### <u>Government Polytechnic Mumbai</u>

**Department of Instrumentation Engineering** 

# P-19 Curriculum

## Semester- II

(Course Contents)

#### **GOVERNMENT POLYTECHNIC MUMBAI**

(Academically Autonoums Institute, Government of Maharashtra)

#### **Teaching and Examination Scheme (P19)**

#### With effect from AY 2019-20

#### Programme: Diploma in Instrumentation Engineering (Sandwich Pattern)

**Teaching Hours/Contact Hours Examination Scheme (Marks)** Course Theory **Course Title** Credits Code PR Total OR Р TW L TU Total TS2 TH TS1 ----1 --4 SC19110 **Engineering Mathematics** 4 4 60 20 20 100 --SC19106 Applied Chemistry 2 5 25\* 5 60 20 20 25 150 3 5 Electronic Measurement and --------IS19204 2 5 50\* 3 25 75 Instruments **Basics of Electronics** --3 7 60 IS19206 4 20 20 50 25 175 Engineering Fundamental of Electrical --3 5 2 5 EE19206 60 20 20 25 175 50 Engineering --) --------------IS19310 Inkscape (Spoken Tutorial) 4# 4# 4 ---Total 16 14 30 175 30 240 80 80 100 675 \_\_ \_\_\_ Student Centered Activity(SCA) 05 35 **Total Contact Hours** 

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.

In-Charge Curriculum Development Cell Term / Semester - II

Program	Programme : Diploma in CE/ME/CO/IF/EC/EE/IS (Sandwich pattern)											
Course Code: SC19110 Course Title: ENGINEERING MATHEMATICS												
Compul	Compulsory / Optional: Compulsory											
Teachin	ng Sche	eme and	l Credits			Examina	tion Sche	eme				
L	Р	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.

Unit No	<b>Topics / Sub-topics</b>
1	<b>Function</b> 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	<ul> <li>Derivatives &amp; Application of derivative</li> <li>3.1 Definition of the derivative.</li> <li>3.2 Derivatives of standard function.( No proof by first principle)</li> </ul>

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	<ul> <li>3.3 Differentiation of sum, difference, product and quotient of two or more functions</li> <li>3.4 Differentiation of composite function with simple example.</li> <li>3.5 Second order derivative.</li> <li>3.6 Geometrical Meaning of Derivative</li> <li>3.7 Tangents &amp; Normals to the curve,</li> <li>3.8 Maxima &amp; minima of the function</li> </ul>
	3.9 Radius of curvature
	Course Outcome:CO2 Teaching Hours : 10 hrs Marks:10 (R-4, U-4, A-2)
4	<ul> <li>Integration &amp; Application of integration <ol> <li>1Definition of integration as antiderivative ,Integration of standard function</li> <li>Rules of integration(Integration of sum, difference, scalar multiplication) without proof</li> <li>Integration by substitution</li> <li>Integration of composite function</li> <li>Definition of definite integral</li> <li>Properties of definite integral with simple problems</li> <li>Area under the curve</li> <li>Area bounded by two curves</li> </ol> </li> <li>Course Outcome: CO3 Teaching Hours :10 hrs Marks:10 (R-4, U-4, A-2)</li> </ul>
5	<ul> <li>Complex Number:-</li> <li>5.1 Definition of complex number Cartesian ,Polar ,Exponential form of complex number</li> <li>5.2 Algebra of complex number :-Equality, addition, Subtraction, Multiplication &amp; Division with simple examples</li> <li>Course Outcome: CO2 Teaching Hours :10hrs Marks:10 (R-2, U-4, A-4)</li> </ul>
6	Numerical Analysis         6.1       Solution of Algebraic equations using –         i) Bisectional method       ii) Regular – Falsi method         6.2       Solution of simultaneous equation         (i) Gauss elimination method         (ii) Jacobi's method         (iii) Jacobi's method         (iii) Course Outcome:CO2         Teaching Hours : 10 hrs         Marks: 10 (R- 2, U- 4, A- 4)

#### **Suggested Specifications Table (Theory):**

		Distribution of Theory Marks					
Unit No	Topic Title	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		

BOLYTEON

#### **E-References:**

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

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

СО	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)

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

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3		8 /7	4			1	1	1	
CO2	3		-16	- And	5 35	5	1	1	1	
CO3	3			1	5	108	1	1	1	

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

СО	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)

СО	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)

СО	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)

СО	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

POLYTECH

#### **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	Р	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

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 Outcomes: Student should be able to

