

Government Polytechnic Mumbai

Department of Instrumentation Engineering

P-19 Curriculum

Semester- II

(Course Contents)

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Instrumentation Engineering (Sandwich Pattern)

Term / Semester - II

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
		L	P	TU	Total		Theory			PR	OR	TW	Total
							TH	TS1	TS2				
SC19110	Engineering Mathematics	4	--	--	4	4	60	20	20	--	--	--	100
SC19106	Applied Chemistry	3	2	--	5	5	60	20	20	25*	--	25	150
IS19204	Electronic Measurement and Instruments	3	2	--	5	5	--	--	--	50*	--	25	75
IS19206	Basics of Electronics Engineering	3	4	--	7	7	60	20	20	50	--	25	175
EE19206	Fundamental of Electrical Engineering	3	2	--	5	5	60	20	20	50	--	25	175
IS19311	Inkscape (Spoken Tutorial)	--	4#	--	4#	4	--	--	--	--	--	--	--
	Total	16	14	--	30	30	240	80	80	175	--	100	675
Student Centered Activity(SCA)					05								
Total Contact Hours					35								

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal assessment, # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2:30 hours, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCS /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Coordinator,
Curriculum Development,
Department of Instrumentation Engg.

In-Charge
Curriculum Development Cell

Head of Department
Department of Instrumentation Engg.

Principal

Programme : Diploma in CE/ME/CO/IF/EC/EE/IS (Sandwich pattern)										
Course Code: SC19110				Course Title: ENGINEERING MATHEMATICS						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
4	--	--	4	60	20	20	--	---	--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

This subject is kept under the branch of sciences. This subject intends to teach student basic facts ,concepts, principles, and procedure of mathematics as a tool to analyze engineering problems and as such lays down foundation for understanding the engineering and core technology subject.

Course Outcomes: Student should be able to

CO1	Define the basic principles of function, limits, derivatives, complex number and relations between two variables.
CO2	Apply rules, concept and properties to solve the problems
CO3	Solve the given problems of integration using suitable method.

Course Content Details:

Unit No	Topics / Sub-topics
1	Function 1.1 Definition of variable, constant, intervals such as open, closed, semi-open etc 1.2 Definition of function, value of function and types of functions and simple examples Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)
2	Limits 2.1 Definition of neighbourhood, concept and definition of limit 2.2 Limits of Algebraic function 2.3 Limits of Trigonometric Functions with simple examples Course Outcome:CO1 Teaching Hours:10 hrs Marks: 10 (R- 2 , U-4 , A-4)
3	Derivatives & Application of derivative 3.1 Definition of the derivative. 3.2 Derivatives of standard function.(No proof by first principle)

	<p>3.3 Differentiation of sum, difference, product and quotient of two or more functions</p> <p>3.4 Differentiation of composite function with simple example.</p> <p>3.5 Second order derivative.</p> <p>3.6 Geometrical Meaning of Derivative</p> <p>3.7 Tangents & Normals to the curve,</p> <p>3.8 Maxima & minima of the function</p> <p>3.9 Radius of curvature</p> <p>Course Outcome:CO2 Teaching Hours : 10 hrs Marks:10 (R-4 , U- 4 , A-2)</p>
4	<p>Integration & Application of integration</p> <p>4.1 Definition of integration as antiderivative ,Integration of standard function</p> <p>4.2 Rules of integration(Integration of sum, difference, scalar multiplication) without proof</p> <p>4.3 Integration by substitution</p> <p>4.4 Integration of composite function</p> <p>4.5 Definition of definite integral</p> <p>4.6 Properties of definite integral with simple problems</p> <p>4.7 Area under the curve</p> <p>4.8 Area bounded by two curves</p> <p>Course Outcome: CO3 Teaching Hours :10 hrs Marks:10 (R-4, U- 4 , A-2)</p>
5	<p>Complex Number:-</p> <p>5.1 Definition of complex number Cartesian ,Polar ,Exponential form of complex number</p> <p>5.2 Algebra of complex number :-Equality, addition, Subtraction, Multiplication & Division with simple examples</p> <p>Course Outcome: CO2 Teaching Hours :10hrs Marks:10 (R- 2 , U-4 , A-4)</p>
6	<p>Numerical Analysis</p> <p>6.1 Solution of Algebraic equations using – i) Bisectional method ii) Regular – Falsi method iii) Newton- Raphson method</p> <p>6.2 Solution of simultaneous equation (i) Gauss elimination method (ii) Jacobi's method (iii) Gauss-Seidal method</p> <p>Course Outcome:CO2 Teaching Hours : 10 hrs Marks: 10 (R- 2 , U- 4, A- 4)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Function	04	04	02	10
2	Limits	02	04	04	10
3	Derivatives & Application of Derivatives	04	04	02	10
4	Integration & Application of Integration	04	04	02	10
5	Complex Number	02	04	04	10
6	Numerical Analysis	02	04	04	10
Total		18	24	18	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Mathematics for Polytechnic Students	S.P.Deshpande, Pune Vidyavardhini Graha Prakashan	-
2	Mathematics for Polytechnic Students (Volume I)	H.K.Dass, S.Chand Prakashan	9788121935241
3	Companions to Basic Maths	G.V.Kumbhojkar, Phadke Prakashan	10-B07951HJDQ 13-B07951HJDQ
4	Applied Mathematics	N.Raghvendra Bhatt late, Tata McGraw Hill Publication Shri R Mohan Singh	9789339219567, 9339219562

E-References:

1. www.math-magic.com
2. www.Scilab.org/-SCI Lab
3. www.mathworks.com/Products/Matlab/-MATLAB
4. www.wolfram.com/mathematica/-Mathematica
5. <https://www.khanaacademy.org/math?gclid=CNqHuabCys4CFdoJaAoddHoPig>
6. www.dplot.com/-Dplot
7. www.allmathcad.com/-Math CAD
8. www.easycalculation.com
9. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-maths>
10. MYCBSEGUIDE

