

**MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION, MUMBAI**  
**TEACHING AND EXAMINATION SCHEME FOR POST S.S.C. DIPLOMA COURSES**  
**COURSE NAME : DIPLOMA IN CIVIL/ELECTRICAL/MECHANICAL/COMPUTER/ELECTRONICS & TELECOMMUNICATION ENGINEERING**  
**COURSE CODE : CC/EC/MC/GC/XC**  
**DURATION OF COURSE : 8 SEMESTERS**  
**WITH EFFECT FROM 2013-14**  
**SEMESTER : FIRST**  
**DURATION : 16 WEEKS**  
**PATTERN : CORRESPONDANCE - SEMESTER**  
**SCHEME : G**

SR. NO	SUBJECT TITLE	Abbrviation	SUB CODE	TEACHING SCHEME				EXAMINATION SCHEME								
				TH	TU	PR	PAPER HRS	TH (1)		PR (4)		OR (8)		TW (9)		SW (17901)
1	English	ENG	17911	07	01	08	03	100	40	--	--	--	--	25@	10	
2 *	Basic Science	Physics	17912	07	01	20	02	50	40	25@	50	20	--	--	--	
		Chemistry	17913	07	01	20	02	50	40	25@	50	20	--	--	--	50
3	Basic Mathematics	BMS	17914	07	01	--	03	100	40	--	--	--	--	--	--	
4	Engineering Graphics	EGG	17915	08	--	40	--	--	--	50#	20	--	--	25@	10	
<b>TOTAL</b>				<b>36</b>	<b>04</b>	<b>88</b>	<b>--</b>	<b>300</b>	<b>--</b>	<b>100</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>50</b>	<b>--</b>	<b>50</b>

**TOTAL CONTACT HOURS DURING RESIDENT SESSION: 128 HRS [16 days \* 8 hrs per day]**

**Theory and practical periods of 60 minutes each. Total Marks : 500**

@ Internal Assessment, # External Assessment, ## On Line Examination, [REDACTED] No Theory Examination.

Abbreviations: TH-Theory, TU- Tutorial, PR-Practical, OR-Oral, TW- Term work, SW- Sessional Work

**NOTE:**

- HOURS MARKED BY \* FOR INTERNAL PRACTICAL EXAMINATION TO BE CONDUCTED AT RESIDENT SESSION.
- ONE TEST OF 25 MARKS TO BE CONDUCTED AT RESIDENT SESSION AND MARKS TO BE SUBMITTED TO GPDL PUNE.
- 240 HOURS FOR SELF STUDY AT HOME.
- ALL PRACTICALS/ORAL EXAMS [EXTERNAL ASSESSMENT INDICATED BY #] TO BE CONDUCTED AT EXAM CENTRE.
- ORAL EXAMINATION [INTERNAL ASSESSMENT @] TO BE CONDUCTED AT EXAM CENTRE.
- INTERNAL ASSESSMENT @ OF TERM WORK WILL BE DONE AT RESIDENT SESSION.

\* Basic Science is divided into two parts- Basic Physics and Basic Chemistry. Theory examination of both parts as well as practical examination of both parts will be conducted on separate days. Sum of theory marks of both parts shall be considered for passing theory examination of Basic Science. Similarly it is also applicable to practical examination. It is mandatory to appear theory and practical examination of both parts. Remaining absent in any examination of any part will not be declared successful for that examination head.

\* Candidate remaining absent in examination of any one part of Basic Science subject i.e. Physics, Chemistry will be declare as Absent in Maharashtra State Board of Technical Education. The marks of the part for which candidate was present will not be processed or carried forward.



Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme						
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	01	03	100	--	--	25@	125

NOTE:

- > Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- > Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

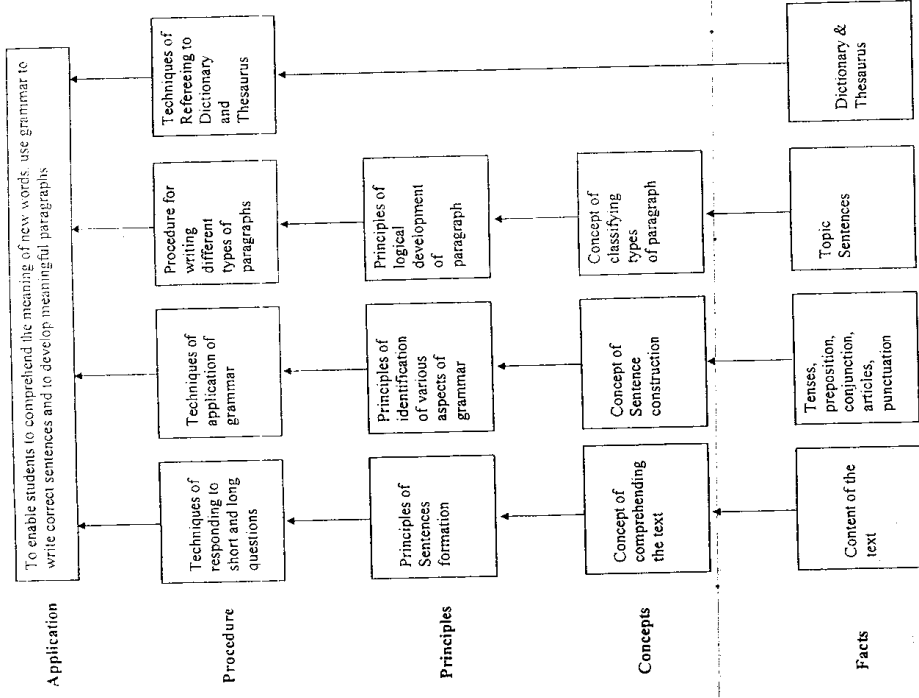
The most commonly used medium to express oneself is language. English, being a global language, is used in all the spheres of human life i.e., personal, professional and social. A diploma student is expected to be proficient in English language and pursue the existing course of study to handle the future jobs. The content of the text includes the aspects related to language skills.

