

Government Polytechnic Mumbai

Department of Instrumentation Engineering

P-19R Curriculum

Semester- II

(Course Contents)

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme
(P19R)With effect from AY 2022-23

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 | | | | |
| SC19R110 | Engineering Mathematics | 4 | -- | -- | 4 | 4 | 60 | 20 | 20 | -- | -- | -- | 100 |
| SC19R106 | Applied Chemistry | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 25* | -- | 25 | 150 |
| IS19R204 | Electronic Measurement and Instruments | 3 | 2 | -- | 5 | 5 | -- | -- | -- | 50* | -- | 25 | 75 |
| IS19R206 | Basics of Electronics Engineering | 3 | 4 | -- | 7 | 7 | 60 | 20 | 20 | 50 | -- | 25 | 175 |
| EE19R206 | Fundamental of Electrical Engineering | 3 | 2 | -- | 5 | 5 | 60 | 20 | 20 | 50 | -- | 25 | 175 |
| UV19R102 | Universal Human Values- II | -- | -- | -- | --- | 2 | --- | --- | --- | --- | -- | --- | --- |
| IS19R311 | Inkscape (Spoken Tutorial) | -- | 4# | -- | 4# | 4 | -- | -- | -- | -- | -- | -- | -- |
| | Total | 16 | 14 | -- | 30 | 32 | 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: SC19R110 | | | | 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 | <p>Function</p> <p>1.1 Definition of variable, constant, intervals such as open, closed, semi-open etc</p> <p>1.2 Definition of function, value of function and types of functions and simple examples</p> <p>Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R- 4, U-4, A-2)</p> |
| 2 | <p>Limits</p> <p>2.1 Definition of neighbourhood, concept and definition of limit</p> <p>2.2 Limits of Algebraic function</p> <p>2.3 Limits of Trigonometric Functions with simple examples</p> <p>Course Outcome:CO1 Teaching Hours:10 hrs Marks: 10 (R- 2 , U-4 , A-4)</p> |
| 3 | <p>Derivatives & Application of derivative</p> <p>3.1 Definition of the derivative.</p> <p>3.2 Derivatives of standard function.(No proof by first principle)</p> |

| | |
|---|--|
| | <p>3.3 Differentiation of sum, difference, product and quotient of two or more functions 3.4 Differentiation of composite function with simple example. 3.5 Second order derivative. 3.6 Geometrical Meaning of Derivative 3.7 Tangents & Normals to the curve, 3.8 Maxima & minima of the function 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 4.1 Definition of integration as antiderivative ,Integration of standard function 4.2 Rules of integration(Integration of sum, difference, scalar multiplication) without proof 4.3 Integration by substitution 4.4 Integration of composite function 4.5 Definition of definite integral 4.6 Properties of definite integral with simple problems 4.7 Area under the curve 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:- 5.1 Definition of complex number Cartesian ,Polar ,Exponential form of complex number 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 6.1 Solution of Algebraic equations using – i) Bisectional method ii) Regular – Falsi method iii) Newton- Raphson method 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: SC19R106 | | | | 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