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1	1		1
CO2	3			1			1	1		1
CO3	3			1			1	1		1

CO Vs PO and CO Vs PSO Mapping (MECHANICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			1			1	1	
CO2	3			1			1	1	
CO3	3			1			1	1	

CO Vs PO and CO Vs PSO Mapping (COMPUTER ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1	1	1	
CO2	3			1			1	1	1	
CO3	3			1			1	1	1	

CO Vs PO and CO Vs PSO Mapping (INFORMATION TECHNOLOGY)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1	1		1
CO2	3			1			1	1		1
CO3	3			1			1	1		1

CO Vs PO and CO Vs PSO Mapping (ELECTRONICS ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1		1	1
CO2	3			1			1		1	1
CO3	3			1			1		1	1

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3			1			1		1	
CO2	3			1			1		1	
CO3	3			1			1		1	

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3			1			1	1	1
CO2	3			1			1	1	1
CO3	3			1			1	1	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement ltd. Mumbai Head Office
2	Mrs. Deepawali S. kaware	Lecturer in Mathematics	Government polytechnic Vikaramgad
3	Mr. A.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai
4	Mr.V.S.Patil	Lecturer in Mathematics	Government polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Department
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

Programme : Diploma in EE/IS (Sandwich Pattern)										
Course Code: SC19106				Course Title: Applied Chemistry						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2.30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	--	5	60	20	20	25*	--	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: For Minimum passing marks under various heads, refer, examination rule AR26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale:

The subject is included under category of basic sciences. The role is to understand the fundamental concepts and facts about infrastructure of physical matters and their interrelationship. This will provide input for better understanding of other foundation and technology subjects

Course Outcomes: Student should be able to

CO1	Apply the principles of chemistry under different engineering situations.
CO2	Apply various applications of electrolysis and cells and batteries in engineering field.
CO3	Adopt methods of prevention of corrosion for environmental and safety concerns.
CO4	Select suitable Alloy, Lubricants, material for a particular use effectively.

Course Content Details:

Unit No	Topics / Sub-topics
1	Atomic Structure <ol style="list-style-type: none"> 1.1 Introduction of atom, Molecules, Fundamental Particles, Proton, Neutron, Electron. their mass, charge, location. And symbol Bohr's theory, Postulates, Structure of modern atom. 1.2 Atomic number and atomic mass number. Atomic weight Numerical based on atomic number & atomic mass number. 1.3 Rules governing filling up of atomic orbitals. Quantum no., Pauli's Exclusion Principle, Aufbau's Principle, Hund's rule. Electronic configuration of atoms up to atomic number 30 1.4 Valence and chemical bonding. Valence : Definition, & examples. Types of valence : Electrovalence & Co-valence . 1.5 Electrovalent bond: Definition, Formation Formation of NaCl 1.6 Co-valent bond : Definition & formation Formation of following molecules Single bond :, Chlorine. Double bond : Oxygen,, Triple Bond : Nitrogen.

	1.7 Distinction between electrovalent and covalent compound.
	Course Outcome: CO1 Teaching Hours : 7 hrs Marks: 10 (R- 2, U-4, A-4)
2	Electrochemistry 2.1 Definition of Electrochemistry, Electrolytes: Definition, Types. Differences between Atom and ion . Definition of ionization & electrolytic dissociation, Arrhenius theory, Degree of ionization with factors affecting it. 2.2 Terms related to Electrolysis Mechanism of electrolysis. Examples of: mechanism of Electrolysis of CuSO_4 by using Cu electrodes. 2.3 Faradays First law and its mathematical derivation. Faradays second law & its mathematical derivation, Numerical based on laws of Faraday. 2.4 Application of Electrolysis: Electroplating, Electrefining.
	Course Outcome: CO2 Teaching Hours : 7 hrs Marks: 10 (R- 4, U-4 , A-2)
3	Cells And Batteries 3.1 Conductor: Definition, types (metallic, electrolytic), Difference between them. 3.2 Ohms law, Charging and discharging of cells, Closed circuit voltage, Open circuit voltage, Electrochemical couple, Separator, Electromotive force (E.M.F) 3.3 Cells: Definition, types (Electrolytic and Electrochemical), difference between them. 3.4 Classification of Electrochemical cell (primary and Secondary) Definition and Difference between them. 3.5 Primary cells: Lachlance cell, Dry cell, Daniel cell 3.6 Secondary cell : Lead acid storage cell or battery, Nickel cadmium cell or battery 3.7 Lead acid storage battery: construction, working, charging and discharging, electrical characteristics, methods of charging storage batteries, indication of fully charged battery, Maintenance of Lead acid batteries, application of Lead acid storage batteries.
	Course Outcome: CO2 Teaching Hours : 7 hrs Marks: 10 (R- 4 , U-4 , A-2)
4	Corrosion 4.1 Definition of corrosion. Types of corrosion . Atmospheric & Electrochemical Corrosion. 4.2 Mechanism of atmospheric corrosion, types of oxide film formed, (stable, unstable, volatile, with examples). 4.3 Electrochemical corrosion/immersed corrosion Definition. Example. Factors Affecting , Atmospheric & Electrochemical Corrosion. 4.4 Protection of metals from Corrosion:- By protective coatings a) organic coating (Paints and Varnishes), b) inorganic coating (Metallic Coating). 4.5 Different methods of Protective metallic coatings. A) Hot dipping (Galvanizing & Tinning) b) Sherardizing c) Metal Spraying
	Course Outcome: CO3 Teaching Hours : 6 hrs Marks: 10 (R-2, U- 4 , A-4)
5	Lubricants 5.1 Definition of lubricant, example , functions of lubricant, classification of lubricants (solid, semi-solid and liquid) examples. conditions under which each lubricant is used. 5.2 Lubrication: definition and types. conditions under which each lubricant is used Types of lubrications, Fluid film, Boundary, Extreme pressure lubrication. Definition, diagram & description of each type. 5.3 Characteristic of good lubricant A) Physical Characteristics <ul style="list-style-type: none"> • Viscosity