General Objectives:

Students will be able to:

1. Develop vocabulary.
2. Apply the rules of grammar.
3. Comprehend the given unseen passage.

Learning Structure:



Name of the Topic	Hours	Marks
<p><b>UNIT: Theory</b></p> <p><b>RT I - Application of Grammar</b></p> <p><b>Specific Objective:</b></p> <ul style="list-style-type: none"> <li>Apply grammatical rules to form correct sentences.</li> </ul> <p><b>Intents:</b></p> <ul style="list-style-type: none"> <li>Articles: Appropriate use of definite and indefinite Articles</li> <li>Prepositions: To use correct Prepositions as per context</li> <li>Conjunctions: Co-ordinating and sub-ordinating Conjunctions</li> <li>Tenses: Correct usages of past, present and future tenses</li> <li>Active and Passive voice: Use of Active and Passive voice</li> <li>Direct and Indirect sentences: Conversion of direct into indirect sentence and vice versa</li> </ul> <p><b>RT II - Text</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>Answer the questions based on the articles</li> <li>State the meanings of the given words from the articles</li> </ul> <p><b>Intents:</b></p> <ul style="list-style-type: none"> <li>Articles</li> </ul> <p><b>RT III - Paragraph Writing</b></p> <p><b>Specific Objective:</b></p> <ul style="list-style-type: none"> <li>Write a paragraph on a given topic</li> </ul> <p><b>Intents:</b></p> <ul style="list-style-type: none"> <li>Paragraph Writing: Elaborate and expand the ideas with cohesion, coherence and use of correct punctuation marks</li> <li>Types of Paragraph: Narrative, Descriptive, Technical, Comparison and Contrast</li> <li>Dialogue Writing: Based on various situations</li> <li>Speech Writing based on situations: Welcome Speech, Farewell Speech, Vote of Thanks and Introducing a Guest</li> </ul> <p><b>RT IV - Comprehension</b></p> <p><b>Specific Objective:</b></p> <ul style="list-style-type: none"> <li>Comprehend and provide the answers on given passages</li> </ul> <p><b>Intents:</b></p> <ul style="list-style-type: none"> <li>Comprehension of Passage: Comprehending questions and writing the answers on unseen passages</li> </ul> <p><b>RT V. Vocabulary Building</b></p> <p><b>Specific Objective:</b></p> <ul style="list-style-type: none"> <li>Use correct words in given situations</li> </ul> <p><b>Intents:</b></p> <ul style="list-style-type: none"> <li>Words Often Confused</li> </ul>	<p>12</p> <p>20</p> <p>06</p> <p>04</p> <p>06</p>	<p>24</p> <p>32</p> <p>16</p> <p>12</p> <p>16</p>

Collocation	Prefix and Suffix	Synonyms and Antonyms	Total
			48
			100

**Skills to be developed in practicals:**  
**Intellectual Skills:**

- Select appropriate words/verbs and formulate correct sentences
- Develop ability of correct pronunciation
- Report writing skills

**Assignments:**

Journal consists of the following assignments -

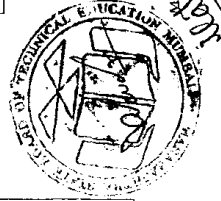
- Punctuate 25 sentences given by the teacher
- Rewrite the passage/passages with correct form of verbs. (Teacher is expected to give passage /passages of verbs used wrongly (at least 25 verbs )
- Write 15 synonyms and 15 antonyms with the help of the thesaurus
- Write a paragraph each on descriptive, narrative, comparison, contrast and technical type in 75 to 100 words.
- Write 10 words of prefixes and 10 words of suffixes and use them in sentences.
- Select one news from any English newspaper. The news may be from any one of the following areas - Social, environmental, financial, economics, sports, etc. Prepare a summary of the news and make it presentable by using relevant photographs/graphics.
- Students will be given ten collocations, develop three sentences for each collocation.

**NOTE: The following assignment should be performed in the Language Laboratory/with the help of interactive media.**

- Listen and practice the dialogues with the help of interactive media/ interactive software.

**Learning Resources:**

Sr. No.	Title	Author	Publisher
1	MSBTE TEXTBOOK	-----	MSBTE
2	ESSENTIAL ENGLISH GRAMMAR	RAYMOND MURPHY	CAMBRIDGE
3	HIGH SCHOOL ENGLISH GRAMMAR AND COMPOSITION	WREN AND MARTIN	S CHAND & CO



Course Name : Diploma in Civil / Electrical / Mechanical / Computer / Industrial Electronics  
/ Electronics & Telecommunication Engineering  
Course Code : CC/C1/CE/EC/EG/IL/MC/MG/GC/XC

Semester : First

Subject Title : Basic Science (Physics)

Subject Code : 17912

Teaching and Examination Scheme:

Teaching Scheme		Examination Scheme						
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
02	--	02	02	50	25@	--	--	75

**NOTE:**

- > Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- > Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).
- > Students should compulsory appear for Basic Science (Physics) & Basic Science (Chemistry) theory examination. There should be combined passing for the subject (40/100). Remaining absent in any examination of any part will not be declared successful for that examination head.
- > Students should compulsory appear for Basic Science (Physics) & Basic Science (Chemistry) practical examination. There should be combined passing for the subject (20/50). Remaining absent in any examination of any part will not be declared successful for that examination head.

**Rationale:**

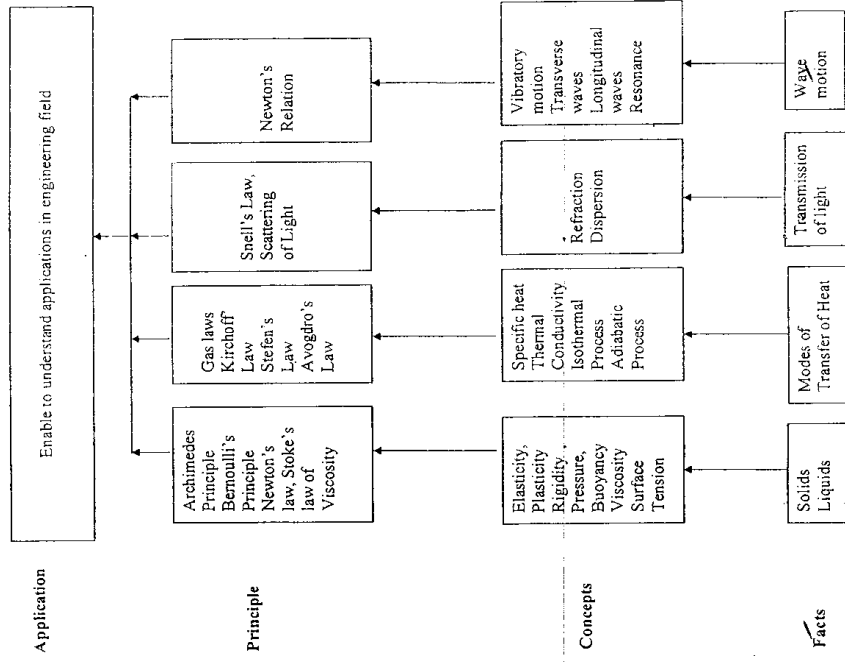
Physics is a foundation of all core technology subjects. Study of science and technology goes hand in hand. Technical knowledge can be gained more effectively using concepts of Physics. Curriculum of Engineering Physics includes fundamental concepts used in industrial applications. Study of various properties of matter is helpful in the study of Strength of Material, Fluid mechanics, Fluid power etc., and selection of lubricant for machine parts. Property of Surface tension is applicable in Paint industry and capillary phenomenon is useful in plumbing. Thermal properties of matter are applicable in study of various core technology subjects like Thermal Engineering, Heat Transfer etc. Optical phenomena such as refraction and dispersion are required in higher study as well as in industry such as in characterization of material using Spectroscopy, X-ray diffraction (XRD), Atomic Force Microscopy (AFM). Study of wave motion, Simple Harmonic Motion and their behavior is useful in field of Civil Engineering, Electronics & Communication Engineering, Mechanical Engineering and Electrical Engineering. Principle of Photocell and its applications are required in study of Solar cells, Photovoltaic cells.