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

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| | <p>1.7 Distinction between electrovalent and covalent compound.</p> <p>Course Outcome: CO1 Teaching Hours : 7 hrs Marks: 10 (R- 2, U-4, A-4)</p> |
| 2 | <p>Electrochemistry</p> <p>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.</p> <p>2.2 Terms related to Electrolysis Mechanism of electrolysis. Examples of: mechanism of Electrolysis of CuSO_4 by using Cu electrodes.</p> <p>2.3 Faradays First law and its mathematical derivation. Faradays second law & its mathematical derivation, Numerical based on laws of Faraday.</p> <p>2.4 Application of Electrolysis: Electroplating, Electrorefining.</p> <p>Course Outcome: CO2 Teaching Hours : 7 hrs Marks: 10 (R- 4, U-4 , A-2)</p> |
| 3 | <p>Cells And Batteries</p> <p>3.1 Conductor: Definition, types (metallic, electrolytic), Difference between them.</p> <p>3.2 Ohms law, Charging and discharging of cells, Closed circuit voltage, Open circuit voltage, Electrochemical couple, Separator, Electromotive force (E.M.F)</p> <p>3.3 Cells: Definition, types (Electrolytic and Electrochemical), difference between them.</p> <p>3.4 Classification of Electrochemical cell (primary and Secondary) Definition and Difference between them.</p> <p>3.5 Primary cells: Lachlance cell, Dry cell, Daniel cell</p> <p>3.6 Secondary cell : Lead acid storage cell or battery, Nickel cadmium cell or battery</p> <p>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.</p> <p>Course Outcome: CO2 Teaching Hours : 7 hrs Marks: 10 (R- 4 , U-4 , A-2)</p> |
| 4 | <p>Corrosion</p> <p>4.1 Definition of corrosion. Types of corrosion . Atmospheric & Electrochemical Corrosion.</p> <p>4.2 Mechanism of atmospheric corrosion, types of oxide film formed, (stable, unstable, volatile, with examples).</p> <p>4.3 Electrochemical corrosion/immersed corrosion Definition. Example. Factors Affecting , Atmospheric & Electrochemical Corrosion.</p> <p>4.4 Protection of metals from Corrosion:- By protective coatings a) organic coating (Paints and Varnishes), b) inorganic coating (Metallic Coating).</p> <p>4.5 Different methods of Protective metallic coatings.</p> <p>A) Hot dipping (Galvanizing & Tinning)</p> <p>b) Sherardizing c) Metal Spraying</p> <p>Course Outcome: CO3 Teaching Hours : 6 hrs Marks: 10 (R-2, U-4 , A-4)</p> |
| 5 | <p>Lubricants</p> <p>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.</p> <p>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.</p> <p>5.3 Characteristic of good lubricant</p> <p>A) Physical Characteristics</p> <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, . Preperation, Properties & uses Glass wool. Definition, .Preperation, Properties & uses</p> <p>Alloys</p> <p>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 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:

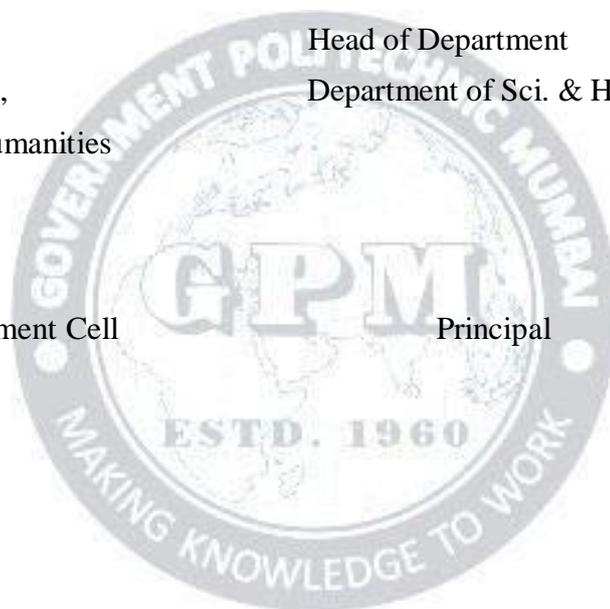
| Sr. No | Name | Designation | Institute/Organisation |
|--------|-----------------------|---|------------------------------------|
| 1 | Neelamkumar R. Sawant | State Head Technical Services for (Maharashtra and Goa) | JSW Cement ltd. Mumbai Head Office |
| 2 | Mrs. Vaishali Gokhale | Lecturer in Chemistry | 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: IS19R204 | | | | 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 | <p>Fundamentals of Measurements and Bridges:</p> <p>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</p> <p>Course Outcome: CO1</p> |
| 2 | <p>Analog DC and AC Meters:</p> <p>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> |

| | |
|---|--|
| | <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 |

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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,
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Department of Instrumentation Engg.