Topics / Sub-topics
Atomic Structure
<ul> <li>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.</li> <li>1.2 Atomic number and atomic mass number. Atomic weight Numerical based on atomic number &amp; atomic mass number.</li> <li>1.3 Rules governing filling up of atomic orbitals.Quantum no.,Paulis Exclusion Principle, Aufbau's Principle ,Hund's rule. Electronic configuration of atoms up to atomic number 30</li> <li>1.4 Valence and chemical bonding. Valence : Definition, &amp; examples. Types of valance : Electrovalence &amp; Co-valance .</li> <li>1.5 Electrovalent bond: Definition, Formation Formation of NaCl</li> <li>1.6 Co-valent bond : Definition &amp; formation Formation Formation of following molecules Single bond :,Chlorine. Double bond : Oxygen,, Triple Bond : Nitrogen.</li> </ul>



	1.7 Distinction between electrovalent and covalent compound.								
	Course Outcome: CO1 Teaching Hours : 7 hrs Marks: 10 (R- 2, U-4, A-4)								
2	<ul> <li>Electrochemistry</li> <li>2.1 Definition of Electrochemistry, Electrolytes: Definition, Types. Differences between Atom and ion . Definition of ionization &amp; electrolytic dissociation, Arrhenius theory, Degree of ionization with factors affecting it.</li> <li>2.2 Terms related to Electrolysis Mechanism of electrolysis. Examples of: mechanism of Electrolysis of CuSo<sub>4</sub> by using Cu electrodes.</li> <li>2.3 Faradays First law and its mathematical derivation. Faradays second law &amp; its mathematical derivation, Numerical based on laws of Faraday.</li> <li>2.4 Application of Electrolysis: Electroplating, Electrorefining.</li> </ul>								
	Course Outcome: CO2 Teaching Hours : 7 hrs Marks: 10 (R- 4, U-4, A-2)								
3	<ul> <li>3.1 Conductor: Definition, types (metallic, electrolytic), Difference between them.</li> <li>3.2 Ohms law, Charging and discharging of cells, Closed circuit voltage, Open circuit voltage, Electrochemical couple,Seperator,Electromotive force (E.M.F)</li> <li>3.3 Cells: Definition, types (Electrolytic and Electrochemical), difference between them.</li> <li>3.4 Classification of Electrichemical cell ( primary and Secondary) Definition and Difference between them.</li> <li>3.5 Primary cells: Lachlance cell,Dry cell,Daniel cell</li> <li>3.6 Secondary cell : Lead acid storage cell or battery, Nickel cadmium cell or battery</li> <li>3.7 Lead acid storage battery: construction,working,charging and discharging, electrical charecteristics, methods of charging storage batteries, indication of fully charged battery, Maintenance of Lead acid batteries, application of Lead acid storage batteries.</li> </ul>								
	Course Outcome:CO2 Teaching Hours : 7 hrs Marks: 10 (R-4, U-4, A-2) Corrosion								
4	<ul> <li>Corrosion</li> <li>4.1 Definition of corrosion. Types of corrosion . Atmospheric &amp; Electrochemical Corrosion.</li> <li>4.2 Mechanism of atmospheric corrosion, types of oxide film formed, (stable, unstable, volatile, with examples).</li> <li>4.3 Electrochemical corrosion/immersed corrosion Definition. Example. Factors Affecting , Atmospheric &amp; Electrochemical Corrosion.</li> <li>4.4 Protection of metals from Corrosion:- By protective coatings a)organic coating (Paints and Varnishes), b)inorganic coating (Metallic Coating).</li> <li>4.5 Different methods of Protective metallic coatings. A) Hot dipping (Galvanizing &amp; Tinning)</li> <li>b) Sherardizing c) Metal Spraving</li> </ul>								
	Course Outcome: CO3 Teaching Hours :6 hrs Marks: 10 (R-2, U-4, A-4)								
5	<ul> <li>Lubricants</li> <li>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.</li> <li>5.2 Lubrication: definition and types. conditions under which each lubricant is used Types of lubrications, Fluid film, Boundary, Extreme pressure lubrication. Definition, diagram &amp; description of each type.</li> <li>5.3 Characteristic of good lubricant</li> </ul>								
	A) Physical Characteristics • Viscosity								