**General Objectives:** Student will be able to:

- 1. Understand method of selection of material for intended purpose.

- 2. Apply knowledge of good and bad conductors of heat in various engineering concepts
- 3. Know the effect of interference between light waves.
- 4. Apply knowledge of characteristics of wave motion and resonance in engineering applications.
- 5. Apply Concept of photoelectric effect for applications like photovoltaic cell, Solar cell

**Learning Structure:**



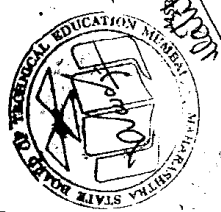
Topic and Contents	Hours	Marks
<p><b>Topic 1] Properties of solids:</b></p> <p><b>Specific Objectives:</b></p> <ul style="list-style-type: none"> <li>Calculate the Young's Modulus of material of wire.</li> <li>Elasticity: Definitions of deforming force, restoring force, elasticity, plasticity, Factors affecting elasticity.</li> <li>Stresses: Tensile, Compressive, Volumetric and Shear stress,</li> <li>Strains: Tensile, Volumetric and Shear strain.</li> <li>Elastic limit, Hooke's law.</li> <li>Elastic co-efficient- Young's modulus, bulk modulus, modulus of rigidity and relation between them</li> <li>Stress-strain diagram: behavior of wire under continuously increasing load, yield point, ultimate stress, breaking stress, factor of safety, compressibility, Poisson's ratio</li> </ul> <p><b>Topic 2] Properties of liquids</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Determine the surface tension of the given liquid</li> <li>Determine the coefficient of viscosity by Stoke's method.</li> </ul> <p><b>Fluid friction:</b></p> <p>Pressure, pressure-depth relation (<math>P = \rho h</math>), atmospheric pressure, Pascal's law, Archimedes's principle.</p> <p>Viscous force, definition of viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its SI unit.</p> <p>Streamline and turbulent flow with examples, critical velocity, Reynold's number and its significance.</p> <p>Up thrust force, terminal velocity, Stokes law, and derivation of coefficient of viscosity by Stoke's method, effect of temperature and adulteration on viscosity of liquid.</p> <p><b>Surface tension :</b></p> <p>Cohesive and adhesive force, Laplace's molecular theory of surface tension, Surface Tension: definition and unit, effect of temperature on surface tension.</p> <p>Angle of contact, Capillarity and examples of capillary action, derivation of expression for surface tension by capillary rise method, applications of surface tension.</p> <p><b>Topic 3] Thermal properties of matter:</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Distinguish between isothermal and adiabatic process.</li> <li>Determine the relation between specific heats.</li> </ul> <p><b>Modes of transformation of heat :</b></p> <p>Difference between heat and temperature, definition of calorie, Absolute zero, units of temperature: °C, °F, °K, with their conversion.</p> <p>Conduction, law of thermal conductivity, coefficient of thermal conductivity, good conductors of heat &amp; insulators with suitable examples, applications of conduction. Convection, applications of convection, Radiation, applications of radiation.</p> <p><b>Gas laws :</b></p> <p>Boyle's law, Charles law, Gay-Lussac's law (Statement and mathematical equation only)</p>	05	08
<p><b>Topic 4] Optics</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Calculate refractive index of prism.</li> <li>Determine the numerical aperture of optical fiber</li> </ul> <p><b>Refraction of light :</b></p> <ul style="list-style-type: none"> <li>Refraction of monochromatic light, Snell's law, Derivation of prism formula, total internal reflection, critical angle.</li> <li>Optical fibre: principle, structure of optical fiber, propagation of light wave through optical fibre, derivation of numerical aperture and acceptance angle.</li> </ul> <p><b>Topic 5] Wave motion</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Differentiate between transverse waves and longitudinal waves</li> <li>Derive expression for displacement, velocity and acceleration of a body executing SHM</li> </ul> <p><b>5.1 Wave motion :</b></p> <ul style="list-style-type: none"> <li>Definition of a wave, wave motion, wave velocity, wave period, wave frequency, wave length, vibratory motion, periodic motion, amplitude of a vibrating particle, derivation of <math>v = n\lambda</math></li> <li>Simple harmonic motion (SHM), examples of SHM, equation of SHM, expression of velocity and acceleration of a body executing SHM.</li> <li>Types of progressive waves: transverse and longitudinal waves with examples.</li> </ul> <p><b>5.2 Resonance:</b></p> <ul style="list-style-type: none"> <li>Stationary wave, formation of stationary wave, examples of stationary wave, characteristics of stationary waves, free and forced vibrations with examples.</li> <li>Resonance: definition of resonance, examples of resonance, formula to calculate velocity of sound by resonance tube method.</li> </ul>	09	12
<p><b>Topic 6] Properties of Matter:</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Select proper measuring instruments</li> <li>Verify the principles, laws, using given instruments under different conditions</li> <li>Read and interpret the graph.</li> <li>Interpret the results from observations and calculations.</li> </ul> <p><b>2) Motor skills-</b></p> <ul style="list-style-type: none"> <li>Handle the instruments.</li> <li>Measuring physical quantities accurately.</li> <li>Observe the phenomenon and to list the observations in a tabular form.</li> <li>Plot the graphs.</li> </ul>	08	12

