PROPOSED

First Curriculum Structure for B.Voc. Degree Programme in

Industrial Automation & Mechatronics

(Dr Babasaheb Ambedkar Technological University, Lonere)

Semester I

Sr. No.	Course Code	Name of the Course	Teaching scheme			Evaluation Scheme			Credits	Total Marks
			L	T	P	IA	MSE	ESE		
General Education										
		Theory								
1	BVIMC101	Elements of Electrical and Electronics Engineering	3	0	0	25	0	25	3	50
2	BVIMC102	IT Foundation and Programming Concepts	3	0	0	25	0	25	3	50
3	BVIMC103	Basic Instrumentation	3	0	0	25	0	25	3	50
4	BVIMC104	Workshop Technology	3	0	0	25	0	25	3	50
								Total	**12**	**200**
Skill Components										
		Lab/Practical								
5	BVSWL105	Elements of Electrical and Electronics Engineering	0	0	1	25	0	25	1.5	50
6	BVIML106	Basic Instrumentation	0	0	1	25	0	25	1.5	50
On-Job-Training (OJT)										
7	BVIME117	Electrical Technician (ELE/Q6301)	200 (150 Marks External Assessment by NSDC / SSC and 50 Marks Internal Assessment)						15	200
		Total							**18**	**300**

Semester II

Sr. No.	Course Code	Name of the Course	Teaching scheme			Evaluation Scheme			Credits	Total Marks
			L	T	P	IA	MSE	ESE		
General Education										
		Theory								
1	BVIMC201	Analog and Digital Electronics	3	0	0	25	0	25	3	50
2	BVIMC202	Sensors and Transducers	3	0	0	25	0	25	3	50
3	BVIMC203	Electrical Drives & Control	3	0	0	25	0	25	3	50
4	BVIMC204	Control System Components	3	0	0	25	0	25	3	50
								Total	**12**	**200**
Skill Components										
		Lab/Practical								
5	BVIML205	Analog and Digital Electronics	0	0	1	25	0	25	1.5	50
	BVIML206	Electrical Drives & Control	0	0	1	25	0	25	1.5	50
On-Job-Training (OJT)										
7	BVIME217	QP- Data Networking and Cable Technician (ELE/Q4613)	200 (150 Marks External Assessment by NSDC / SSC and 50 Marks Internal Assessment)						15	200
		Total							**18**	**300**

Semester

I

Syllabus

Subject Name: **Elements of Electrical and Electronics Engineering**	
Course Code :BVIMC101	Semester: I
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 IA: 25 Total: 50
TH Exam Duration: 01 Hours	Scheme of Marking PR: -- 25 Practical 25 Term
Credit :03	

	Content	Hours
Unit – I	**1.0 D.C. Circuits**	06
	Ideal and Practical Energy Sources, Line Regulation and Load Regulation, Source Transformation, Star-Delta Transformation, Application of Kirchhoff's Law, Capacitor: Types of Capacitor, Capacitance of Multiple Parallel Plate Capacitor, Energy stored in a Capacitor, Charging & Discharging of Capacitor & Time constant.	
Unit – II	**2.0 Magnetic circuit & Electromagnetic Induction**	06
	Law of Magnetic Circuit, Series & parallel Magnetic Circuits and Calculation, Comparison of magnetic & Electric Circuit, Magnetization Curves, review of Faraday's Law, Lenz's Law, Self & Mutual Inductance, Inductance of coupled circuits.	
Unit – III	**3.0 A.C. Circuits & Transformer**	06
	Generation of A.C. Voltage , Equation of A.C. Voltage, Average value, R.M.S. Value, Form Factor, Peak Factor, Phase & Phase Difference, Pure Resistive, Pure Inductive, Pure Capacitive and combination of R-L-C Circuits, Active -Reactive and Apparent power & Power Factor, Generation of 3-phase voltage, Phase Sequence , Interconnection of three phase, Star – Delta, Voltage ,Current & Power relationship in balanced 3-Phase Circuits, Measurement of power in 3-phase circuit and Effect of power factor on Wattmeter readings, 1 Phase Transformer	
Unit – IV	**4.0 Semiconductors & Applications**	06
	Semiconductors (p-type, n-type), pn junction diodes, pn junction as a circuit element, its characteristics, half wave, full wave and bridge type rectifier circuits, basic filter circuits, Diode as a voltage multiplier, clipper & clamper circuit. Zener diode as a voltage regulator. LED, its characteristics construction & applications.	
Unit – V	**5.0 Transistors & Applications**	06
	Introduction to transistors, Characteristics of transistors in different configuration. Concept of d.c. and a.c. load line and operating point selection. Various amplifiers configurations their h-parameter equivalent circuits, determination of voltage gain current gain, input resistance and output resistance & power gain. Concept of feedback in amplifiers, different oscillators circuits (without analysis).	
Unit – VI	**6.0 Amplifiers & Applications**	06
	Differential amplifier and its transfer characteristics. IC Op-Amps, its ideal & practical specifications and measurement of parameters. Op-Amp in different modes as inverting amplifier, non-inverting amplifier, scale changer, differentiator & integrator.	