	<ul style="list-style-type: none"> • Viscosity index • Oiliness • Volatility • Flash point & Fire Point • Cloud and Pour point <p>B) Chemical Characteristics</p> <ul style="list-style-type: none"> • Acidity /Neutralization no. • Emulsification • Saponification value <p>Course Outcome: CO4 Teaching Hours :6 hrs Marks: 10 (R- 4 , U-4 , A-2)</p>
6	<p>Materials And Alloys.</p> <p>6.1 Metallic: Metals & their characteristics, (hardness, ductility, malleability, toughness, brittleness, tensile strength, weldability, casting, forging, soldering)</p> <p>6.2 Physical and chemical properties and uses of following metals (Fe, Cu, Al, Cr, Ni, Pb, Zn, Ag, Sn).</p> <p>6.3 Non-Metallic: Definition of non-metallic engineering materials</p> <p>6.4 Plastic: Definition, example Polymerization : definition different Types of Polymerization addition and condensation Addition polymerization : definition formation of polyethylene , Condensation-polymerization : definition and examples, formation Of nylon-66 Types of plastic: thermo softening ,thermo setting plastics, Differences between them. Compounding of plastic , Materials needed for it (pigments, fillers, Plasticizers accelerators etc), Properties and engineering applications</p> <p>6.5 Rubber: Definition of rubber (elastomer). Natural rubber : Basic unit in natural rubber(isoprene), Occurrence & Processing of Latex . Drawbacks of natural Rubber Vulcanisation.: Definition. process, Chemical reactions Synthetic rubber: Importance, Example Buna-S Buna-N, Butyl rubber, Thiokol, Neoprene) Properties of rubber: Elasticity, Tack, Rebound abrasion resistance Uses of rubber</p> <p>6.6 Thermal insulating materials Definition, Examples Thermocole, Glasswool. Thermocole: Definition,. Preparation, Properties & uses Glass wool. Definition,. Preparation, Properties & uses</p> <p>Alloys</p> <p>6.7 Definition of alloy: purposes of preparation of Alloy.</p> <p>6.8 Preparation of binary alloy by fusion method.</p> <p>6.9 Classification of alloy : Ferrous and non Ferrous Alloy.</p> <p>6.10 Ferrous alloy : Steel, Definition and classification based on % of C (Mild carbon steel, medium carbon steel, high carbon steel, their properties & uses),</p> <p>6.11 Non-Ferrous Alloys Aluminum Alloys: Duralumin Solders Alloys : Woods metal Bearing Alloys : Babbitt metal</p> <p>Course Outcome: CO4 Teaching Hours :12 hrs Marks: 10 (R- 2 , U-6 A-2)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Atomic Structure	02	04	04	10
2	Electrochemistry	04	04	02	10
3	Cells And Batteries	04	04	02	10
4	Corrosion	02	04	04	10
5	Lubricants	04	04	02	10
6	Materials And Alloys	02	06	02	10
Total		18	26	16	60

List of experiments: Total 10 experiments(or turns) out of 15 experiments(or turns)

Sr. No.	Unit No	CO	List of Experiments	Hours
1	1	CO1	Introduction of chemistry laboratory & safety measures.	2
2	2	CO2	Determination of electrochemical equivalent of copper by using Cu-electrodes	2
3	4	CO3	To find out pH of different solutions using Lovibond comparator, pH paper, pH meter	2
4	5	CO4	Determination of coefficient of viscosity of given oil (Glycerin) by using Ostwald's Viscometer	2
5	1	CO1	A Qualitative analysis of any three salt solutions. Basic radicals : Cu^{++} , Fe^{++} , Fe^{+++} , Cr^{+++} , Mn^{++} , Ni^{++} , Zn^{++} , Ca^{++} , Ba^{++} , Mg^{++} , NH_4^+ Acidic Radicals: Cl^- , Br^- , I^- , CO_3^{--} , SO_4^{--} , NO_3^-	6
6	2	CO2	Determination of conductivity of different electrolytes by using conductivity meter.	2
7	4	CO3	To Study Corrosion of Aluminum rod and iron rod in acidic and basic medium and plot a graph of rate of corrosion	2
8	5	CO4	To find out acid value of given lubricant	2
9	3	CO2	Construction of Daniel Cell and measure its E M F.	2
10	4	CO3	Determination of percentage of moisture in given soil sample.	2
11	6	CO4	Estimation of percentage purity of iron from the given alloy sample	2
12	6	CO4	To find out the % of Cu from the given alloy sample	2
13	6	CO4	Preparation of phenol formaldehyde / Bakelite plastic	2
Total				30

Note: Experiments No. 1 to 10 are compulsory and should map all units and Cos. Remaining experiments are to be performed on the importance of topic/availability of time.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Engineering Chemistry	M.M. Uppal, Khanna Publisher, Delhi	978-81-7409-262-5
2	Poytechnic Chemistry	V.P. Mehta, Jain Brothers, Delhi	978-81-8360-093-X
3	Applied Chemistry	P.C. Jain, Monica Jain, Dhanpat Rai and Sons , Delhi	13: 9788187433170
4	Chemistry in Engineering and technology Volume 1 and 2	J.C. Kurlacose, J. Jairam Tata Mcgraw hill.	9780074517352

E-References:

1. www.chemistry.org
2. www.ferrofchemistry.com
3. www.chemistryclassroom.com
4. <http://hperchemistry.phastr.gsu.edu/hbase/hph.htm>
5. www.youtube/chemistry
6. www.sciencejoywagon.com/
7. <https://www.vedantu.com/ncert-solutions/ncert-solutions-class-12-chemistry>

CO Vs PO and CO Vs PSO Mapping (ELECTRICAL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3		1				1	1		
CO2	3	1					1			
CO3	3				1		1	1		
CO4	3		1		1		1	1		1