<ul style="list-style-type: none"> <li>Perfect gas equation (<math>PV=RT</math>) (No derivation), specific heat of a substance, SI unit, specific heat of gas at constant volume (<math>C_v</math>) specific heat of gas at constant pressure (<math>C_p</math>), ratio of specific heat Mayer's relation between <math>C_p</math> and <math>C_v</math>, isothermal process, adiabatic process, difference between isothermal process and adiabatic process.</li> </ul> <p><b>Topic 4] Optics</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Calculate refractive index of prism.</li> <li>Determine the numerical aperture of optical fiber</li> </ul> <p><b>Refraction of light :</b></p> <ul style="list-style-type: none"> <li>Refraction of monochromatic light, Snell's law, Derivation of prism formula, total internal reflection, critical angle.</li> <li>Optical fibre: principle, structure of optical fiber, propagation of light wave through optical fibre, derivation of numerical aperture and acceptance angle.</li> </ul> <p><b>Topic 5] Wave motion</b></p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>Differentiate between transverse waves and longitudinal waves</li> <li>Derive expression for displacement, velocity and acceleration of a body executing SHM</li> </ul> <p><b>5.1 Wave motion :</b></p> <ul style="list-style-type: none"> <li>Definition of a wave, wave motion, wave velocity, wave period, wave frequency, wave length, vibratory motion, periodic motion, amplitude of a vibrating particle, derivation of <math>v = n\lambda</math></li> <li>Simple harmonic motion (SHM), examples of SHM, equation of SHM, expression of velocity and acceleration of a body executing SHM.</li> <li>Types of progressive waves: transverse and longitudinal waves with examples.</li> </ul> <p><b>5.2 Resonance:</b></p> <ul style="list-style-type: none"> <li>Stationary wave, formation of stationary wave, examples of stationary wave, characteristics of stationary waves, free and forced vibrations with examples.</li> <li>Resonance: definition of resonance, examples of resonance, formula to calculate velocity of sound by resonance tube method.</li> </ul>	04	06
<b>TOTAL</b>	<b>32</b>	<b>50</b>

**Practical:**

**Skills to be developed**

- Intellectual skills:
  - Select proper measuring instruments
  - Verify the principles, laws, using given instruments under different conditions
  - Read and interpret the graph.
  - Interpret the results from observations and calculations.
- Motor skills-
  - Handle the instruments.
  - Measuring physical quantities accurately.
  - Observe the phenomenon and to list the observations in a tabular form.
  - Plot the graphs.



List of experiments

1. Know your Physics Laboratory, measuring instruments and interpretation of graph.
2. Measure the dimensions of given objects using vernier caliper.
3. Measure the dimensions of given objects using micrometer screw gauge.
4. Determine Young's modulus of elasticity of metal wire by using Searle's apparatus.
5. Determine coefficient of viscosity of given liquid using Stoke's Method
6. Determine surface tension of liquid by capillary rise method using travelling microscope.
7. Determine the coefficient of thermal conductivity of copper by Searle's method
8. Determine refractive index of liquid by concave mirror.
9. Determine stiffness constant 'K' of a helical spring.

Learning Resources:

1. Reference Books:

Sr. No.	Title	Author	Publisher
01	Engineering Physics	B.L. Theraja	S. Chand Publishers – New Delhi
02	Engineering Physics	V. Rajendran	Tata McGraw-Hill Publications
03	Conceptual Physics	P. G. Hewitt	Pearson education (10th edition)
04	Physics- Std XI, Std XII	-	HSC board/CBSE Board
05	Engineering Physics	R.K. Gaur and S.L.Gupta	Dhanpat Rai Publication, New Delhi.

2. Websites:

- <http://hyperphysics.phy-astr.gsu.edu/hbase/permo2.htm>
- <http://physics.info>
- <http://inventors.about.com/od/xyzstartinventions/a/x-ray.htm>
- <http://www.kettering.edu/physics/drussel/Demos/waves/wavemotion.html>
- <http://physics.usask.ca/~hirosep/ep225/anim.htm>
- <http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/dispersion.html>

3) Videos:

1. <http://www.youtube.com/watch?v=u5AXL1SIEEs>: Demonstration showing surface tension of water using screen
2. <http://www.youtube.com/watch?v=5h3h2E4z2Q> Demonstration showing Photoelectric effect and Photo Cell
3. <http://www.youtube.com/watch?v=42Qv8lkB-nM> Demonstration showing viscosity of various liquids
4. <http://www.can-do.com/cei/ssi2003/gas-laws.html> Demonstration of various Gas Laws

4) CD:

- Educational Cd of NCERT
- Educational cd of Pearson education India

5) PPT:

- [www.slidehare.net/donprajai/photoelectriceffectppt](http://www.slidehare.net/donprajai/photoelectriceffectppt)
- [www.khanacademy.com](http://www.khanacademy.com)

Course Name : Diploma in Civil / Electrical / Mechanical / Computer / Industrial Electronics / Electronics & Telecommunication Engineering

Course Code : CC/C/IC/LE/EC/IL/MC/MG/GC/XC

Semester : First

Subject Title : Basic Science (Chemistry)

Subject Code : 17913

Teaching and Examination Scheme:

Teaching Scheme				Examination Scheme			
TH	TU	PR	PAPER HRS	TH	PR	OR	TW
02	--	02	02	50	25@	--	--
							TOTAL
							75

Note:

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Rationale:

Basic Chemistry is the basic science which is essential to all engineering courses. For an engineer, the usage of equipments and instruments would require knowledge of chemical substances, their composition and properties. Hence the content of this subject provides knowledge of engineering materials. This knowledge also aims to bridge the theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in the field of engineering. It helps in understanding chemical and physical properties of engineering materials.

The content of this curriculum has four units which provide the knowledge of chemical bonding, mechanisms of various applications of electrochemistry. It also provides in depth knowledge of extraction processes, properties and applications of metals and alloys. The non-metallic materials like plastics, rubber, insulators are the back bone of developing industries.