I/C, Curriculum Development Cell

Principal

| | | | | | | | | | | |
|--|---|----|-------|---|---------------|--------------|----|----|----|-------|
| Programme : Diploma in Instrumentation Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: IS19R206 | | | | 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 | <p>Semiconductor Diodes:</p> <p>1.1 Classification of component on the basis of energy band theory and effect of Temperature.</p> <p>1.2 Different types of Semiconductor and their materials. P-type and N-type Semiconductors.</p> <p>1.3 Symbol, Construction, working principle, Forward and Reverse Biasing, V-I Characteristics and applications of: PN junction diode, Zener diode, LED , Photo diode.</p> <p>Course Outcome: CO1 Teaching Hours : 07 hrs Marks: 10 (R-4 , U-6, A-0)</p> |
| 2 | <p>Diode applications:</p> <p>2.1 Types of rectifier: Circuit, waveform and working of Half Wave, Full Wave Rectifier (Bridge and Center tapped).</p> <p>2.2 Parameters of rectifier: Average DC value of current and voltage, ripple factor, ripple frequency, PIV of diode, TUF, efficiency of rectifier.</p> <p>2.3 Diode as clipper and clamper:</p> <p>2.3.1 Circuit diagram, waveform and working of positive, negative and biased clippers.</p> <p>2.3.2 Circuit diagram, waveform and working of positive, negative and biased clampers.</p> <p>2.4 Applications of LED: power indicator, seven segment display.</p> |

| | |
|---|---|
| | 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 |

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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:

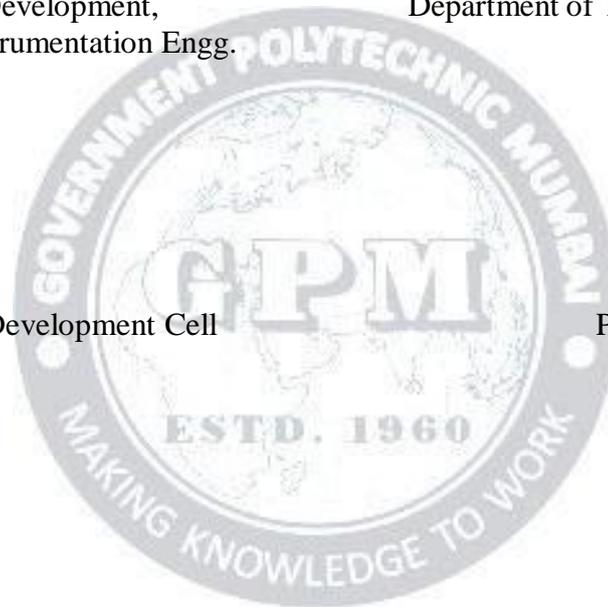
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| 3 | Mr. F.S.Bagwan | Lecturer in instrumentation Engg. | Govt. Polytechnic, Mumbai |
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I/C, Curriculum Development Cell

Principal



| | | | | | | | | | | |
|--|---|----|-------|--|---------------|--------------|----|----|----|-------|
| Programme : Diploma in Instrumentation Engineering (Sandwich Pattern) | | | | | | | | | | |
| Course Code: EE19R206 | | | | 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 | Identify different types of transformer & its working. |
| 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 Kirchoff's current law, Kirchoff'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> <p>i. Mesh/Loop analysis</p> <p>ii. Nodal analysis</p> <p>iii. Superposition theorem.</p> <p>iv. Thevenin's theorem.</p> <p>v. Norton's theorem.</p> <p>vi. Maximum Power Transfer Theorem.</p> <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>4.11 Difference between single phase and polyphase system, Generation of three-phase a.c. supply, Advantages of three-phase supply over single-phase supply.</p> <p>Course Outcome: CO4 Teaching Hours:14 hrs Marks:12 (R- 2, U-4 A-6)</p> |