CO Vs PO and CO Vs PSO Mapping (INSTRUMENTATION ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3		1				1	1	1
CO2	3	1					1		
CO3	3				1		1	1	
CO4	3		1		1		1	1	

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Neelamkumar R. Sawant	State Head Technical Services for (Maharashtra and Goa)	JSW Cement Ltd. Mumbai Head Office
2	Mrs. Vaishali Gokhale	Lecturer in Chemistry	Govt. Polytechnic Pune
3	Mrs J. V. Iyengar	Lecturer in Chemistry	Government polytechnic Mumbai
4	Mrs. S. M. Patil	Sel. Gr. Lecturer in Chemistry	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Sci. & Humanities

Head of Department
Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course Code: IS19204				Course Title: Electronic Measurement and Instruments						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	-	5	-	-	-	50*	-	25	75

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1&TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination.

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

Instrumentation engineers have to deal with the measuring instruments to acquaint information, analyze it and troubleshoot the faults in instrumentation systems. This course intends to study the facts, concepts, principles of analog & digital electronic measuring instruments and apply it to measure various signals indifferent industrial applications.

Course Outcomes: Student should be able to

CO1	Use analog bridges to measure given passive components.
CO2	Measure electrical parameters by using analog meters.
CO3	Measure electrical parameters by using digital meters.
CO4	Determine the electrical parameters of given signal using CRO and Function generator.

Course Content Details:

Unit No	Topics / Sub-topics
1	Fundamentals of Measurements and Bridges: 1.1 Classification of instruments-Absolute Instruments, Secondary Instruments 1.2 Standards and their Classification - International, Primary, Secondary, Working. 1.3 Calibration of Instruments-definition, need etc. 1.4 Grounding-Importance of ground, types of Grounding (earth ground, chassis ground, signal ground), Equipment grounding for safety. 1.5 Bridges: 1.5.1 DC Bridges- Wheatstone bridge, Kelvin Bridge 1.5.2 AC Bridges- Maxwell's bridge, Schering's bridge Course Outcome: CO1
2	Analog DC and AC Meters: 2.1 Classification of Analog Instruments. 2.2 PMMC-Working Principle, Construction, Sources of torque. 2.2.1 Analog DC Ammeters and Voltmeters, concept of loading effect and sensitivity.

	<p>2.2.2 Analog AC Ammeter and Voltmeter-Average Responding(Rectifier type)</p> <p>2.3 Ohmmeter- series and shunt.</p> <p>2.4 Analog Multimeter- Circuit diagram and operation.</p> <p>Course Outcome: CO2</p>
3	<p>Digital Instruments:</p> <p>3.1 Resolution, Sensitivity and Accuracy of digital display.</p> <p>3.2 Digital frequency meter-Block Diagram and operation only.</p> <p>3.3 Digital Voltmeter-Ramp type DVM, Integrating type DVM, Successive approximation type DVM, Dual slope type DVM. (Block diagram, Operation and waveforms)</p> <p>3.4 Digital Multi meter -Block Diagram and operation.</p> <p>3.5 LCR, Q- meter-Block diagram and operation only.</p> <p>3.6 Digital phase meter-Block diagram and operation only.</p> <p>Course Outcome: CO3</p>
4	<p>Oscilloscope:</p> <p>4.1 Display system – CRT, construction and operation. Deflection of electron beam in CRT, Electrostatic and Electromagnetic deflection.</p> <p>4.2 Vertical deflection system- Input coupling selector, input attenuator, pre-amplifier, main vertical amplifier, delay line.</p> <p>4.3 Horizontal deflection system –Trigger circuit, time base generator, Main horizontal amplifier.</p> <p>4.4 CRO Probes- General block diagram of CRO probe, passive voltage probe and their compensation, active voltage probes, current probes.</p> <p>4.5 CRO – Block diagram of single beam single trace, single beam -dual trace oscilloscope.</p> <p>4.6 CRO–specifications (single beam-dual trace).</p> <p>4.7 Block diagram of Digital storage oscilloscope (DSO).</p> <p>4.8 Measurement of amplitude, time period, frequency and phase using CRO, tracing of diode and transistor characteristics using CRO.</p> <p>Course Outcome: CO4</p>
5	<p>Signal Generator and Wave Analyzer:</p> <p>5.1 Concept of signal generator.</p> <p>5.2 Need, block diagram, operation, applications and specifications of signal generators: AF and RF type, function generator and pulse generator, Pattern generator.</p> <p>5.3 Need, block diagram, operation, applications and specifications of spectrum and logic analyzer</p> <p>Course Outcome:CO4</p>

Suggested Specifications Table (Theory): --NA---

List of experiments: Total 10experiments (or turns) out of 15 experiments(or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	Use Wheatstone bridge to determine unknown resistance.	02
2	2	CO2	Identify the parts of PMMC analog multimeter and perform	02

			measurement of different electrical parameters.	
3	3	CO3	Identify the front panel control of DMM and measure different electrical parameters using DMM.	02
4	4	CO4	Identify the front panel control of CRO and measure amplitude and frequency of different signals using CRO.	02
5	5	CO4	Identify the front panel control of function generator and measure frequency and amplitude of different waveforms available at the output of function generator	02
6	1	CO1	Calibrate the given multimeter with standard instrument.	02
7	2	CO2	Calculate the sensitivity of the given analog voltmeter.	02
8	3	CO3	Observe values of given resistance, inductance, capacitance using LCR meter and compare those with component codes.	02
9	4	CO4	Measure unknown frequency and phase difference with respect to given signal using lissajous patterns.	02
10	5	CO4	Identify the front panel control of DSO and measure various parameters of given signal.	02
11	1	CO1	Use Schering bridge to determine unknown capacitance.	02
12	2	CO2	Calculate the loading effect of the given analog voltmeter.	02
13	4	CO4	Testing of components using CRO. (Resistors, Capacitors, Transformers, PN junction diode, Zener Diode and LED). Draw the observed nature of patterns/waveforms.	02
14	4	CO4	Measure amplitude and frequency of given signal using cursor method using DSO.	02
15	5	CO4	Determine the frequency of given signal using spectrum analyzer.	02
Total				30