General Objectives:

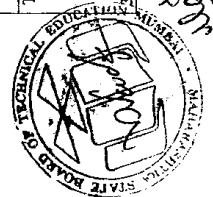
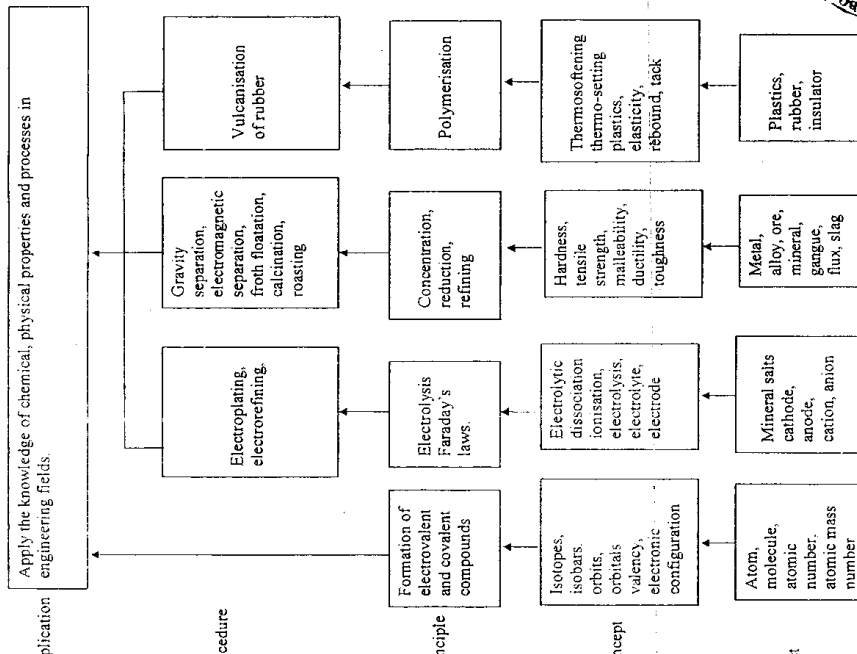
The student will be able to

1. Know the concepts of valence electrons and valency of elements
2. Apply the knowledge of electrolysis in engineering applications.
3. Understand the formation of various molecules.



4. Apply the properties of metals and alloys in engineering field.
5. Use non-metallic materials in engineering applications.

**Learning Structure:**



**Theory Content:**

Topic and Contents	Hours	Marks
<b>Topic 1] Chemical Bonding:</b> <b>Specific Objectives:</b> > Predict valence electrons and valency of elements. > Draw schematic diagram for formation of molecules. [8 Marks] <b>1.1 Atomic Structure :</b> • Definition of atom, Bohr's atomic model, structure of modern atom, characteristics of fundamental particles of an atom, definition of atomic number, atomic mass number and their differences, Isotopes and Isobars: Definitions, examples and distinction, applications of carbon and cobalt isotopes Orbits: Bohr's energy levels, sub-energy levels, s, p, d, f orbitals, shapes and description of s-orbital and p-orbital. Distribution of electrons in orbitals: Definition of electronic configuration, Aufbau's principle, Hund's rule, orbital electronic configurations (s, p, d, f) of elements having atomic number 1 to 30. [4 Marks] <b>1.2 Valency:</b> • Definitions of valence electrons, valency. • Definition of electrovalency, positive and negative electrovalency, formation of Electrovalent compounds-MgO, CaCl <sub>2</sub> . • Definition of covalency, single, double and triple covalent bonds, formation of Covalent compounds H <sub>2</sub> O, CO <sub>2</sub> , N <sub>2</sub> .	08	12
<b>Topic 2] Electrochemistry:</b> <b>Specific Objectives:</b> > Describe the mechanism of electrolysis. > Identify the role of electrodes in application of electrolysis. [4 Marks] <b>2.1 Basic concepts of electrolysis:</b> • Electrolyte, types of electrolyte- strong and weak electrolyte, their difference. • Ionisation and electrolytic dissociation, Arrhenius theory of electrolytic dissociation, degree of ionization, factors affecting degree of ionization. Definitions of electrolytic cell, electrodes-cathode, anode, electrode potential-oxidation potential and reduction potential. <b>2.2 Electrolysis:</b> [10 Marks] • Mechanism of electrolysis- Electrolysis, electrochemical series for cations and anions, • Mechanism- of electrolysis- of CuSO <sub>4</sub> solution by using platinum electrodes and copper electrodes • Applications of electrolysis- Electroplating of silver, electro refining of blister copper, • Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numericals <b>pH and pOH:</b> Definition of pH, pOH, pH Scale, Numericals.	10	14
<b>Topic 3] Metals and Alloys:</b> <b>Specific Objectives:</b> > Identify the properties of metals and alloys related to engineering applications. > Describe the process of extraction of metals. [8 Marks] <b>3.1 Metals:</b>	08	12

- Occurrence of metals in free and combined state, definitions- mineral, ore, gangue, flux and slag, metallurgy
- Metallurgy- Detailed Flow chart for extraction of metal,
- Important extraction processes-Concentration-gravity separation, electro-magnetic separation, froth floatation, calcination and roasting, Reduction-smelting, aluminothermic process, Refining-poling, electrorefining
- Mechanical properties of metals- Hardness, ductility, malleability, tensile strength, toughness, machinability, weldability, forging, soldering, brazing, castability.

**3.2 Alloys:**

- Definition, purposes of making alloys with examples
- Preparation methods- Fusion, Compression
- Classification of Alloys- Ferrous and non ferrous alloys with examples.
- Examples of alloys- Composition, properties and applications of duralumin, Woods metal, babbit metal.

**Topic 4 | Non-metallic Engineering Materials:**

**Specific Objectives:**

- Distinguish between thermosetting and thermosetting plastics.
- List the properties of rubber
- State the applications of thermal insulators.

**4.1 Polymers (Plastics, Rubber):**

- Plastics: Definition of plastic, polymer, polymerisation, types of polymerisation with examples
- Types of plastic-thermo softening plastics and thermosetting plastics and their difference, properties and applications of plastics.
- Rubber: Types of rubber.

- Natural Rubber- definition, drawbacks of natural rubber, vulcanization of rubber with chemical reaction, applications of vulcanized rubber.
- Synthetic rubber- definition, difference between natural and synthetic rubber, examples of synthetic rubber, properties of synthetic rubber like - elasticity, tack, and abrasion resistance, their definition and related applications.

**4.2 Thermal Insulators**

- Thermal Insulators -Definition, characteristics of thermal insulators, classification- organic and inorganic thermal insulators, their examples, preparation, properties and applications of, thermocole and glasswool.

Total 32 50

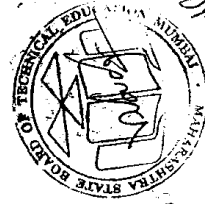
**Practical:**

**Intellectual Skills:**

1. Analyse given solution and to find the chemical properties of metallic and non-metallic ions
2. Interpret the results of experiments or numerical values.
3. Understand the set up of the experiment
4. Verify the laws and characteristics.

