson Education India,2010 , latest edition
2.	Audio video systems : principle practices & trou- bleshooting	Bali R and Bali S.P	Khanna Book Publishing Co. (P) Ltd., 2010Delhi , India, latest edition
3.	Modern Television prac- tices	Gulati R.R.	New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition
4.	Audio video systems	Gupta R.G.	Tata Mc graw Hill, New Delhi, India 2010, latest edition
5.	Mastering Digital Television	Whitaker Jerry & Benson Blair	McGraw-Hill Professional, 2010, latest edition
6.	Standard hand book of Audio engineering	Whitaker Jerry & Benson Blair	McGraw-Hill Professional, 2010, latest edition.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- Different types of microphones and speakers
- Maintain audio systems
- Analyse the composite video signal used in TV signal transmission
- Troubleshoot colour TV receiver
- Maintain various consumer electronic appliances

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DIGITAL COMMUNICATION SYSTEMS
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021403	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Maintain basic digital communication systems**

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	Block diagram and sub-system description of a digital communication system. Sampling of low-pass and band-pass signals, PAM, PCM, signal to quantization noise ratio analysis of linear and nonlinear quantizers, Line codes and bandwidth considerations; PCM TDM hierarchies, frame structures, frame synchronization and bit stuffing.	**14**
Unit II	Quantization noise analysis of DM and ADM; DPCM and ADPCM; Low bit rate coding of speech and video signals. Baseband transmission, matched filter, performance in additive Gaussian noise; Inter symbol interference (ISI), Nyquist criterion for zero ISI, sinusoidal roll-off filtering, correlative coding, equalizers and adaptive equalizers; Digital subscriber lines.	**15**
Unit III	Geometric representation of signals, maximum likelihood decoding; Correlation receiver, equivalence with matched filter. Generation, detection and probability of error analysis of OOK, BPSK, coherent and non-coherent FSK, QPSK and DPSK; QAM, MSK and multicarrier modulation; Comparison of bandwidth and bit rate of digital modulation schemes.	**15**

Unit IV	Introduction to Information and Coding Theories: Information Theory: information measures, Shannon entropy, differential entropy, mutual information, capacity theorem for point-to point channels with discrete and continuous alphabets. Coding Theory: linear block codes – definitions, properties, bounds on minimum distance (singleton, Hamming, GV, MRRW), soft versus hard decision decoding, some specific codes (Hamming, RS, Concatenated); Convolutional codes – structure, decoding (the Viterbi and BCJR algorithms); Turbo codes, LDPC codes.	**16**
	TOTAL	**64**

References:

S. No.	Title of Book	Author	Publication
1.	Communication Systems	Haykin, S	4th Ed., John Wiley & Sons
2.	Modern Digital and Analog Communication Systems	Lathi, B.P. and Ding, Z	Intl. 4th Ed., Oxford University Press.
3.	Digital Communications	Proakis, J.G. and Saheli, M	5th Ed., McGraw-Hill
4.	Digital Communication: Fundamentals and Applications	Sklar, B., and Ray, P.K	2nd Ed., Dorling Kindersley
5.	Elements of Information Theory	T. Cover and J. Thomas	2/e, Wiley.
6.	Principles of Digital Communication	R. G. Gallager	Cambridge Univ. Press
7.	A Foundation in Digital Communication	A. Lapidoth	Cambridge Univ. Press
8.	Error Control Coding	S. Lin and D. Costello	2/e, Prentice Hall.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- Analyse various error detection and correction codes in digital communication systems
- Use various pulse code modulation techniques
- Maintain systems based on digital modulation techniques

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ELECTRONICS EQUIPMENT MAINTENANCE
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021404	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Maintain the electronic Equipment's/Gadgets/Appliance**

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	Fundamental Troubleshooting Procedures Inside An Electronic Equipment: Reading Drawings And Diagrams – Block Diagram, Circuit Diagram, Wiring Diagram; Disassembly and reassembly of equipment, Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions, Nature of faults, Fault location procedure, Fault finding aids – Service and maintenance manuals and instruction manuals, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Grounding systems in Electronic Equipment, Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.	**10**
Unit II	Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions therein, variable capacitor types, Testing of inductors and inductance measurement	**09**
Unit III	Testing of Semiconductor Devices Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp circuits	**09**

Unit IV	Logic IC families : Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods – typical faults, testing digital ICs with pulse generators, Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator, Special consideration for fault diagnosis in digital circuits Handling precautions for ICs sensitive to static electricity Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic.	**10**
Unit V	Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages – SOIC, SOT, LCCC, LGA, BGA, COB, Flatpacks and Quad Packs, Cylindrical Diode Packages, Packaging of Passive Components as SMDs Repairing Surface Mount PCBs, Rework Stations.	**7**
	TOTAL	**45**