Note: Experiments No. 1 to 5 (or 6) are compulsory and should map all units and Cos. Remaining 05 experiments are to be performing on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electrical and Electronic Measurements and Instrumentations	A. K. Sawhney, Dhanpat Rai and Co. 2015	9788177001006
2	Electronic Instruments	H. S. Kalsi, Tata McGraw Hills, 3 rd edition, 2012	9780070702066
3	Electronic Instrumentation and Measurement tech.	W. D. Cooper, 3 rd edition Prentice Hall 1989	9780135932940
4	Electronic Measurements and Instrumentation	K Lal Kishore, 2 nd edition Pearson 2014	9788131721995
5	Electronic Measurement and Instrumentation	R. S. Sedha, S. Chand and Company, New Delhi 2013	9788121997751
6	Electronic Instrumentation and Measurement	Khurana & Rohit, 1 st edition Vikas Publication House, New Delhi 2016	9789325990203

E-References:

1. <https://www.youtube.com/> “type name of topics”
2. <https://www.allaboutcircuits.com/textbook/alternating-current/chpt-12/ac-voltmeters-ammeters/>
3. <https://www.elprocus.com/cro-cathode-ray-oscilloscope-working-and-application/>
4. <https://www.slideshare.net/dineshsharma9277/analog-and-digital-multimeters>
5. <https://www.electronics-notes.com/articles/test-methods/>
6. <https://en.wikipedia.org/wiki/>“type name of topic”

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	1	-	3	-	-	1	2	-
CO2	2	-	-	2	-	-	2	2	-
CO3	2	-	-	2	-	-	2	2	1
CO4	2	-	-	3	-	-	2	2	1

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mrs. Priyanka Patil	Assistant Engineer	ONGC, Mumbai
2	Mrs. V.K.Pawar	Lecturer in instrumentation Engg.	Govt. Polytechnic, Karad
3	Mr. U.B.Shinde	Lecturer in instrumentation Engg.	Govt. Polytechnic, Mumbai
4	Mrs. S.T. Shinde	Lecturer in instrumentation Engg.	Govt. Polytechnic, Mumbai

Coordinator,
Curriculum Development,
Department of Instrumentation Engg.

Head of Department
Department of Instrumentation Engg.

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course Code: IS19206				Course Title: Basics of Electronics Engineering						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	4	-	7	60	20	20	50	--	25	175

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1&TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment), * Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination. Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term.

Rationale:

Instrumentation engineers have to study and apply the basic principles, analyze and troubleshoot simple electronic circuits in measurement and control applications. To acquire these levels of understanding, the basic knowledge of electronic devices and circuits is essential. This Course deals with construction, working principle, applications of electronic components.

Course Outcomes: Student should be able to

CO1	Describe the Fundamentals of Diode
CO2	Select different types of Diodes for given applications.
CO3	Analyze different Biasing circuits (BJT and FET).
CO4	Explain regulation and its circuits.

Course Content Details:

Unit No	Topics / Sub-topics
1	Semiconductor Diodes: 1.1 Classification of component on the basis of energy band theory and effect of Temperature. 1.2 Different types of Semiconductor and their materials. P-type and N-type Semiconductors. 1.3 Symbol, Construction, working principle, Forward and Reverse Biasing, V-I Characteristics and applications of: PN junction diode, Zener diode, LED, Photo diode. Course Outcome: CO1 Teaching Hours : 07 hrs Marks: 10 (R-4, U-6, A-0)
2	Diode applications: 2.1 Types of rectifier: Circuit, waveform and working of Half Wave, Full Wave Rectifier (Bridge and Center tapped). 2.2 Parameters of rectifier: Average DC value of current and voltage, ripple factor, ripple frequency, PIV of diode, TUF, efficiency of rectifier. 2.3 Diode as clipper and clamper: 2.3.1 Circuit diagram, waveform and working of positive, negative and biased clippers. 2.3.2 Circuit diagram, waveform and working of positive, negative and biased clampers. 2.4 Applications of LED: power indicator, seven segment display.

	2.5 Applications of photodiode: alarm circuit, counter circuit Course Outcome: CO2 Teaching Hours :08hrsMarks:12 (R-2 , U-4 , A-6)
3	Transistor Fundamentals: 3.1 Classification of transistors (BJT, FET, UJT). 3.2 Construction and working of PNP and NPN transistors. 3.3 Transistor configuration: CB, CE, CC. 3.4 Working and characteristics of transistors in CB,CE and CC modes. 3.5 BJT Biasing: DC load line, Operating point, stabilization, Concept of thermal runaway. 3.6 Types of biasing: circuit and analysis of Fixed bias, base bias with Emitter feedback, Voltage divider bias.(circuit, working, derivation for IC, VCE) 3.7 Transistor as a Switch and Single stage CE amplifier. 3.8 Construction and working of UJT- (circuit diagram and working) Course Outcome: CO3 Teaching Hours :11hrs Marks:14(R-2, U-6 , A-6)
4	Field Effect Transistor: 4.1 Symbol, Construction, working and characteristics of JFET (N-channel and P-channel) and MOSFET (Depletion and enhancement Type). 4.2 FET Biasing: Fixed, Self-bias, Voltage divider bias. 4.3 Applications of FET. 4.4 Comparison of FET with BJT. Course Outcome: CO3 Teaching Hours :11 hrs Marks:14 (R-2 , U-4 , A-6)
5	Passive Filters and Regulated Power supply: 5.1 Types of Filters: Waveform and working of Shunt Capacitor, series Inductor and π filter. 5.2 Block diagram of DC regulated power supply. 5.3 Definition of load regulation and line regulation. 5.4 Zener diode as voltage regulator. 5.5 Transistorized series and shunt regulator- circuit diagram and working. Course Outcome:CO4 Teaching Hours :08hrs Marks:12 (R-2, U-4 , A-6)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Semiconductor Diodes	04	06	--	10
2	Diode applications	02	04	06	12
3	Transistor Fundamentals	02	06	06	14
4	Field Effect Transistor	02	04	06	12
5	Passive Filters and Regulated Power supply	02	04	06	12
Total		12	24	24	60