**Motor Skills:**

1. Handle various laboratory reagents.
2. Accurately measure proper quantity of various chemicals.
3. Observe correct colour of precipitate, evolution of gas.
4. Connect electrical circuit as per the circuit diagram.



5. Proficiently handle apparatus and equipments to perform experiments
6. Observe the completion of reaction.

**List of Experiments:**

Sr. No.	Name of the experiment
1	Know your Chemistry laboratory and prepare sample solutions of different concentrations
2	Determine the basic radical (metallic ion) and acidic radical (non-metallic ion) by qualitative analysis of given salt solution no-1.
3	Determine the basic radical (metallic ion) and acidic radical (non-metallic ion) by qualitative analysis of given salt solution no-2.
4	Determine the basic radical (metallic ion) and acidic radical (non-metallic ion) by qualitative analysis of given salt solution no-3.
5	Determine the basic radical (metallic ion) and acidic radical (non-metallic ion) by qualitative analysis of given salt solution no-4.
6	Determine the basic radical (metallic ion) and acidic radical (non-metallic ion) by qualitative analysis of given salt solution no-5.
7	Calculate the electrochemical equivalent of copper by electrolysis of copper sulphate solution using copper electrodes.
8	Determine pH value of given solutions by using pH paper, universal indicator and pH meter.
9	Prepare Phenol formaldehyde resin used in manufacturing of Bakelite plastic

**Learning Resources:**

**1. Reference books:**

Sr. No.	Author	Name of the book	Publisher
1	Jam and Jain	Engineering Chemistry	Dhanpat Rai and Sons
2	----	Engineering Chemistry	Wiley India Edition
3	B. K. Sharma	Industrial Chemistry	Goel Publication
4	S. S. Dara	Engineering Chemistry	S. Chand Publication

**2. List of web sites/ Videos and animations:**

**Chemical Bonding**

- <http://cas.sdsos.org/dro/en/proj/advanced/spectraltypes/energylevels.asp>
- <http://en.wikipedia.org/wiki/Matter>
- [http://en.wikipedia.org/wiki/Electron\\_configuration](http://en.wikipedia.org/wiki/Electron_configuration)
- <http://www.chemguide.co.uk/atoms/promenu.html#top>
- <http://www.chem1.com/acad/webtext/chembond/>
- <http://www.footprints-science.co.uk/Chemistry.htm>
- <http://www.youtube.com/watch?v=8tqDE6vqs&feature=related> (Ionic Bonding)
- <http://www.youtube.com/watch?v=Kj0CHgqda&feature=related> (Chemical Bonding)
- <http://dub4.unl.edu/chemAnime/ECONFI/GECONFI.html> (electronic Configuration)
- [http://employees.oneonta.edu/viningwv/sims/atomic\\_electron\\_configurations\\_1.html](http://employees.oneonta.edu/viningwv/sims/atomic_electron_configurations_1.html) (electronic Configuration)



- p://employees.oneonta.edu/~unigw1/sims/atomic\_electron\_configurations\_32.htm (electronic configuration of Ions)
- p://www.kemchemistry.com/links/AtomicStructure/PauliHundsRule.htm (Hunds Rule)
- p://www.quimica3d.com/animations/en-21a.php (Orbital)
- p://www.ausetute.com.au/lewisstr.html (Lewis Structure)
- p://winter.group.shef.ac.uk/orbital/AOs/2p/index.html (Atomic Orbitals)
- p://ppex.pppl.gov/interactive/matter/molecule.html
- p://www.kemchemistry.com/links/bonding/typesofBonds.htm (Chemical Bond)

**Electrochemistry**

- p://en.wikipedia.org/wiki/Electrolysis
- 3://www.chem1.com/acad/webtext/electrochem/
- 3://www.splung.com/content/sid/3/page/batteries
- rw.teachnet-uk.org.uk/\_/Metals/\_metals/Properties%20of%20Meta
- powerpoint/
- 3://www.audiotext.com/Presentation/45Guest53360-286609-froth-flotation-Entertainment-
- 3://dwb4.uni.edu/chem/Anime/index.htm
- 3://physchem.co.za/OB12-che/electrolysis.htm#copper (Electrochemistry)
- 3://www.mindzeit.com/chemistry.php

**Alloys and Alloys**

- p://en.wikipedia.org/wiki/Metal

**Plastic and Rubber**

- 3://www.tvo.org/icmp/plastic/animations.html# (Addition Polymerization)
- 3://www.tvo.org/icmp/plastic/animations.html# (Condensation Polymerization)
- 3://www.chemistryland.com/PolymerPlanet/Polymers/PolymerTutorial.htm (Plastic)
- 3://www.elmhurst.edu/~chem/vchembook/403rubber.html (Rubber)

Course Name : Diploma in Civil / Electrical / Mechanical / Computer / Industrial Electronics  
 / Electronics & Telecommunication Engineering  
 Course Code : CC/CV/CL/EC/EG/LL/MC/MG/GC/CX  
 Semester : First  
 Subject Title : Basic Mathematics  
 Subject Code : 17914

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme				
TH	TU	PR	PAPER HRS	TH	PR	TW	TOTAL
03	--	--	03	100	--	--	100

**Notes:**

- > Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- > Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

**Rationale:**

Mathematics is the foundation of science and technology. The study of basic mathematics is helpful to understand concepts of Engineering. This subject enhances logical thinking capability. It also improves the systematic approach in solving engineering problem. Algebra provides the language and abstract symbols of mathematics. It also helps to use that Language in real-life applications. Matrix and Determinant topics are helpful for finding optimum solution of system of simultaneous equations which are formed in the various branches of engineering using different parameters.