| | |
|---|---|
| 5 | <p>Transformer:</p> <p>5.1 Construction: Shell, Core, Step up , Step down , Specifications & working principle of Transformer.</p> <p>5.2 Transformer losses.</p> <p>5.3 Single phase Transformer Testing: O.C & S.C test, direct loading test on transformer.</p> <p>5.4 Efficiency, regulation and rating of transformer.</p> <p>5.5 Auto Transformer advantages, disadvantages and applications.</p> <p>5.6 Instrument transformer types and use: Current Transformer & Voltage or Potential Transformer.</p> <p>5.7 Three phase transformer – Types of connections and applications.</p> |
| <p>Course Outcome: CO5 Teaching Hours: 05Hrs. Marks: 08 (R- 2, U-4 , A- 2)</p> | |
| 6 | <p>Electrical wiring:</p> <p>6.1 Types of wiring for Domestic Installation: Conduit, Casing and Capping and Concealed (brief information and application)</p> <p>6.2 Concept of lighting circuit and power circuit.</p> <p>6.3 Electric wiring - wiring accessories, switches, sockets, ICDP, ICTP, Ratings of Wires, switches, sockets used for lighting and power circuit.</p> <p>6.4 Fuses, importance and types for domestic applications. MCB, their ratings for domestic applications.</p> <p>6.5 One lamp controlled by one switch. Staircase wiring.</p> <p>6.6 Earthing, necessity and types.</p> <p>6.7 Safety precautions in electrical indoor & outdoor installations.</p> |
| <p>Course Outcome: CO6 Teaching Hours :05 hrs Marks: 8 (R- 2 , U-4 , A- 2)</p> | |

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 | 14 | 2 | 4 | 6 | 12 |
| 5 | Transformer | 05 | 2 | 4 | 2 | 8 |
| 6 | Electrical wiring | 05 | 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 | Perform OC and SC test on transformer and find copper and iron losses. | 04 |
| 6 | 6 | CO6 | Prepare extension board with three pin sockets. | 04 |
| 7 | 2 | CO2 | Verify Kirchoff'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 | 5 | CO5 | Perform direct load test on Transformer & find efficiency, regulation of Transformer | 04 |
| 11 | 6 | CO6 | Identify different types of wires and accessories switch, fuse, socket outlet used in wiring and write their rating | 04 |
| 12 | 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 |

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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:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------------|--|-------------------------------------|
| 1 | Mr. B.B.Sul | HOD IS | Govt.Polytechnic Mumbai |
| 2 | Mr.M.K.Kulkarni | Lecturer in Instrumentation Engineering | Govt.Polytechnic Mumbai |
| 3 | Mr. Santosh Kamble | Director | Saitronics Pvt. Ltd.Kamothe |
| 4 | Mr. Shakti Kumar Shiledar | Assistant Professor in Instrumentation Engineering | Govt. Engineering College Ratnagiri |

Coordinator,
Curriculum Development,
Department of Electrical Engineering

Head of Department
Department of Electrical Engineering

| Programme : Diploma in ME/CE/EE/CO/IF/IS/EC/RT/LT/LG (Sandwich Pattern), AIML | | | | | | | | | | |
|--|----|----|----------------|---|------------|-----------|----|----|----|-------|
| Course Code: UV19R102 | | | | Course Title: Universal Human Values-II | | | | | | |
| Compulsory / Optional: Compulsory | | | | | | | | | | |
| Teaching Scheme and Credits | | | | Examination Scheme | | | | | | |
| L | P | TU | Total (Credit) | TH (2 Hrs 30min) | TS1 (1 Hr) | TS2 (1Hr) | PR | OR | TW | Total |
| -- | -- | - | 02 | - | - | - | -- | -- | -- | -- |

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 tests are to be conducted. First skill test at mid-term and second skill test at the end of the term.

Rationale:

Universal Human Values-I course helped students to discover themselves and comfortably connect with their peers. Students experienced living in harmony with nature by visiting a nature park and participating in activities like tree plantation, beach cleaning and institute cleaning.

Universal Human Values-II course is more focused on helping students to create health consciousness and experience living in harmony with their bodies. It will help to create a holistic perspective based on self-exploration about themselves, family, society and nature.

Interactions with underprivileged sections of society will help to inculcate values like empathy, accountability and social gratitude. Patriotic values will be imbibed by learning about the constitution of India. Through experiential learning, an ideal personality will be developed to excel in the field of work. It is the journey of thought process from 'my family' to 'world family'.