List of experiments: Total 15experiments (or turns) out of 20 experiments(or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	To plot the V-I characteristic of semiconductor P-N diode. Find out static, dynamic resistance and knee voltage of P-N diode.	04
2	2	CO2	To construct and test half wave rectifier and draw input/output waveform.	02
3	3	CO3	To plot V-I characteristics of BJT and find out input resistance and o/p resistance of BJT in CE Mode.	04
4	4	CO3	To plot the V-I characteristic of FET.	02
5	5	CO4	To construct and test circuit for Zener regulator. Find out load and line regulation.	02
6	1	CO1	To plot the V-I characteristic of Zener diode.	02
7	2	CO 2	To construct and test full wave center tapped rectifier and draw input/output waveform.	02
8	3	CO 3	To plot the V-I characteristic of UJT.	02
9	4	CO 3	To plot the V-I characteristic of MOSFET.	02
10	5	CO 4	To construct and test Capacitive filter using Bridge wave rectifier.	02
11	2	CO2	To construct and test the circuit for Power ON indicator.	02
12	3	CO3	To construct and test transistor as a switch circuit.	02
13	3	CO3	To construct and test the circuit for voltage divider biasing.	02
14	5	CO 4	To construct and test π filter using Bridge wave rectifier.	04
15	2	CO 2	To construct and test clipper circuit (Positive, negative and biased) Draw input and output waveform.	06
16	2	CO 2	To construct and test clamper circuit (Positive, negative and biased) Draw input and output waveform.	06
17	3	CO 3	To construct and test single stage CE amplifier.	02
18	5	CO 4	To construct and test Inductive filter using Bridge wave rectifier.	04
19	2	CO 2	To construct and test object detector circuit using photodiode.	04
20	3	CO 3	To construct and test the circuit for base biasing.	04
Total				60

Note: Experiments No. 1 to 5are compulsory and should map all units and Cos. Remaining 10 experiments are to be performing on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electronic Devices and Circuit Theory	Boylestad Robert, Louis Nashelsky Pearson Education, 2015 11 th edition	9789332542600
2	A Text book of Applied Electronics	Sedha R. S. S. Chand Publications 2008 3 rd edition	9788121927833
3	Electronics Principles	Malvino Albert, David bates McGraw Hill Education 2017 7 th edition	9780070634244
4	Principles of Electronics	Mehta V.K. S. Chand and Company 2014 7 th edition	9788121917230
5	Basic Electronic Engineering	Baru V., Kaduskar R. Gaikwad S.T. Dreamtech Press 2011 7 th edition	9789350040126

E-References:

1. <https://www.youtube.com/> “type name of topics”
2. <http://vlabs.iitkgp.ernet.in/be/#>
3. <https://www.electronicshub.org/>
4. <https://www.allaboutcircuits.com>
5. <https://www.slideshare.net/babaiarup3/basic-electronics-20135927>
6. <https://en.wikipedia.org/wiki/> “type name of topic”

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	1	2	-
CO2	2	2	-	-	2	-	2	2	1
CO3	2	-	-	2	-	-	1	2	1
CO4	1	2	-	-	-	-	1	1	-

Industry Consultation Committee:

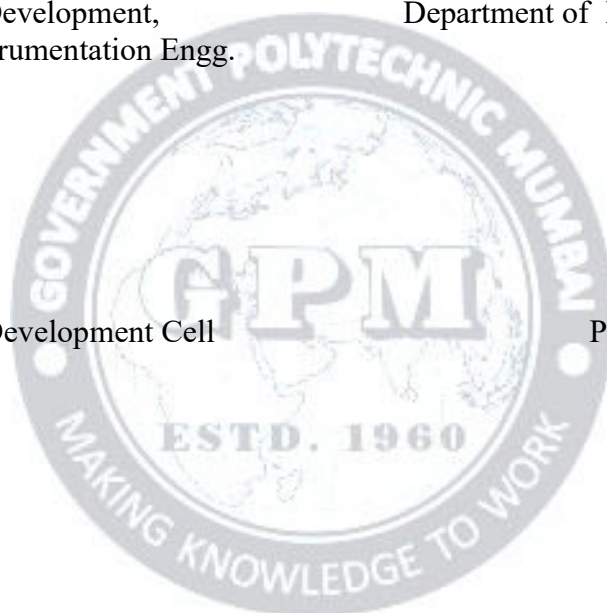
Sr. No	Name	Designation	Institute/Organisation
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Head of Department
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I/C, Curriculum Development Cell

Principal



Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course Code: EE19206				Course Title: Fundamentals of Electrical Engineering						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
3	2	-	5	60	20	20	50		-	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1&TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment),* Indicates assessment by External Examiner else internal practical skill test, # indicates Self, on- line learning Mode, @ indicates on line examination.

Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill tests are to be conducted. First skill test at midterm and second skill test at the end of the term

Rationale:

All the equipment related to instrumentation utilizes electrical energy for their operations. Diploma holders from this branch come across various types of electrical circuits and devices. The purpose of this subject is to give fundamental knowledge of electrical engineering so that they will be able to handle electrical equipments, circuits and analyze simple DC/AC circuits.