**Trigonometry is the study of triangles and angles.**

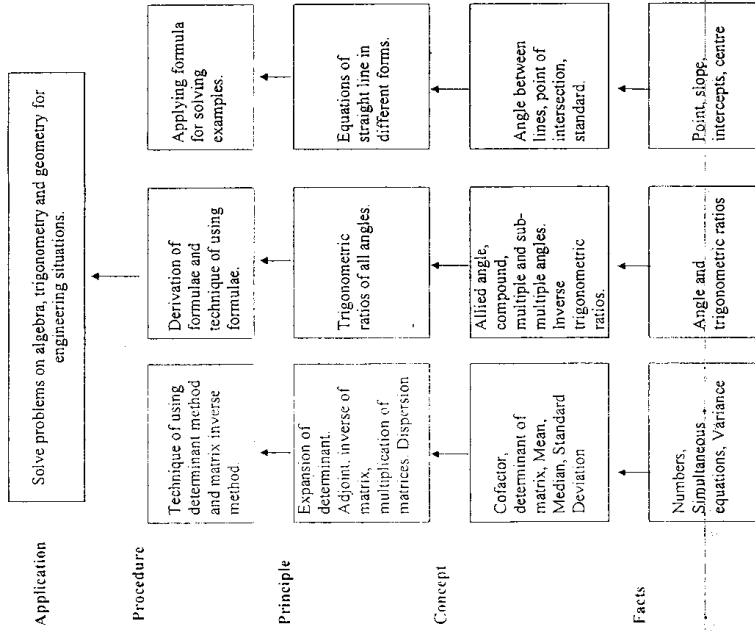
Geometry gives emphasis on understanding the deductive reasoning process. It includes writing derivations of theorems and giving geometric relationships by reasoning. Coordinate geometry plays an important role in Animation, AutoCAD, Computer graphics etc. Contents of this subject will form foundation for further study in mathematics.

**General Objectives:**

Student will be able to:

1. Apply Cramer's rule and matrix method to solve simultaneous equations in three variables.
2. Use concept of allied angle, compound angle, multiple and sub-multiple angles to solve engineering problems.
3. Use factorization and de-factorization formulae to solve examples
4. Understand the relationship of two variables.





Topic and Contents	Hours	Marks
<b>Topic - I Algebra</b>		
<b>1.1 -Determinant</b> Specific objectives: <ul style="list-style-type: none"> <li>Solve simultaneous equations in three variables using Cramer's rule</li> <li>Definition and expansion of determinant of order 3.</li> <li>Cramer's rule to solve simultaneous equations in three variables.</li> </ul>	04	02
<b>1.2 - Matrices</b> Specific objectives : <ul style="list-style-type: none"> <li>Perform all algebraic operations on matrices.</li> <li>Solve simultaneous equations in three variables.</li> <li>Definition of a matrix of order m x n and types of matrices</li> <li>Algebra of matrices with properties and examples</li> <li>Transpose of a matrix with properties.</li> <li>Cofactor of an element of a matrix.</li> <li>Adjoint of matrix and inverse of matrix by adjoint method</li> <li>Solution of simultaneous equations containing two and three unknowns by matrix inversion method</li> </ul>	16	08
<b>1.3 -Partial Fraction</b> Specific objectives: <ul style="list-style-type: none"> <li>Find partial fraction of proper and improper fraction.</li> <li>Definition of fraction, proper, improper fraction and partial fraction.</li> <li>Resolve proper fractions into partial fraction with denominator containing:                             <ul style="list-style-type: none"> <li>non repeated linear factors,</li> <li>repeated linear factors,</li> <li>non repeated quadratic irreducible factors.</li> </ul> </li> <li>To resolve improper fraction in to partial fraction.</li> </ul>	12	06



Topic	Weightage	Total
<b>Topic 2- Trigonometry</b> 1 Trigonometric Ratios of Allied, Compound, Multiple and Sub-Multiple Angles Specific objectives: > Solve examples of allied angle, compound angle, multiple and sub-multiple angles. • Trigonometric ratios of any angle • Definition of allied angle, compound, multiple and sub-multiple angles • Trigonometric ratios of above angles with proofs. Simple examples 2 Factorization and De-factorization Formulae Specific objectives: > Derive factorization and de-factorization formulae to solve examples. • Formulae for factorization and de-factorization with proof and examples. 3 Inverse Trigonometric Ratios Specific objectives: > Solve examples of inverse trigonometric ratios. • Definition of inverse trigonometric ratios. • Principal value of inverse trigonometric ratios • Relation between inverse trigonometric ratios with proof and examples.	16 06 12 06 12	40
<b>Topic 3- Co-Ordinate Geometry</b> 1 Straight Line Specific objectives: > Solve problems with given condition. • Angle between two lines with proof. Examples • Condition of parallel and perpendicular lines • Point of intersection of two lines, equation of line passing through point of intersection with given condition. • Perpendicular distance between point and line with proof and examples. • Distance between two parallel line with proof and examples 2 Statistics Specific objectives: > Find the range, mean deviation, standard deviation and consistency of any data. • Measures of dispersion - range, mean deviation from mean and median, and standard deviation • Variance and its coefficient • Comparisons of two sets of observations.	16 08 12 04	100
<b>Total</b>	<b>48</b>	<b>100</b>

**Tutorials:**

Note: 1) Tutorials are to be used to get enough practice.  
 1) Make group of 20 students and for each group minimum 10 problems are to be given

**List of tutorial:**

Sr. No.	Topic for tutorial
1	Determinant
2	Matrices (Algebra of matrices)
3	Matrices (Adjoint, inverse and solution of equations using matrix inversion method)
4	Partial Fraction
5	Trigonometric ratio of allied, compound, multiple and sub-multiple angles
6	Factorization and de-factorization formulae
7	Inverse trigonometric ratios
8	Straight line
9	Statistics( Measure of Dispersion)

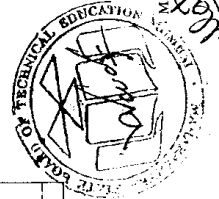
**Learning Resources:**

1) Books :

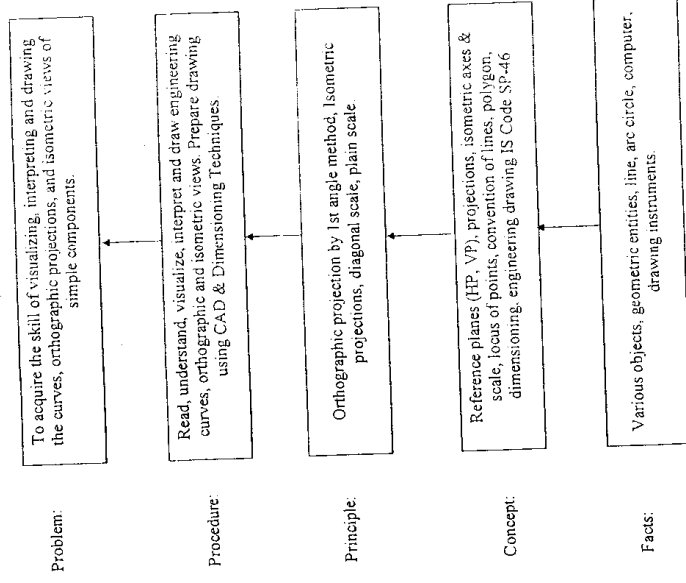
Sr. No.	Title	Authors	Publication
1	Mathematics for Polytechnic	S.P. Deshpande	Pune Vidyarthi Griha
2	Trigonometry	S. L. Loney	S. Chand Publication
3	Matrices	Ayres	Schum series McGraw Hill
4	Higher Engineering Mathematics	B. S. Grewal	Khanna publication
5	Engineering Mathematics	S. S. Sastry	Prentice Hall of India