Recommended Books:

- U.A.Patel , "Elements of Electrical & Electronics Engineering " ,Atul Prakashan.
- B.L.Thereja,"Electrical Technology", S.Chand Volume-I.
- Principles of Electronics – V.K. Mehta, Shalu Melta.
- Electronic Principles – Malvino

Subject Name: IT foundation and Programming Concepts		
Course Code :BVIMC102	**Semester: I**	
Weekly Teaching Hours: TH: 03 Tut: 00	**Scheme of Marking TH: 25 IA: 25 Total: 50**	
TH Exam Duration: 01 Hours	**Scheme of Marking PR: --**	
Credit :03		

	Content	Hours
Unit – I	**1.0 Computer System Characteristics And Capability**	06
	Basic structure, ALU, memory, CPU, I/O devices. Development of computers. Classification of computers:(Micro, mini frame, super computer, pc, server, workstations)	
Unit – II	**2.0 Data Representation With in Computer**	06
	BIT, BYTE, WORD, ASCII, EBCDIC, BCD Code. Introduction to Number system: Binary, Octal, Decimal and Hexadecimal. Conversation from one number system to another number system. Introduction to Basic Gates.	
Unit – III	**3.0 Input Devices and Output Devices**	06
	Keyboard, Direct Entry: Card readers, scanning devices (BAR CODE, OMR, MICR),Voice input devices, Light pen, Mouse, Touch Screen, Digitizer, scanner. CRT, LCD/TFT, Dot matrix printer, Inkjet printer, Drum plotter, Flatbed plotter	
Unit – IV	**4.0 Memory Devices**	06
	RAM, ROM, PROM, EPROM, EEPROM. - Base memory, extended memory, expanded memory, Cache memory - Storage devices Tape, FDD, HDD, CDROM, Pen Drive.	
Unit – V	**5.0 Algorithm& Flowcharts**	06
	Definition and properties, Principles of flowcharting, Flowcharting symbols, Converting algorithms to flowcharts	
Unit – VI	**6.0 Introduction To Programming Environment**	06
	History of languages, high-level, Low level, Assembly languages etc. ,Compilers, Interpreters, Assemblers, Linkers, Loaders	

Text Books		
Name of Authors	**Title of the Book**	**Publisher**
R. Hunt And Shell Y.	Computers And Commonsense	BPB Publications
V.Rajaraman	Computer Fundamentals	PHI Learning
Reference Books		
Ashok Arora	Fundamentals of Computer Systems.	
Russell A Stultz	Fundamentals of Computer Systems	

Subject Name: **Basic Instrumentation**	
Course Code :BVIMC103	Semester: I
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 IA: 25 Total: 50
TH Exam Duration: 01 Hours	Scheme of Marking PR: -- 25 Practical 25 Term
Credit :03	