	Viscosity index								
	• Oiliness								
	Volatility								
	• Flash point & Fire Point								
	• Cloud and Pour point								
	B) Chemical Characteristics								
	Acidity /Neutralization no								
	Fmulsification								
	Saponification value								
	Course Outcome: CO4 Teaching Hours : 6 hrs Marks: 10 ( $\mathbf{R}_{-4}$ U-4 A-2)								
	Materials And Allovs								
	Matthais And Anoys.								
	6.1 Metallic: Metals & their characteristics (hardness ductility malleability toughness brittleness								
	tensile strength weldability casting forging soldering)								
	6.2 Physical and chemical properties and uses of following metals								
	(Fe Cu $\Delta 1$ Cr Ni Ph Zn $\Delta q$ Sn)								
	6 3 Non-Metallic: Definition of non-metallic engineering materials								
	6.4 Plastic								
	Definition example Polymerization : definition different Types of								
	Polymerization addition and condensation								
	A ddition polymerization : definition formation of polyethylene								
	Condensation_nolymerization : 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 (nigments fillers Plasticizers								
	accelerators etc) Properties and engineering applications								
	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								
6	Synthetic rubber: Importance								
	Example Buna-S Buna-N Butyl rubber Thiokol Neoprene)								
	Properties of rubber:								
	Elasticity Tack, Rebound abrasion resistance								
	Uses of rubber								
	6.6 Thermal insulating materials								
	Definition. Examples Thermocole. Glasswool.								
	Thermocole: Definition., Preperation, Properties & uses								
	Glass wool. Definition. Preperation, Properties & uses								
	Alloys								
	6.7 Definition of alloy: purposes of preparation of Alloy.								
	6.8 Preparation of binary alloy by fusion method.								
	6.9 Classification of alloy : Ferrous and non Ferrous Alloy.								
	6.10 Ferrous allov : Steel. Definition and classification based on % of C								
	(Mild carbon steel, medium carbon steel, high carbon steel, their properties &uses),								
	6.11 Non-Ferrous Allovs								
	Aluminum Alloys: Duralumin								
	Solders Alloys : Woods metal								
	Bearing Alloys : Babbitt metal								
	Course Outcome:CO4 Teaching Hours :12 hrs Marks: 10 (R-2, U-6 A-2)								

#### **Suggested Specifications Table (Theory):**

Unit No		Distribution of Theory Marks					
	Topic Title	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					
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 <sup>++,</sup> Fe <sup>++,</sup> Fe <sup>+++,</sup> Cr <sup>+++,</sup> Mn <sup>++,</sup> Ni <sup>++,</sup> Zn <sup>++,</sup> Ca <sup>++,</sup> Ba <sup>++,</sup> Mg <sup>++</sup> NH4 <sup>+</sup> Acidic Radicals: Cl <sup>-</sup> , Br <sup>-</sup> , L <sup>-</sup> , CO <sup>+-</sup> , SO <sup>+-</sup> , NO <sup>+-</sup>	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 perform on the importance of topic/availability of time.

Page4

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

#### **References/ Books:**

#### **E-References:**

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

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

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3		21	FSI	2	0.00	1.	1		
CO2	3	1	TE	60	19		G,			
CO3	3		~	GRAN	-1		0.1	1		
CO4	3		1	100	PWLE	JGE	1	1		1

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

СО	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	<b>Consultation</b>	<b>Committee:</b>
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Sr.	Name	Designation	Institute/Organisation
NO			
1	Neelamkumar R. Sawant	State Head Technical Services for	JSW Cement ltd. Mumbai
		(Maharashtra and Goa)	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,

Head of Department Department of Sci. & Humanities

Department of Sci. & Humanities

I/C, Curriculum Development Cell

Principal

1960

EST

Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course Code: IS19204				Course Title: Electronic Measurement and Instruments						
Compul	Compulsory / Optional: Compulsory									
Teaching Scheme and Credits				Examination Scheme						
L	Р	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.