2) Websites :

i) www.khan Academy



Learning Structure:



Course Name : Diploma in Civil / Electrical / Mechanical / Computer / Industrial Electronics

/ Electronics & Telecommunication Engineering

Course Code : CC/CU/EC/EG/IL/MC/MG/GC/XC

Semester : First

Subject Title : Engineering Graphics

Subject Code : 17915

Teaching and Examination Scheme:

Teaching Scheme	Examination Scheme							
	TU	PR	PAPER HKS	TH	PR	OR	TW	TOTAL
02	--	04	--	--	50#	--	25@	75

- Notes - 1) Students should use the A3 size sketchbook for class works.  
2. Use approximately 570mm x 380mm size drawing sheet for term work.

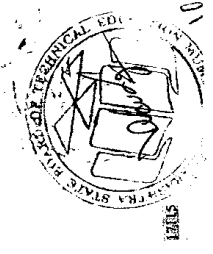
Rationale:

Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop, express the ideas, and convey the instructions which are used to carry out jobs in the field Engineering. The course illustrates the techniques of graphics in actual practice. This preliminary course aims at building a foundation for the further course in drawing and other allied subjects. This subject is useful in developing drafting and sketching skills of students.

Objectives:

The student after studying this subject will be able to:-

- 1) Draw different engineering curves and know their applications
- 2) Draw orthographic projections of different objects
- 3) Visualize three dimensional objects and draw Isometric Projections.
- 4) Draw simple geometrical figures using CAD package.



Name of the Contents	Hours
<b>1. Principles of Drawing</b> Specific Objective > Use Instruments for drawing, Scales, Lines, & there applications. > Draw a basic 2-D geometrical entities using CAD.  1.1 Drawing Instruments and their uses • Standard sizes of drawing sheets (ISO-A series) • Letters and numbers (single stroke vertical) • Convention of lines and their applications. • Scale (reduced, enlarged & full size) plain scale and diagonal scale. • Dimensioning technique as per SP-46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning  1.2 Introduction to CAD software (Basic commands like draw, modify). • Advantages of CAD • Geometrical constructions <b>2. Engineering curves &amp; Loci of Points.</b> > Draw Conic curves, involute, Cycloid & know their applications > Draw helix, spiral, & loci of points from given data.  2.1 Conic Section • To draw an ellipse by Arcs of circle method & Concentric circles method • To draw a parabola by Directrix and focus method & Rectangle method • To draw a hyperbola by Transverse Axis and focus method & rectangular hyperbola (Inclined axes).  2.2 Engineering curves • To draw involutes of circle & pentagon, • To draw a cycloid, epicycloids, hypocycloid • To draw Helix & Archimedean spiral. • Loci of points on any link of (i) 4 bar mechanism and (ii) Single slider crank mechanism with given specifications <b>3. Orthographic projections</b> Specific Objective > Visualize, interpret & draw orthographic views from given pictorial view.  • 3.1 Introduction to Orthographic projections. • 3.2 Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only) – elevation, plan and end view • 3.3 Selection of section plains and drawing sectional view (simple object)  <b>Chapter-4 Isometric projections</b> Specific Objective > Visualize interpret & draw isometric view from given orthographic views  • 4.1 Isometric scale, comparison of true scale with isometric scale • 4.2 Conversion of orthographic views into Isometric View / projection	06
<b>Total</b>	09
<b>Total</b>	32

Practical:  
 Skills to be developed for practical:  
 Intellectual skills:

- To develop ability to solve problems on geometrical constructions
- To develop ability to differentiate between conic and curves
- Able to interpret the given mechanisms and locus of points.
- Develop ability to interpret first angle projection method.
- To interpret and able to solve problem on orthographic projection of given object.
- Develop ability to differentiate between isometric view and isometric projections
- To differentiate between Isometric scale and true scale

**Motor Skills:**

- To develop ability to draw the geometrical constructions by computer Using CAD
- To develop ability to draw different types of curves.
- Develop ability to draw orthographic projections by first angle projection method
- Develop ability to draw isometric views and isometric projections from given orthographic views of an object using computer.

**List of Practical:**

List of Practical
<b>1. Geometrical Constructions Using CAD - (1 Sheet)</b> Using CAD, draw the following figures with dimensions- Rectangle, circle, pentagon, hexagon, and two composite figures involving tangential exercises <b>2. Engineering curves &amp; Loci of points - (1 Sheet)</b> i) These different curves are to be draw using any one method ii) Draw locus of point on any one mechanism <b>3. Orthographic projections - (Total 2 Sheets)</b> Two objects by first angle projection method – • Full orthographic views -One sheet • Sectional orthographic views-One sheet <b>4. Isometric projection - (Total 2 sheets)</b> • Isometric views of two objects- One sheet • Isometric projection of two objects – One sheet

**Learning Resources:**

**1. Books:**

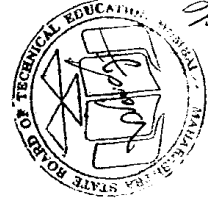
Sr. No.	Author	Title	Publication
1	N. D. Bhatt	Engineering Drawing	Charotar Publishing House 2010
2	Amar Pathak	Engineering Drawing	Dreamtech Press, 2010



3	D. Jethi	Engineering Drawing	Tata McGraw Hill Edu., 2010
4	M. B. Shah, B.C. Rana	Engineering Drawing	Pearson, 2010
5	R. K. Dhawan	Engineering Drawing	S. Chand Co., Reprint 2010
6	K. L. Narayan, P. Kanniah	Text Book on Engineering Drawing	Scitech Publications, 24 <sup>th</sup> Reprint August 2011
7	K. Venugopal	Engineering Drawing and Graphics + AutoCAD	New Age Publication: Reprint 2006
8	IS Code - SP - 46	Engineering Drawing Practice for schools and colleges	

## 2. Video Cassettes / CD's

1. Instructional / Learning CD developed by ARTADDICT.



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