	Content	Hours
Unit – I	**1.0 Fundamentals of measurement**	06
	Need of Instrumentation, General Instrumentation System, Static and Dynamic characteristics of instruments, input & output impedance, loading effects of series and shunt connected instruments, Fundamentals of measurements, Types of Errors, Statistical Analysis, Probability of Errors, Limiting Errors, Calibration of instruments, calibration report & certification, traceability and traceability chart	
Unit – II	**2.0 Analog Indicating Instruments**	06
	DC galvanometer, PMMC and Moving Iron instruments, voltmeters, ammeters, ohmmeters and extension of range of instruments, AC indicating instruments: EDM type instruments, EDM Wattmeter (single phase) and errors present, 1 Φ induction type energy meter, Potential and current transformers, DC Potentiometers, standardization, applications of DC potentiometer	
Unit – III	**3.0 Bridge Circuits**	06
	DC bridges: Wheatstone bridge and Kelvin bridge design, bridge sensitivity, errors in bridge circuits, null type and deflection type bridges, current sensitive and voltage sensitive bridges, applications of DC bridges AC bridges: Quality factor (Q) and dissipation factor(D), General equations for bridge balance, detectors for AC bridges, Maxwell bridge, Hay bridge, Schering bridge, Wien bridge, applications of AC bridges	
Unit – IV	**4.0 Oscilloscope**	06
	Introduction, General purpose oscilloscope Block Diagram, Cathode Ray Tube, Vertical Deflection System, Horizontal Deflection System, deflection sensitivity, front panel controls, Delay Line, Oscilloscope Probes, Dual trace CRO, ALT and CHOP modes, measurement of electrical parameters like voltage, current, frequency, phase, Zmodulation, Digital Storage oscilloscope, sampling rate and bandwidth, roll mode, applications like pretrigger, post-trigger, zoom and restart	
Unit – V	**5.0 Digital Instruments**	06
	Introduction to digital instruments, Advantages of Digital instruments over Analog instruments, Block diagram, principle of operation, Accuracy of measurement: Digital Multimeter, Kilo Watt Hour meter, Digital Tachometer, Ultrasonic Distance meter, Digital Thermometer, Digital pH meter, Digital capacitance meter	
Unit – VI	**6.0 Recording Instruments and Waveform Generation**	06
	Classification of recorders, Principle and working of strip chart and X-Y recorders, single and multi-channel recorders, driving systems for pen and chart, applications of recorders, Waveform generation methods, Function generator	

Recommended Text and Reference Books:

1. Sawhney A. K., Electrical and Electronics Measurements and Instruments

2. W. D. Cooper & A. D. Helfrick, 'Electronic Instrumentation and Measurement Techniques', PHI

3. Kalsi H. S., 'Electronic Instrumentation', TMH, 2nd or 3rd e/d

<table>
<tr><td colspan="3" align="center">Subject Name: Workshop Technology</td></tr>
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Subject Name: Workshop Technology		

Course Code :BVIMC104	**Semester: I**
Weekly Teaching Hours: TH: 03 Tut: 00	**Scheme of Marking TH: 25 IA: 25 Total: 50**
TH Exam Duration: 01 Hours	**Scheme of Marking PR: -- 25 Practical 25 Term**
Credit :03	

	Content	Hours
Unit – I	**1.0 Basic Workshop Tools And Its Operation**	06
	State the importance of workshop processes. List the various workshop processes and explain briefly about each like – carpentry, fitting, forging and sheet metal work	
Unit – II	**2.0 Concept Of Drilling**	06
	Concept of drilling, working principle of drilling, different types of drilling machines, line diagrams of the sensitive and radial drilling machines , Identify the parts of these machines, Describe the functions of each part; Specications of drilling machines, nomenclature of the drill bit; geometry of twist drill; functions of twist drill elements; different operations on drilling machine	
Unit – III	**3.0 Concept of Foundry**	06
	Acquaint with foundry as a manufacturing process; advantages of casting over other process; limitations of the process; various hand moulding tools ; properties of good moulding sand; types of moulding sands; ingredients in foundry sand; various types of patterns; sequence of pattern making operations; colour codes; various moulding processes; need and types of cores; casting processes; defects in casting; special casting processes	
Unit – IV	**4.0 Mechanical Working Of Metals**	06
	Mechanical working of metals; cold working with hot working; working principle of hot rolling, piercing, spinning, extrusion and drawing; advantages and limitations of hot working; various cold working processes such as rolling, bending and squeezing; advantages and limitations of cold working.	
Unit-V	**5.0 Welding Technology**	06
	SMAW, GMAW, GTAW Welding processes, Manual and auto welding, Selection of welding process, Surface preparation, Welding Inspection, Safety guidelines	
Unit-VI	**6.0 Machining Centre and CNC Machining**	06
	Machining Centre, Grinding Machine, Drill Press, Bandsaw, EDM Equipment, Milling Machine, Surface Finishing Tools, Coordinate Measuring Machine, CNC Milling Machine, CNC Lathe Machine, Machine shop safety rules	