Course Outcomes: On completion of this course, student should be able to

| | |
|-----|---|
| CO1 | Develop empathy for others. |
| CO2 | Understand and appreciate duties and civic responsibilities. |
| CO3 | Develop health consciousness |
| CO4 | Develop respect and recognition for others work. |
| CO5 | Understand the importance of living in harmony with nature and society. |

Course Content Details:

| Sr. No | Activity | Related Value/s | Methodology of Implementation | Student's Role | Mentor's role | Resources Required |
|---------------|---|--|---|--|--|---|
| 01 | Essay writing i) Role of engineer in development of nation ii) Global warming and its remedies iii) My favorite book iv) Bad and good of social media v) My best friend Mentor can add more essay topics related to mentioned values. | Social gratitude, Harmony in behavior, Accountability | Selecting a topic from the list and writing an essay on it | Thoughtfully write the essay on a selected topic. | Display the best essays on the notice board. | Notice board, panel of judges |
| 02 | Visiting under-privileged children of less or same age group - understand their life, difficulties, compare with your life, 'give' them what you can i) Blind school ii) Slums iii) Physically handicapped schools iv) Adiwasi pada | Empathy Compassion Accountability Joy of Giving Social Gratitude | Students to arrange visit under supervision of mentor. Identify and impart technical skills needed to improve their lives. | Interact with the children, Observe their life pattern. Make them aware about technologies used in daily life. | Verify the visit plan and arrangements done by students see that discipline and safety is maintained during visit. | Traveling facilities, food and sufficient drinking water |
| 03 | Read preamble of constitution and list down duties and responsibilities of a citizen | Patriotism Integrity Loyalty Harmony Righteousness | Read preamble of constitution of India from internet website | Brainstorm to understand importance of preamble. | Motivate students to present different stories related to Indian constitution | https://www.constitutionofindia.net/constitution_of_india/preamble |
| 04 | To visit war memorial/ Hutatma smarak in city | Patriotism Respect | Students to arrange activity under supervision of mentor | List available war memorial/ Hutatma smarak in nearby area | Scrutinize and monitor the visit plan made by students | Traveling facilities, food and sufficient drinking water |
| 05 | Prepare your own SWOT Analysis | Self-exploration, Honesty | Analysis and report writing | Thoughtfully analyze self | Explain process of SWOT analysis | Case studies |

| | | | | | | |
|----|---|-----------------------------|---|---|---|---|
| 06 | Student will prepare a diet chart, analyze food consumption habit-List food consumed during last 3 days and identify its nutritional effects on body | Health consciousness | Balanced diet chart preparation | Find out the ways to maintain balanced diet chart | Provide information resources | Internet websites, Professional dietician |
| 07 | Identify 5 personalities from the areas like sports, defence, politics,, businesses and social work who have demonstrated great spirit of integrity in their life and write a report. e.g. Rajendra singh - Water man of india, Dr. A P J Abdul kalam - scientist and former president of india. Mohammed Yunus - Bangladeshi social entrepreneur, Kapil Dev -Cricketer of the century. David Packard - Chairman of Hewlett-Packard (HP) | Integrity , respect | Information collection and analysis | Identify personalities and study their extraordinary work | Guide students to identify various dimensions of the personality | Internet websites, Institute Library |
| 08 | Spend an hour with the local municipal corporation disaster management cell. | Recognition of others' work | Visit disaster management cell of local municipal corporation in groups | Interact with the officers and staff | Distribute different groups of students in different local municipal corporations | List of local municipal corporations |
| 09 | Spend a day in a local housing society to spread awareness about efficient use of energy while using elevators and home appliances as well as during transportation | Environment Conservation | Interaction with society residents and office bearers | Identify local housing society, interact with people and write report | Make students aware about energy audit | Energy auditor |

| | | | | | | |
|-----------|--|---|---|--|--|---------------------------|
| 10 | Study the Sustainable Development Goals of the United Nations for peace and prosperity of people and the planet, now and into the future by visiting the following website: https://sdgs.un.org/goals | Social Gratitude, Empathy, Compassion, Accountability | Visit the website, study history and List 17 sdgs | Study the sdg in detail (assigned to your group by mentor), prepare presentation | Assign 17 sdgs to different groups of students | Local NGOs working for UN |
|-----------|--|---|---|--|--|---------------------------|