References:

S. No.	Title of Book	Author	Publication
1.	Modern Electronic Equipment: Trouble-shooting, Repair and Maintenance	Khandpur	TMH 2006
2.	Electronic Instruments and Systems: Principles, Maintenance and Troubleshooting	R. G. Gupta	Tata McGraw Hill Edition 2001
3.	Student Reference Manual for Electronic Instrumentation Laboratories	David L Terrell	Butterworth-Heinemann
4.	Electronic Testing and Fault Diagnosis	G. C. Loveday, A. H	Wheeler Publishing

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- Select maintenance policy for equipment/appliances/gadgets.
- Select troubleshooting tools for a specified work
- Maintain the electronic home appliances consumer electronics products
- Select digital troubleshooting method
- Rework and Repair of Surface Mount Assemblies

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INDUSTRIAL AUTOMATION

Subject Code	Theory						Credits
2040405	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS: THEORY		Hours	Marks
Unit-1	Automation 1.1 Need of automation 1.2 Advantages of automation 1.3 Requirements of automation	02	02
Unit-2	Control System 2.1 Concept of control system 2.2 Basic block diagram of control system 2.3 Transfer function 2.4 Different terms in control system 2.5 Types of control system 2.6 Applications of control system 2.7 Development of block diagram for simple applications like level, temperature, flow control	04	04
Unit-3	Control System Components 3.1 Contacts-types, current capacity & load utilization categories 3.2 Solenoids-dc, ac 3.3 I/P devices- switches-push buttons, foot switch, selector switch, pilot switch, proximity, photoelectric, temperature actuated, level control, pressure sensing, overload sensing 3.4 Relays- electromechanical, reed 3.5 O/P devices- contactors, valves, pilot lamps 3.6 Symbols in power & control circuits 3.7 Developing control circuit-basic & thumb rule 3.8 Power & control circuit for different applications like hoist, crane, conveyer belt, induction motors	08	10
Unit-4	Electrical Actuators 4.1 Potentiometers-working & use as error detector 4.2 Servomotors-ac & dc –working principle 4.3 Synchros - transmitter, control transformer, use of as error detector 4.4 Stepper motor-PM & variable reluctance- working principle 4.5 Tacho - generator 4.6 Applications of above components as AC/DC control system.	08	10

Unit-5	Controllers 5.1 Hydraulic-advantages & disadvantages, hydraulic servomotor, types of pumps used, control valves, components like accumulator, filter, seals 5.2 Pneumatic-resistance & capacitance of pressure system, pneumatic flapper-nozzle system, pneumatic relays, actuating valves, cylinders, comparison between pneumatic & hydraulic systems 5.3 Electrical & electronic controller-brief overview of op-amps, inverting, non-inverting, lead-lag networks 5.4 Digital controllers-brief overview of microprocessor & micro-controller to be worked as controller	08	10
Unit-6	Control actions 6.1 On-Off, P, I, P+I, P+D,P+I+D, actions 6.2 P+I+D action using hydraulic, pneumatic electronic controller 6.3 Tuning of P+I+D controller	06	10
Unit-7	Programmable Logic Controller 7.1 Introduction 7.2 Advantages & disadvantages 7.3 PLC Vs PC 7.4 Block diagram of PLC 7.5 Basic blocks like CPU, I/O modules, bus system, power supplies & remote I/Os Different PLC′s available in market	08	10
Unit-8	Programming of PLC 8.1 development of Ladder logic 8.2 some simple programs such as I/O connections, starting of IM, stepper motor control (treatment to topic no.8.2 should be given at the time of practical / pp hours.)	02	10
Unit-9	Introduction to special control systems 9.1 Distributed Control System(DCS)-brief introduction to hardware & software used 9.2 SCADA- brief introduction to hardware & software used	02	04
	Total	48	70

Text/Reference Books:

Name of Authors	Titles of the Book	Name of the Publisher
Nagrath Gopal	Control System Eng.	Wiley Eastern
K.Ogata	Modern Control Eng.	Prentice Hall
Jacob	Industrial Control Eng.	Prentice Hall
Andrew Parr	Hydraulics & Pneumatics	Jaico Publication
Webb & Reis	Programmable Logic Controller: Principle applications	Wiley Eastern
S.K. Bhattachrya Brijinder Singh	Control of Electrical Machines	New Age International
Jon stenerson	Industrial automation and process control	Prentice Hall
Richad Shell	Handbook of Industrial automation	Taylor and Francis

ELECTRIC MACHINE & CONTROL LAB

Subject Code 2040406	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P/S	Internal	:	15	
	-	-	02	External	:	35	

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- To expose students to the operation, application and control of power conversion systems employing electric drive to cater to industrial needs.
- To familiarize the operation principles, and design of starting, braking, and speed control arrangements for electric motors and their applications.
- To provide strong foundation to asses performance of different industrial drives considering issues such as, energy efficiency, power quality, economic justification, environmental issues, and practical viabilities.