Recommended Text and Reference Books

- Production Technology by Jain & Gupta Khanna Publishers
- 2. Elementary Workshop Technology by Hazra Chowdary & Bhattacharya Media Promoters
- 3. Manufacturing Technology (Vol I) by P N Rao (Mc Graw Hill)
- 3. Workshop Technology Vol I & II by Raghuvamshi

Lab- Elements of Electrical and Electronics Engineering	
Course Code :**BVSWL105**	Semester: **I**
Weekly Practicals: PR: **01** Tut: **00**	Scheme of Marking TH: **--**
TH Exam Duration:**--**	Scheme of Marking PR: **25,** IA: **25,** Total: **50**
Credit:1.5	
Content	

List of Experiments :

1. Verification of KCL and KVL

2. Measurement of Impedance of R-L, R-C,R-L-C & study of resonance phenomena

3. Measurement of power & power factor in a single phase AC circuit using three Ammeter Method

4. Measurement of active and reactive power in single phase A.C. Circuit

5. Identification of types of packages, terminals and noting different ratings using data books for various types of semiconductor diodes (Germanium, point contact, silicon low power, high power and switching diode)

6. Testing of various passive and active components

7. Plotting of forward V-1 characteristics for a point contact and P-N junction diode (Silicon & Germanium diode).

8. Plot forward and reverse V-I characteristics for a Zener diode

9. Plot the input and output characteristics and calculation of parameters of a transistor in common base configuration

10. Plot input and output characteristics and calculation of parameters of a transistor in common emitter configuration.

Lab- Workshop Technology	
Course Code :**BVIML106**	Semester: **I**
Weekly Practicals: PR: **01** Tut: **00**	Scheme of Marking TH: **--**
TH Exam Duration:**--**	Scheme of Marking PR: **25,** IA: **25,** Total: **50**
Credit:1.5	

Content

List of Experiments :

1. General use and safety Considerations : PPE Kits, Bench Tools, Machinist's Hammers, Screw Drivers, Punches, Chisels, Scrapers, Scribers, Files, Pliers and Cutters, Wrenches, Hacksaw, Bench Vise, , Hand drill, Taps and Dies, Hand Shears, Rules, Tapes and Squares, Soldering Iron, Rivets

2. Hand Working Operations: Sawing, Filing, Threading, Scribing, Shearing, Soldering, Riveting

3. Measuring and Gauging: Introduction, Semi – Precision Tools – Calipers, depth Gauge, Feeler Gauge, Precision Tools – Micrometers, Vernier Calipers, Vernier Height Gauge, Telescopic Gauge, Hole Gauge, Bevel Protractor, Dial Indicator, Gauge Blocks and Surface Plate

4. One Job on Drilling

5. One Job on Foundry

6. One Job on Sheet Metal

7. One Job on MIGMAG Welding

8. One Job On SMAW

9. One job on CNC Milling Machine

10. One Job on CNC Lathe Machine

Semester I - On-Job-Training (OJT)/Qualification Pack

Group GEM1 of Qualification Pack

Subject Name: Electrical Technician (ELE/Q6301)	
Course Code :**BVIME117**	Semester: **I**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: 150**,** IA: 50**,** Total: **200**
Credit:**15**	**Choose any one from specified Group GEM1 of Qualification Packs**
Syllabus for this qualifier Pack is available on **https://nsdcindia.org/sites/default/files/MC_ELEQ6301_V1.0_Electrical%20Technician_23.08.2019.pdf**	