Course Outcomes: Student should be able to

CO1	Define basic terminologies related to electrical circuit
CO2	Solve simple DC circuits.
CO3	Analyze DC network theorems
CO4	State concepts of ac fundamentals and solve simple ac series circuits.
CO5	Compare star and delta connected polyphase system.
CO6	Identify various types of wiring and safety precautions.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Basic Concepts:</p> <p>1.1 Electric Current: Definition, Direction of current, unit, Electric potential, potential difference, Concept of EMF and Potential difference.</p> <p>1.2 Resistance: Definition, unit, Factors on which resistance depends, Effect of temperature on resistance. <i>(simple numerical)</i></p> <p>1.3 Conductance, Ohms Law.</p> <p>1.4 Electric power and energy concept and unit. <i>(simple numerical)</i></p> <p>1.5 Measurement of voltage, current, power and energy.</p> <p>1.6 Effects of Electric Current: Heating Effect, Magnetic Effect and Chemical Effect. <i>(Only Introduction)</i></p> <p>Course Outcome: CO1 Teaching Hours :07 hrs Marks: 10 (R-4, U-2, A-4)</p>

2	<p>DC Circuits:</p> <p>2.1 Introduction to concept.</p> <p>2.2 DC series circuit: Concept, Equation for equivalent resistance connected in series, main characteristics, advantages, disadvantage, and application of series circuit.</p> <p>2.3 DC Parallel circuit: Concept, Equation for equivalent resistance connected in parallel, main Characteristics, advantages, application of Parallel circuit, Current divider rule.</p> <p>2.4 Series parallel circuit, Application of series parallel circuit. <i>(simple numerical)</i></p> <p>2.5 Definition of: Circuit, Parameter, Linear circuit, Nonlinear circuit, Bilateral circuit, Unilateral circuit, Electric network, Passive-Network, Active network, Node, Branch, Loop, Mesh.</p> <p>2.6 Kirchhoff's current law, Kirchhoff's voltage law, signs convention. <i>(simple numerical limited up to two variables on above)</i></p> <p>Course Outcome: CO2 Teaching Hours : 07 hrs Marks: 10 (R- 2 , U- 4 , A- 4)</p>
3	<p>DC Network theorem:</p> <p>3.1 Network Analysis: Direct method, Network reduction method.</p> <p>3.2 Statement, Explanation, and simple Numerical on following theorem.</p> <ul style="list-style-type: none"> i. Mesh/Loop analysis ii. Nodal analysis iii. Superposition theorem. iv. Thevenin's theorem. v. Norton's theorem. vi. Maximum Power Transfer Theorem. <p>Course Outcome: CO3 Teaching Hours :07 hrs Marks : 12 (R- 2 , U- 6, A- 4)</p>
4	<p>AC Fundamentals:</p> <p>4.1 Difference between AC and DC quantity. Advantages of AC Over DC.</p> <p>4.2 Generation of A.C. Voltage and current. Mathematical Expression of alternating quantity & its derivation.</p> <p>4.3 Definition of Waveform, Instantaneous value, Cycle, Time period, Frequency, Amplitude, Peak value, Average value and RMS value, Form factor and Peak factor for sinusoidal <i>(simple numerical)</i></p> <p>4.4 Phase, Phase difference, Phasor representation of sinusoidal quantities</p> <p>4.5 Circuit diagram, phasor diagram and wave form of a.c. circuits through pure Resistance, Pure Inductance and pure Capacitance. Concept of inductive reactance</p> <p>4.6 and capacitive reactance.</p> <p>4.7 Circuit diagram, phasor diagram and wave form of a.c. circuits</p> <p>4.8 RL, RC and RLC circuit. Impedance and Impedance Triangle. <i>(simple numerical)</i></p> <p>4.9 Active power, Reactive power and apparent power.</p> <p>4.10 Power factor and its significance</p> <p>Course Outcome: CO4 Teaching Hours:10 hrs Marks:10 (R- 0, U-4 A-6)</p>

5	Polyphase Circuits: 5.1 Difference between single phase and polyphase system, Generation of three-phase a.c. supply, Advantages of three-phase supply over single-phase supply. 5.2 Concept of phase sequence and balanced/unbalanced load. 5.3 Star connected system, Relation between phase and line values of current and voltage in balanced Star system. (no derivation) 5.4 Delta connected system, Relation between phase and line values of current and voltage in balanced Delta system. (no derivation) 5.5 Active, Reactive and Apparent power in three phase Star/Delta system. 5.6 Advantages of star and delta connected system (Simple Numerical based on above.) Course Outcome: CO5 Teaching Hours:06 hrs Marks:10 (R- 2, U-4 A-4)
6	Electrical wiring: 6.1 Types of wiring for Domestic Installation: Conduit, Casing and Capping and Concealed (brief information and application) 6.2 Concept of lighting circuit and power circuit. 6.3 Electric wiring - wiring accessories, switches, sockets, ICDP, ICTP, Ratings of Wires, switches, sockets used for lighting and power circuit. 6.4 Fuses, importance and types for domestic applications. MCB, their ratings for domestic applications. 6.5 One lamp controlled by one switch. Staircase wiring. 6.6 Earthing, necessity and types. 6.7 Safety precautions in electrical indoor & outdoor installations. Course Outcome: CO6 Teaching Hours :08 hrs Marks: 8 (R- 2 , U-4 , A- 2)

Suggested Specifications Table (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Basic Concepts	07	4	2	4	10
2	DC Circuits	07	2	4	4	10
3	DC Network theorem	07	2	6	4	12
4	AC Fundamentals	10	--	4	6	10
5	Polyphase circuit	06	2	4	4	10
6	Electrical wiring	08	2	4	2	8
Total		45	12	24	24	60

List of experiments: Total 08 experiments (or turns) out of 11 experiments (or turns)