Practical's:

1. Dismantle the given DC motor and identify its different parts
1. Dismantle the given AC motor and identify its different parts
2. Control the speed of DCM to rusing armature voltage control method
3. Control the speed of DC Motor using field current control method
4. Measure the output voltage of chopper forresistive load by varying the frequency and / or duty cycle of chopper.
5. Control the speed of three phase squirrel cage induction motor using stator voltage control method.
6. Effect on speed of given D.C. series motor by varying armature voltage using step down chopper.
7. Observe the effect on speed of the given D.C. separately excited motor by varying voltage using step down chopper.
8. Control the speed of the given separately excited motor by changing the firing angle of SCR using single phase semi converter and measure the speed.
9. Control the speed of the given separately exited motor by changing the firing angle of SCR using single phase full converter and measure the speed
10. Control the speed of the given three phase in duction motor by using constant V/f method and plot the graph between speed and frequency.
11. Control the speed of the given three phase induction motor by varying frequency and plot the graph between speed and frequency
12. Control the speed of the given synchronous motor drives using micro controller.
13. Demonstrate High power SCR/ power device and Heat sink and write their specifications and rating.
14. Control the speed of single-phase capacitor split phase induction motor using DIAC–TRIAC circuit.
15. Control the speed of DC motor drives using micro controller.
16. Identify different parts and assemble the given DC motor.
17. Identify different parts and assemble the given AC motor.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented Cos associated with the above-mentioned competency:

a. Select relevant DC motor for various electric drive applications.
b. Select relevant AC motor for various electric drive applications.
c. Maintain the operation of D.C. Drives.
d. Maintain the operation of A.C. Drives.
e. Maintain microprocessor/micro controlled electric motors.

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DIGITAL COMMUNICATION SYSTEM LAB
(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021407	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

- **Maintain basic digital communication systems**

CONTENTS: PRACTICAL

S.No.	Name of Topic
1	Pulse Code Modulation and Differential Pulse Code Modulation.
2	Delta Modulation and Adaptive Delta modulation.
3	Simulation of Band Pass Signal Transmission and Reception • Amplitude Shift Keying • Frequency Shift Keying • Phase Shift Keying.
4	Performance Analysis of Band Pass Signal Transmission and Reception • Amplitude Shift Keying • Frequency Shift Keying • Phase Shift Keying.
5	Implementation of Amplitude Shift Keying
6	Implementation of Frequency Shift Keying
7	Implementation of Phase Shift Keying.
8	Time Division Multiplexing: PLL (CD 4046) based synch, clock and data extraction

References:

S. No.	Title of Book	Author	Publication
1.	Communication Systems	Haykin, S	4th Ed., John Wiley& Sons
2.	Modern Digital and Analog Com- munication Systems	Lathi, B.P. and Ding, Z	Intl. 4th Ed., Oxford University Press.
3.	Digital Communications	Proakis, J.G.and Saheli, M	5th Ed., McGraw-Hill

4.	Digital Communication: Fundamentals and Applications	Sklar, B., and Ray, P.K	2nd Ed., Dorling Kindersley
5.	Elements of Information Theory	T. Cover and J. Thomas	2/e, Wiley.
6.	Principles of Digital Communication	R. G. Gallager	Cambridge Univ. Press
7.	A Foundation in Digital Communication	A. Lapidoth	Cambridge Univ. Press
8.	Error Control Coding	S. Lin and D. Costello	2/e, Prentice Hall.

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

- Analyse various error detection and correction codes in digital communication systems
- Use various pulse code modulation techniques
- Maintain systems based on digital modulation techniques

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INDUSTRIAL AUTOMATION LAB

Subject Code 2040408	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	

Course Content:

SUGGESTED PRACTICALS/ EXERCISES

The practical in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Hrs.
1.	Develop a data acquisition system using arduino	02
2.	Temperature control system using PID	02
3.	Level control system based on error feedback	02
4.	PLC programming using Relay ladder Logic for AND,OR XOR and NOR gate	02
5.	PLC, RLL programming using CASCADE method	02
6.	PLC timer, counter, registers and analog input/output functions	02
7.	Variable Speed drive of an induction motor	02
8.	PLC/ microcontroller-based computer numerical control machine job completion	02
Total=		**16**

LEARNING RESOURCES:

S. No.	Title of Book	Author	Publication
1	Industrial Instrumentation, Con- trol and Automation	S. Mukhopadhyay, S. Sen and A. K. Deb	Jaico Publishing House, 2013 ISBN : 978-8184954098
2	Electric Motor Drives, Modelling, Analysis and Control	R. Krishnan	Prentice Hall India, 2002 ISBN : 978-0130910141

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MATLAB

Subject Code 2040409	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	
	-	-	-	-	-	-	

Unit-1	MATLAB Environment – Introduction, MATLAB environment, MATLAB as a calculator, MATLAB Online, Syntax and Semantics, Help, Plotting. Matrices and Operators : Introduction, the Colon Operator, Accessing Parts of a Matrix, Combining and Transforming Matrices, Arithmetic Part 1, Arithmetic Part 2, Operator Precedence.
Unit-II	Functions : Introduction, Function I/O, Formal Definition of Functions, Sub Functions, Scope, Advantages of Functions, Scripts, an Problem Solving.
Unit-III	Programmer's Toolbox : Introduction, Matrix Building, Input-Output, Plotting, Debugging, Selection : Selection, If – Statements, Relational and Logical Operators, Nested if – Statements, Variable Number of Function Arguments, Robustness, Persistent Variables.
Unit-IV	Loops : For -Loops While – Loops, Break Statements, Logical Indexing. Data Types : Introduction, Strings, Structs, Cells.
Unit-V	File Input / Output : I/O, Excel Files, Text Files, Binary Files. Applications of MATLAB in Electrical Machine, Power system, Control System and Power Electronics.
Unit-VI	Simulink : Getting Started, Simulink Library Browser, Connections, Block Specification, Toolboxes, Building Systems, Applications.

List of Practical's :

1.	Basic Operations on Matrices.
2.	Generation of Various Signals such as Unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp etc.
3.	Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4.	Mesh and Nodal analysis of electrical circuits.
5.	Application of network theorems such as Thevenin's, Norton's, Superposition etc. to electrical networks.
6.	Locating Zeroes and poles and plotting the pole-zero maps in S plane and for the given TF
7.	Simulation of DC circuits.

8.	Measurement of Active power of three phase circuit for balanced oads.
9.	Simulation of single-phase diode bridge rectifiers with filter for R and RL loads.

References / Text Books :

1. Books
   (i) Computer Programming with MATLAB by J. Michael Fitzpatrick and Akos Ledeczi
   (ii) Getting Started with MATLAB : A Quick Introduction for Scientists and Engineers by Rudra Pratap
2. Video Lectures (Web Links) :
   (1) https://ocw.mit.edu/courses/mathematics/18-s997-introduction-to-matlab-programming.fall2011/index.html
   (2) https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-094-introduction-tomatlab-january-jjap-2010/index.html.
   (3) https://in.mathworks.com/vidoes/getting-started-with-matlab-68985.html.
   (4) https://www.mathworks.com/examples/

https://www.coursera.org/learn/matlab

ESSENCE OF INDIAN KNOWLEDGE AND TRADITION (TW)

(ELECTRONICS ENGINEERING GROUP)

Subject Code 2021410	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	
	-	-	-	-	-	-	

Course Content:

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

References:

S. No.	Title of Book	Author	Publication
1.	Cultural Heritage of India- Course Material	V. Sivaramakrishna	Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	Bharatiya Vidya Bhavan
3.	The web of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay International Foundation, Velliarnad, Amakuam
6.	Science of Consciousness Psychotherapy and Yoga Practices	R N Jha	Vidyanidhi Prakasham, Delhi, 2016

MICROPROCESSORS AND ITS APPLICATIONLAB (TW)

Subject Code 2021411	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	
	-	-	-	-	-	-	

CONTENTS: PRACTICAL

Intellectual Skills:

1. Logical development
2. Programming skills

Motor Skills:

1. Data entry, Error Correction and Execution of assembly language programms
2. Connection Skills

List of Practical's:

Using microprocessor 8085 kit:

1. Demonstration and study of microprocessor kit
2. Program for addition of and subtraction of two hexadecimal numbers
3. Program for finding largest / smallest number
4. Program for arranging numbers in ascending / descending order
5. Program for 16-bit addition
6 Program for data masking
7 Program for multiplication of two eight-bit numbers
8 Program using JMP Instruction
9 Two programs using

Loop.

MINOR PROJECT (TW)

Subject Code 2021412	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	50	02
	L	T	P/S	Internal	:	15	
	-	-	04	External	:	35	
	-	-	-	-	-	-	

BLOCK CHAIN THROUGH MOOCS / SWAYM / OTHERS (TW)

Subject Code (2021413)	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal	:	07	
	-	-	02	External	:	18	
	-	-	-	-	-	-	