Semester
II
Syllabus

Subject Name: **Analog and Digital Electronics**	
Course Code :BVIMC201	Semester: I
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 IA: 25 Total: 50
TH Exam Duration: 01 Hours	Scheme of Marking PR: -- 25 Practical 25 Term
Credit :03	

	Content	Hours
Unit – I	**1.0 Differential, Multi-Stage And Operational Amplifiers**	06
	Differential, multi-stage and operational amplifiers, Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product), Superposition Theorem, Thevenin's Theorem, Norton's & Maximum Power Transfer	
Unit – II	**2.0 Linear Applications Of Op-Amp**	04
	Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion	
Unit – III	**3.0 Nonlinear Applications Of Op-Amp**	04
	Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector	
Unit – IV	**4.0 Combinational Digital Circuits**	08
	Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization	
Unit – V	**5.0 Sequential Circuits And Systems**	08
	A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K-T and D types flip-flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters	
Unit – VI	**6.0 A/D and D/A Converters**	08
	Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs	

Recommended Books:

- J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.

- P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.

- Ramakant A Gayakwad, Op- Amps and Linear Integrated Circuits, Prentice Hall of India

- R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

Subject Name: **Sensors and Transducers**	
Course Code :BVIMC202	Semester: I
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 IA: 25 Total: 50
TH Exam Duration: 01 Hours	Scheme of Marking PR: --
Credit :03	

	Content	Hours
Unit – I	**1.0 Introduction**	06
	Measurement and measurement system, industrial measuring parameters and their units, definitions of sensors and transducers, classification of transducers, static and dynamic characteristics, selection criteria, importance.	
Unit – II	**2.0 Displacement Measurement**	06
	Resistive: Potentiometer, Strain gauges, Inductive: LVDT and Eddy current type , Capacitive: Capacitance pickups, Differential capacitive type, Piezoelectric, Ultrasonic transducers and Hall effect transducers, Optical transducers	
Unit – III	**4.0 Velocity, Speed, Vibration and Acceleration measurement**	06
	Velocity and Speed: Electromagnetic tachometer, Photoelectric tachometer, Toothed rotor variable reluctance, tachometer. Magnetic pickups, Encoders, Photoelectric pickups, Stroboscopes, Shaft speed measurement. Vibration and acceleration: Eddy current type, piezoelectric type, Seismic Transducer, Accelerometer: Potentiometric type, LVDT type, Piezo-electric type	
Unit – IV	**5.0 Force and torque measurement**	06
	Basic methods of force measurement, elastic force traducers, strain gauge, load cells, piezoelectric force transducers, vibrating wire force transducers, Strain gauge torque meter, Inductive torque meter, Magnetostrictive transducers, torsion bar dynamometer, etc. Dynamometer (servo control and absorption) instantaneous power measurement and alternator power measurement.	
Unit – V	**6.0 Pressure measurement**	06
	Definition, pressure scale, standards, working principle, types, materials, design criterion: Manometers, elastic pressure sensors, secondary pressure sensors, differential pressure sensors, force balance type, motion balance, type, capacitive (delta cell), ring balance, vibrating cylinder type, high-pressure gauges, vacuum gauges, dead weight and vacuum gauge tester.	
Unit – VI	**Temperature measurement**	06
	Temperature Scales, Standards and Units and relations, Classification of temperature sensors Bimetallic Thermometer, Filled system thermometers, SAMA classifications, Resistance Temperature Detectors (RTD), Thermistor, Thermocouples, Study of thermocouple tables (calculation of intermediate temperature and voltage), Lead wire compensation, Cold junction compensation techniques, Protection (Thermo well), Thermopiles, Pyrometers, Temperature IC sensors (AD590 and LM35).	