Cours	coutcomes. Student should be use 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 Outcomes: Student should be able to

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

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

#### 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				
1	1	CO1	Use Wheatstone bridge to determine unknown resistance.	02			
2	2	CO2	Identify the parts of PMMC analog multimeter and perform	02			

 ${}^{Page}2$ 

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

#### **E-References:**

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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	1	-	3	-	-	1	2	-
CO2	2	-	-	2	-	-	2	2	-
CO3	2	-	-	2	I VITE	-	2	2	1
CO4	2	-	-	3	ST LEC	10	2	2	1

#### CO Vs PO and CO Vs PSO Mapping

#### **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: Bas					e: Basics	of Elect	ronics E	ngineeri	ing	
Compul	Compulsory / Optional: Compulsory									
Teaching Scheme and Credits Examination Scheme										
L	Р	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	Concomes. 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 Outcomes: Student should be able to

Unit No		Topics / Sub-topics								
	Semiconductor Diodes:									
1	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.								
	Cou	rse Outcome: CO1 Teaching Hours : 07 hrs Marks: 10 (R-4 , U-6, A-0)								
	Dio	de 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								
2		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)					
	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	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)					
	Field Effect I ransistor:					
	4.1 Symbol, Construction, working and characteristics of JFET (N-channel and P-channel)					
	and MOSFEI (Depletion and enhancement Type).					
4	4.2 FET Blashig: Fixed, Self-blas, Voltage divider blas.					
	4.5 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)					
	Passive Filters and Regulated Power supply:					
	5.1 Types of Filters: Waveform and working of Shunt Capacitor, series Inductor and II filter.					
	5.2 Block diagram of DC regulated power supply.					
5	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.					
	ANOW/ EDGE					
	Course Outcome:CO4 Teaching Hours :08hrs Marks:12 (R-2, U-4, A-6)					

#### Suggested Specifications Table (Theory):

Unit		Distribution of Theory Marks					
No	Topic Title	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		

Sr. No.	Unit No	COs Title of the Experiments				
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 $\pi$ 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 6						

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

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.	Title	Author, Publisher, Edition	ISBN
No.		and	
		Year Of publication	
1	Electronic Devices and	Boylestad Robert, Louis Nashelsky	9789332542600
	Circuit Theory	Pearson Education, 2015	
		11 <sup>th</sup> edition	
2	A Text book of Applied	Sedha R. S.	9788121927833
	Electronics	S. Chand Publications 2008	
		3 <sup>rd</sup> edition	
3	Electronics Principles	Malvino Albert, David bates	9780070634244
		McGraw Hill Education2017	
		7 <sup>th</sup> edition	
4	Principles of Electronics	Mehta V.K.	9788121917230
		S. Chand and Company 2014	
		7 <sup>th</sup> edition	
5	Basic Electronic	Baru V., Kaduskar R. Gaikwad S.T.	9789350040126
	Engineering	Dreamtech Press 2011	
		7 <sup>th</sup> edition	

#### **E-References:**

- 1. https://www.youtube.com/ "type name of topics"
- 2. <u>http://vlabs.iitkgp.ernet.in/be/#</u>
- 3. https://www.electronicshub.org/
- 4. <u>https://www.allaboutcircuits.com</u>
- 5. https://www.slideshare.net/babaiarup3/basic-electronics-20135927

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6. https://en.wikipedia.org/wiki/"type name of topic"

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

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#### CO Vs PO and CO Vs PSO Mapping

Sr. No	Name	Designation	Institute/Organisation
1	Mr. S. K. Kamble	Proprietor	Saitronics Pvt. Ltd. Kamothe
2	Mrs. A.J. Barbole	Lecturer in Electronic	Govt. Polytechnic, Thane
3	Mr. F.S.Bagwan	Lecturer in instrumentation Engg.	Govt. Polytechnic, Mumbai
4	Mrs. S.T.Shinde	Lecturer in instrumentation Engg.	Govt. Polytechnic, Mumbai

**Industry Consultation Committee:** 



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1960

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Instrumentation Engineering (Sandwich Pattern)										
Course	Course Code: EE19206 Course Title: Fundamentals of Electrical Engineering									
Compulsory / Optional: Compulsory										
Teachin	Teaching Scheme and Credits Examination Scheme									
L	Р	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.

Basic Concepts:           1.1 Electric Current: Definition, Direction of current, unit, Electric potential, potential difference, Concept of EMF and Potential difference.	Topics / Sub-topics								
1.2 Resistance: Definition, unit, Factors on which resistance depends. Effect of temperature	e								
<ul> <li>on resistance. <i>(simple numerical)</i></li> <li>1.3 Conductance, Ohms Law.</li> </ul>	-								
<ul> <li>1 1.4 Electric power and energy concept and unit. <i>(simple numerical)</i></li> <li>1.5 Measurement of voltage, current, power and energy.</li> </ul>									
1.6 Effects of Electric Current: Heating Effect, Magnetic Effect and Chemical Effect. (On Introduction)	y								
Course Outcome: CO1 Teaching Hours :07 hrs Marks: 10 (R-4, U-2, A-4									