Methodology:

1. The course is Non Examination, Credit Course.
2. The course will be introduced during the student induction programme (orientation programme) of one week duration. Most of the activities are to be completed during induction programme and to be continued throughout the term during SCA hours under the guidance of mentor.
3. The mentor will be assigned to the student for a group of 20 students each.
4. In consultation and under supervision of a mentor, the student/ Group of students has to complete the activity.
5. Activities no.2, 7, 8 and 10 can be performed in collaboration with related government organizations or industries (under CSR activity).
6. All events will be organized and managed by students. The mentor will work as a facilitator/ advisor.
7. The strategies to learn the course is "Self- Exploratory" and "Experiential Learning"
8. The onus of responsibility for completing the activities is with students.
9. The student has to complete at least **five** no. of activities throughout the term to earn the credits.

References/ Books:

| Sr. No. | Title | Author, Publisher, Edition and Year Of publication | ISBN |
|---------|--|--|-------------------|
| 1 | A Foundation Course in Human Values and Professional Ethics | R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010 | 978-8-174-46781-2 |
| 2 | Human Values | A.N. Tripathy, New Age International Publishers, 2003 | 978-8-122-42589-5 |
| 3 | Teacher's Manual - A Foundation Course in Human Values and Professional Ethics | R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, New Delhi, 2010 | - |
| 4 | Science and Humanism, Towards a Unified World View | PL Dhar, RR Gaur, Commonwealth Publications, 1992 | 978-8-171-69222-4 |
| 5 | Education for values in schools- a framework | NCERT | |
| 6 | Value oriented education | E N Gawande | |

E-References:

- 1) https://youtu.be/kOJu1vj_BVk (The 10 Most Important Human Values)
- 2) Dr. Prakash Baba Amte- Movie
- 3) <https://youtu.be/QeogOlzG2ls> (Value of Education -short film)
- 4) https://www.constitutionofindia.net/constitution_of_india/preamble
- 5) <https://slidemodel.com/personal-swot-analysis-quick-guide/>
- 6) <https://possible.in/balanced-diet-chart.html>

E-References for mentors:

- 1) <https://www.edutopia.org/>
- 2) <https://sdgs.un.org/goals>

Consultation Committee:

| Sr. No | Name | Designation | Institute/Organisation |
|--------|---------------------------|---|--------------------------------|
| 1 | Dr. L.A. Patil | Principal (Retired) | Pratap College, Amalner |
| 2 | Dr. Nitin Deshpande | Lead Consultant | Dnyanpeeth Academy, Pune |
| 3 | Dr. Chandrakant Shahasane | Founder Trustee | Karnala Charitable Trust, Pune |
| 4 | Mr. Sunil V. Joshi | Ex- Sr. Lecturer, Mechanical Engineering, | Government Polytechnic, Mumbai |
| 5 | Mrs. Swati D. Deshpande | Ex-Principal | Government Polytechnic, Mumbai |
| 6 | Mr. U.A. Agnihotri | Lecturer, Mechanical Engineering | Government Polytechnic, Mumbai |
| 7 | Mr. K. V. Patil | Lecturer, Mechanical Engineering | Government Polytechnic, Mumbai |

Institute Coordinator,
Curriculum Development,

Principal
Government Polytechnic, Mumbai

| | | | | | | | | | | |
|---|----|----|-------|------------------------|---------------|--------------|----|----|----|-------|
| Programme : Diploma in Instrumentation Engineering | | | | | | | | | | |
| Course Code:IS19R 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 | -- | -- | -- | -- | -- | -- | -- |

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 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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Curriculum Development,
Department of Instrumentation

Head of Department
Department of Instrumentation

I/C, Curriculum Development Cell

Principal