Recommended Books:

- B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis", Tata McGraw Hill Education.
- D. Patranabis, "Principle of Industrial Instrumentation", Tata McGraw Hill.
- D.V.S. Murty, "Instrumentation and Measurement Principles", PHI, New Delhi.

Subject Name: **Electrical Drives & Control**	
Course Code :BVIMC203	Semester: I
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 IA: 25 Total: 50
TH Exam Duration: 01 Hours	Scheme of Marking PR: -- 25 IA: 25 Total: 50
Credit :03	

	Content	Hours
Unit – I	**1.0 Introduction**	06
	Basic elements-types of electric drives-factors influencing electric drives-heating and cooling curves loading conditions and classes of duty-Selection of power rating for drive motors with regard to	
Unit – II	**2.0 Drive Motor Characteristics**	06
	Mechanical characteristics- speed- torque characteristics of various types of load and drive motors - braking of electrical motors-dc motors: shunt, series, compound motors-single phase and three phase induction motors	
Unit – III	**3.0 Starting Methods**	06
	Types of DC motor starters-typical control circuits for shunt and series motors-three phase squirrel and slip ring induction motors	
Unit – IV	**4.0 Conventional And Solid State Speed Control Of D.C Drives**	06
	Speed control of DC series and shunt motors-Armature and field control, Ward-Leonard control system using controlled rectifiers and DC choppers –applications.	
Unit – V	**5.0 Conventional And Solid State Speed Control Of AC Drives**	06
	Speed control of three phase induction motor-Voltage control, voltage/frequency control, slip power recovery scheme-using inverters and AC voltage regulators-applications	
Unit-VI	**6.0 Selection and Applications of Electrical Drives**	06
	Types of industries, Selection criteria for electrical drives, Applications of AC, DC Electrical Drives in different types of industries, Special types of drives and their applications	

Text Books

1. Vedam Subramaniam "Electric drives (concepts and applications)", Tata McGraw-Hill.2001

2. Nagarath.I.J & Kothari .D.P,"Electrical machines", Tata McGraw-Hill.1998

References

1. Pillai.S.K "A first course on Electric drives", Wiley Eastern Limited, 1998

2. M.D. Singh, K.B.Khanchandani,"Power electronics," Tata McGraw-Hill.1998

3. H.Partab,"Art and science and utilization of electrical energy,"Dhanpat Rai and sons, 1994

	Subject Name: **Control System Components**	

Course Code :BVIMC204	Semester: I
Weekly Teaching Hours: TH: 03 Tut: 00	Scheme of Marking TH: 25 IA: 25 Total: 50
TH Exam Duration: 01 Hours	Scheme of Marking PR: --
Credit :03	

	Content	Hours
Unit – I	**1.0 Auxiliary Process Control Components**	08
	Construction, working & application area of Synchros (Transmitter and Receiver), error detector, Alarm annunciators, Fire and gas detectors (types –flame, gas, fire and gas siren), Square root extractor, Feeders, Dampers, Temperature regulator, Flow regulator, Temperature , Flow, Level and, Pressure Switch, Relief valves, safety valves and rupture disk, Thermostats and Humidistat, Steeper motor	
Unit – II	**2.0 Industrial Control Components - I**	08
	Switches: Construction, symbolic representation, working, application of Toggle switches, Push buttons, Selector switches, DIP switches, Rotary switches, Thumbwheel switches , Drum switch, Limit switches- contact, non-contact- type, Switch specifications. Control Relays: Construction, working, specifications, selection criteria and applications of Electro-mechanical relay, Reed relay, hermetically sealed relay, Solid state relays. Interposing relays and Overload relays. Contactors/starters: Construction, working, specifications and applications of starters and contactors. Comparison between relays and starters /contactors.	
Unit – III	**3.0 Industrial Control Components - II**	08
	RFID - basic principles, frequencies, Active and passive RFID systems , mode of communication, various technologies for In house and outdoor RFID systems, Basic theory and devices for vision components, sensors and systems, Image processing and multi camera systems	
Unit – IV	**4.0 Pneumatic Components**	08
	Pneumatic Power Supply and its components: Pneumatic relay (Bleed & Non bleed, Reverse & direct), Single acting & Double acting cylinder, Special cylinders: Cushion, Double rod, Tandem, Multiple position, Rotary Filter Regulator Lubricator (FRL), Pneumatic valves (direction controlled valves, flow control etc), Special types of valves like relief valve, pressure reducing etc.	
Unit – V	**5.0 Hydraulic Components**	06
	Hydraulic components: Hydraulic supply, Hydraulic pumps, Actuator (cylinder & motor), Hydraulic valves	
Unit-VI	**6.0. Selection and Application of Control Components**	02
	Data Sheets, Manuals, Specifications, Comparative Analysis, Application of control components depending upon process	