	DC Circuits:						
	2.1 Introduction to concept.						
	2.2 DC series circuit: Concept, Equation for equivalent resistance connected in series, main characteristics, advantages, disadvantage, and application of series circuit.						
	2.3 DC Parallel circuit: Concept, Equation for equivalent resistance connected in parallel, main Characteristics, advantages, application of Parallel circuit, Current divider rule.						
2	2.4 Series parallel circuit, Application of series parallel circuit.(simple numerical)						
	2.5 Definition of: Circuit, Parameter, Liner circuit, Nonlinear circuit, Bilateral circuit, Unilateral circuit, Electric network, Passive-Network, Active network, Node, Branch, Loop, Mesh.						
	2.6 Kirchhoff's current law, Kirchhoff's voltage law, signs convention.						
	(simple numerical limited up to two variables on above)						
	Course Outcome: CO2 Teaching Hours: 07 hrs Marks: 10 (R-2, U-4, A-4)						
	DC Network theorem:						
	3.1 Network Analysis: Direct method, Network reduction method.						
	3.2 Statement, Explanation, and simple Numerical on following theorem.						
	1. Mesh/Loop analysis						
	11. Nodal analysis						
3	111. Superposition theorem.						
	iv. Inevenin's theorem.						
	v. Norton's theorem.						
	vi. Maximum rower fransier frieorem.						
	Course Outcome: CO3 Teaching Hours :07 hrs Marks : 12 (R-2, U-6, A-4)						
	AC Fundamentals: 4.1 Difference between AC and DC quantity. Advantages of AC Over DC.						
	4.2 Generation of A.C. Voltage and current. Mathematical Expression of alternating quantity & its derivation.						
	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> )						
	4.4 Phase, Phase difference, Phasor representation of sinusoidal quantities						
4	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						
	4.6 and capacitive reactance.						
	4.7 Circuit diagram, phasor diagram and wave form of a.c. circuits						
	4.8 RL, RC and RLC circuit. Impedance and Impedance Triangle. (simple numerical)						
	4.9 Active power, Reactive power and apparent power.						
	4.10 Power factor and its significance						
	Course Outcome: CO4 Teaching Hours:10 hrs Marks:10 (R- 0, U-4 A-6)						

	Polyphase Circuits:5.1 Difference between single phase and polyphase system, Generation of three-phase							
5	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: CO5Teaching Hours:06 hrsMarks:10 (R- 2, U-4 A-4)							
	<ul><li>Electrical wiring:</li><li>6.1 Types of wiring for Domestic Installation: Conduit, Casing and Capping and Concealed (brief information and application)</li></ul>							
	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	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.							
	Sel Sel S							
	Course Outcome: CO6 Teaching Hours :08 hrs Marks: 8 (R-2, U-4, A-2)							

#### Suggested Specifications Table (Theory):

Unit No	Tonio Titlo	Teaching Hours	Distribution of Theory Marks				
	Topic Title		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	

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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	CO5 Verify relationship between line and phase values of voltage and current in star and delta connected balanced load					
6	6	CO6	Prepare extension board with three pin sockets.					
7	2	CO2	Verify Kirchhoff's current & voltage laws.					
8	3	CO3	Verify Thevenin's theorem and Norton's theorem applicable to D.C. circuit					
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	CO6 Identify different types of wires and accessories switch, fuse, socket outlet used in wiring and write their rating					
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				

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

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



#### **E-References:**

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

#### CO Vs PO and CO Vs PSO Mapping

СО	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	-	10	2	2	49.TV/~	2	3	-

#### Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Kuldeep Singh	Deputy Executive Engineer	400KV RSOM, Kharghar,
	Rajput		Navi Mumbai
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

Progran	Programme : Diploma in Instrumentation Engineering									
Course Code:IS19 310				Course Title	e: Inkscape	2				
Compu	Compulsory / Optional: Compulsory									
Teaching Scheme and Credits			l Credits			Examina	tion Scl	heme		
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

CONTRACTOR OF

	Topics / Sub-topics
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
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.
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
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
5.	Layers and Boolean operations
	Outline: *Layers and layer pallette *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 .
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
7.	Create and Format Text
	Outline: - Inserting text - Formatting text - Aligning text - Spacing and bullet - Making a simple
	flyer
8.	Text tool features
	Outline: -Manual kerning -Horizontal kerning -Vertical shift -Character rotation -Spell check -
	Superscript -Subscript
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
10.	Text Manipulation



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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