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1	CO1	To measure current, voltage, power and energy in single-phase circuit	04
2	2	CO2	Measure voltages and currents in series and parallel resistive circuit.	04
3	3	CO3	Verify Superposition theorem applicable to D.C. circuit.	04
4	4	CO4	Observe AC and DC waveform on CRO and find magnitude of DC voltage, peak average, R.M.S. values and frequency of AC voltage,	04
5	5	CO5	Verify relationship between line and phase values of voltage and current in star and delta connected balanced load	04
6	6	CO6	Prepare extension board with three pin sockets.	04
7	2	CO2	Verify Kirchhoff's current & voltage laws.	04
8	3	CO3	Verify Thevenin's theorem and Norton's theorem applicable to D.C. circuit	04
9	4	CO4	Determine impedance, phase angle of R-L series circuit, plot phasor diagram and also calculate active, reactive and apparent power consumed in R-L series circuit.	04
10	6	CO6	Identify different types of wires and accessories switch, fuse, socket outlet used in wiring and write their rating	04
11	6	CO6	Safety precautions to be observed for indoor and outdoor installations and know first aid practice also refer artificial respiration chart	04
Total				30

Note: Experiments No. 1 to 6 are compulsory and should map all units and Cos. Remaining 02 experiments are to be performing on the importance of topic.

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Electrical Technology (Volume I)	B. L. Theraja and A. K. Thereja, S. Chand and Co. Ltd. Edition 2005	8121924405
2	Basic Electrical Engineering	V. K. Mehta and Rohit Mehta, S. Chand and Co. Ltd. Edition 2012	9788121908719
3	Electrical Technology	Edward Hughes, ELBS Publications. Edition 2012	9780582226968
4	Electrical Estimation and Costing	Surjit Singh, Dhanpat Rai & Co. Edition 2014	1234567150995

E-References:

1. www.nptel.com
2. www.electrical4u.com
3. www.khanacademy.org
4. <https://ndl.iitkgp.ac.in/>
5. <https://phet.colorado.edu/>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	-	2	2	-	2	3	-
CO2	3	3	-	2	2	-	2	3	-
CO3	3	3	-	2	2	-	2	3	-
CO4	3	3	-	2	2	-	2	3	-
CO5	3	3	-	2	2	-	2	3	-
CO6	3	-	-	2	2	-	2	3	-

Industry Consultation Committee:

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2	Mrs.S.P. Phadnaik	Lecturer in Electrical Engineering	G.P. Pune
3	Miss A.V. Patil	Lecturer in Electrical Engineering	Govt. Polytechnic Mumbai
4	Dr. P. N. Padghan	Lecturer in Electrical Engineering	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Electrical Engineering

Head of Department
Department of Electrical Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Instrumentation Engineering										
Course Code:IS19 311				Course Title: Inkscape						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2:30 Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	4#	--	4	--	--	--	--	--	--	--

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Course Content Details:

Topics / Sub-topics
<p>1. Overview of Inkscape Outline: - Introduction to Inkscape - Interesting features - Usage of Inkscape - Installation of Inkscape in Linux and Windows OS - Draw a rectangle - Saving an Inkscape file</p> <p>2. Create and edit shapes Outline: Create and edit shapes Inkscape interface Create basic shapes like rectangle, square circle, ellipse polygons, stars Fill color Learn about the different types of handles -resize rotate skew Modify shapes using handles.</p> <p>3. Fill color and stroke Outline: Fill color in objects Give objects an outline Various types of Gradients Giving Patterns and Stroke paint and style</p> <p>4. Create and edit multiple objects Outline: *Copy and paste objects *Duplicate and clone objects *Group and Order various objects *Multiple selection and invert selection *Clipping and Masking</p> <p>5. Layers and Boolean operations Outline: *Layers and layer palette *Add a new layer *Rename a layer *Position a layer above or below other layers *Lock a layer *Hide a layer *Various modes *Add various filters .</p> <p>6. Align and distribute objects Outline: *Align and distribute various objects *Align objects with reference to something *Arrange objects in rows and columns *Set spacing between objects *Create a tile pattern</p> <p>7. Create and Format Text Outline: - Inserting text - Formatting text - Aligning text - Spacing and bullet - Making a simple flyer</p> <p>8. Text tool features Outline: -Manual kerning -Horizontal kerning -Vertical shift -Character rotation -Spell check - Superscript -Subscript</p> <p>9. Basics of Bezier Tool Outline: -Drawing using Bezier tool -Modes of bezier tool -Shapes of the paths -Node tool -Add, edit, delete nodes -Join and break paths</p> <p>10. Text Manipulation</p>

Outline: -Text on path in Inkscape -Text on shape in inkscape -Image inside text -Text in perspective -Cutout text in inkscape.

11. Create an A4 Poster

Outline: - To make an A4 poster for Spoken Tutorial - Explaining to set page size for A4, default units (pixel/cm/inch), Orientation and Guides - Explaining to design with shapes and path.

12. Create a 3-fold brochure

Outline: - Explaining how to set page size, default unit in Inkscape - Orientation and about Guides for 3-fold - Separating the page into 3 fold with rulers - Design the brochure -Importance.

13. Design a CD label

Outline: - Creating a CD design label - Document settings - Designing the layout - Alignment of text and images - Saving the document and exporting in various formats

14. Design a visiting card

Outline: - To set the page size for visiting card and setting other document properties in Inkscape - Arrangement of the various objects in the visiting card - Explaining how to arrange file

15. Create patterns in Inkscape

Outline: - Create Patterns in Inkscape - Patterns using Cloning - Pattern along Path in Inkscape - Patterns using Spray tool - Path Effect Editor in Inkscape

16. Special effects on text

Outline: - Special effects on text in Inkscape - Reflected text in Inkscape - Labeled text - Change the text case in Inkscape

17. Trace bitmaps in Inkscape

Outline: - Inkscape - Difference between raster and vector image - Various raster and vector formats - Convert raster image to vector

18. Warli art for Textile design

Outline: - Creating a simple Warli art in Inkscape - Repeat patterns using cloning - Application of the Warli art in Textile design

19. Mango pattern for Textile design

Outline: - Mango pattern in Inkscape for Textile design - Repeat patterns using cloning - Draw using Pattern along Path

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