Recommended Books:

1. Andrew Parr, Hydraulics and Pneumatics- A technician's and engineer's guide, Jaico Publishing House, Mumbai.

2 C.D.Johnson, Process Control and Instrument Technology, TMH.

3. P. Harriot, Process Control, Tata McGraw Hill, 2001.

4. E. B. Jones, Instrument Technology, vol-III, Butterworth Publication.

5. D.P. Ekman, Automatic Process Control, Wiley Eastern, 1990.

Lab- Analog and Digital Electronics	
Course Code :**BVIML206**	Semester: **I**
Weekly Practicals: PR: **01** Tut: **00**	Scheme of Marking TH: **--**
TH Exam Duration:**--**	Scheme of Marking PR: **25,** IA: **25,** Total: **50**
Credit:1.5	
Content	

List of Experiments :

1. Analyze the different parameter of op-amp.

2. Analyze the Frequency response of inverting amplifier and non-inverting amplifier.

3. Implement the op-amp as inverting amplifier and non-inverting amplifier.

4. OPAMP circuits –integrator, differentiator, and comparator.

5. Waveform generation – Square, triangular and saw tooth wave form generation using OPAMPs.

6. Application of op-amp as low pass filter, high pass filter and band-pass filter.

7. Verification of function of Half/Full adder circuits.

8. Verification of function of Binary to Grey code conversion.

9. Verification of function of Latch and flip-flop.

10. Verification of counter circuit like binary up/down counter, decimal counter, ring counter, Johnson counter etc.

11. Verification of Specification and Performance indices of D/A and A/D converters

Lab- Electrical Drives and Control	
Course Code :**BVIML207**	Semester: **I**
Weekly Practicals: PR: **01** Tut: **00**	Scheme of Marking TH: **--**
TH Exam Duration:**--**	Scheme of Marking PR: **25,** IA: **25,** Total: **50**
Credit:1.5	

Content

List of Experiments :

1. Implement the fundamental and block diagram of Electric drive.

2. Implement the different methods of speed control of D.C. Motor.

3. Simulate 1- F Semi Control of D.C. separately excited Motor.

4. Simulate 1- F Fully Controlled converter of separately excited Motor.

5. Implement the control techniques used in D.C. chopper.

6. Undertake the control of D.C. motor for (a) Current limit control (b) Closed loop torque control(c) Closed loop speed control.

7. Undertake the chopper control of D.C. Motor for motoring and generating control.

8. Control the D.C. Motor drive using PLL.

9. Simulate AC voltage controller based speed control of AC motor.

10. Simulate Inverter based speed control of Induction/Synchronous motor.

Semester I - On-Job-Training (OJT)/Qualification Pack

Group GEM1 of Qualification Pack

Subject Name: Data Networking and Cable Technician (ELE/Q4613)	
Course Code :**BVIME217**	Semester: **I**
Weekly Skilling Hours: PR: **24** Tut: **00**	Scheme of Marking TH: **00,** IA: **00,** Total: **00**
PR Exam Duration: **06 Hours**	Scheme of Marking PR: 150**,** IA: 50**,** Total: **200**
Credit:**15**	**Choose any one from specified Group GEM1 of Qualification Packs**
Syllabus for this qualifier Pack is available on **https://nsdcindia.org/sites/default/files/QP_ELE-Q4613_Data-Networking-Cable-Technician.pdf**	