

#### 4. CURRICULUM

**Course Name: Mechanical Engineering Group**

**Course code : ME/MH/MI**

**Semester : Fifth for ME and Sixth for MH/MI**

**Subject Title : Power Engineering**

**Subject Code : 17529**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25#	--	25@	150

**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:**

I.C.Engines find applications in almost all sectors of industry and in automobiles. Diploma technicians deal with working, testing and maintenance of I.C. Engines. I.C. Engines are one of the major contributors of air pollution. Hence I.C. Engine pollution control plays a vital role in protecting the environment. Use of air compressors is increasing due to automation. Hence it is necessary to understand constructional features and thermodynamic aspect of air compressor. Gas turbine is used for power generation and for jet propulsion. Diploma engineer should understand the fundamentals of refrigeration and air- conditioning as there are many industrial applications and also many entrepreneurial opportunities in this field.

**General Objectives:**

The Student will be able to:

1. Describe construction and working of I. C. Engines.
2. Calculate various performance parameters by conducting trial on I. C. Engines.

## Contents: Theory

Topic and content	Hrs.	Marks
<b>1. I.C. Engine</b> <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Draw air standard cycles.</li> <li>➤ Explain the combustion and ignition method of I. C. Engine.</li> </ul> 1.1 Power Cycles <ul style="list-style-type: none"> <li>• Carnot, Otto, Diesel, Dual, Brayton Cycle, representation on P-V, T-S diagram and Simple numerical on Otto cycle &amp; Carnot cycle.</li> </ul> 1.2 Classification and Application of I. C. Engines. <ul style="list-style-type: none"> <li>• Four stroke Engines, Construction and working, valve timing Diagram, Turning moment diagram</li> <li>• Brief description of I.C. Engine combustion (SI &amp; CI), scavenging, preignition, detonation, supercharging, turbo charging, air fuel ratio requirements, M.P.F.I., Types of sensors, fuel injection pump, battery ignition in SI Engines</li> </ul>	10	20
<b>2. I.C. Engine Testing and Pollution Control</b> <b>Specific Objectives:</b> <ul style="list-style-type: none"> <li>➤ List lubricant and additive</li> <li>➤ State the pollutants and their effect</li> <li>➤ Calculate various efficiencies</li> </ul> 2.1 Engine terminology: Stroke, bore, piston speed, MEP, compression & cut-off ratio. Engine Testing - I.P., B.P. Mechanical, Thermal, relative efficiency and, BSFC, Heat Balance sheet. Morse Test, Motoring test ---- 10 Marks 2.2 List of fuel, lubricant additives and their advantages.---- 04 Marks 2.3 Pollution Control ---- 10 Marks Pollutants in exhaust gases of petrol and diesel engines, their effects on environment, exhaust gas analysis for petrol and diesel engine, Catalytic Converter, Bharat stage III, IV norms.	10	24
<b>3. Air Compressor</b> <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Explain the concept of single and multistage compressor.</li> <li>➤ List the methods of energy saving.</li> </ul> 3.1 Introduction Uses of compressed air, Classification of air compressors, Definitions of Pressure ratio, Compressor capacity, Free Air Delivered, Swept volume. 3.2 Reciprocating Air Compressor ---- 10Marks Construction and working of single stage and two stage compressor Efficiency: Volumetric, Isothermal and Mechanical Advantages of multi staging, Intercooling and after cooling. 3.3 Rotary Compressor ----- 10 Marks	10	20

Construction and working of screw, lobe, vane, (No Numericals) Comparison and applications of reciprocating and rotary compressors Purification of air to remove oil, moisture and dust, Methods of energy saving in air compressors.		
<b>4. Gas Turbine And Jet Propulsion</b> <b>Specific Objectives</b> <ul style="list-style-type: none"> <li>➤ Classify gas turbines.</li> <li>➤ Describe method to improve the efficiency of gas turbine.</li> <li>➤ Explain the principles of jet propulsion</li> </ul> 4.1 Classification and applications of gas turbine, Constant pressure gas turbines. Closed cycle and open cycle gas turbines and their comparison. 4.2 Methods to improve thermal efficiency of gas turbine Regeneration, inter- cooling, reheating ,representation on T-S diagram (no analytical treatment) , 4.3 Jet Propulsion, Principles of turbojet, turbo propeller, Ram jet.	8	16
<b>5. Refrigeration and Air- Conditioning</b> Specific objectives: <ul style="list-style-type: none"> <li>➤ To describe the components and application of vapour compression system.</li> <li>➤ Describe psychrometric processes and air conditioning systems.</li> </ul> 5.1 Refrigeration ----- 08 Marks Tonnes of Refrigeration, coefficient of performance. Vapour compression system, Vapour compression refrigeration cycle Subcooling and superheating, representation on p-h, T-S diagrams. Basic components of Vapour Compression Cycle, their function and location. Simple vapour absorption refrigeration system. Applications- Water cooler, Domestic refrigerator, Ice plant & cold storage. 5.2 Psychrometry ----- 08 Marks Properties of moist air-DBT, WBT, DPT, Specific humidity and relative humidity, Dalton's law of partial pressure psychrometric chart & psychrometric processes-sensible heating/cooling, humidification, dehumidification, evaporative cooling. 5.3 Air conditioning systems ----- 04 Marks Definition and classification of Air conditioning Systems. Construction and working of Window air conditioner and split air conditioner.	10	20
<b>Total</b>	<b>48</b>	<b>100</b>

### Practical:

Skills to be developed:

**Intellectual Skills:**

1. Identify components of IC Engines.
2. Understand working principals of IC Engines, Compressors and refrigeration systems.
3. Analyze exhaust gases and interpret the results.
4. Select tools and gauges for inspection and maintenance.

**Motor Skills:**

1. Assemble and dismantle engine according to given procedure.
2. Operate IC Engine test rig, refrigeration test rig for measuring various parameters and plotting them.
3. Operate exhaust gas analyzer for measuring pollutants.

**List of Practical:**

1. Dismantle and assemble single / multi-cylinder four stroke petrol / diesel engine.
2. Dismantle and assemble
  - a) Carburetor of petrol engine
  - b) Fuel pump and fuel injector of diesel engine.
3. Demonstrate
  - a) M.P.F.I. system of petrol engine.
  - b) C.R.D.I. system of diesel engine.
4. Know and understand the components of cooling and lubrication systems of I. C. engine.
5. Conduct trial on single / multi cylinder petrol / diesel engine for heat balance sheet.
6. Conduct Morse Test on multi cylinder petrol engine to determine its indicated power and mechanical efficiency.
7. Measure I.C. engine pollutants with the help of exhaust gas analyzer.
8. Conduct trial on two-stage reciprocating air compressor to determine its volumetric efficiency and isothermal efficiency.
9. Understand construction and working of a jet engine with the help of model.
10. Conduct trial on refrigeration test rig to determine C.O.P.
11. Identify the components of window air conditioner and trace the flow of refrigerant through various components.

**List of Assignments:**

1. Study of manufacturer's catalogue for Reciprocating/Screw Compressor with respect to application, specifications and salient features.
2. Visit website- <http://library.think.quest.org>, <http://www.grc.nasa.gov> and prepare a brief report on gas turbine and jet propulsion.

**Learning resources:****Books:**

Sr.	Author	Title	Publisher
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No.			
01	M. M. Rathore	Thermal Engineering	Tata McGraw Hill
02	V. Ganeshan	I. C. Engines	Tata McGraw Hill 3 <sup>rd</sup> edition
03	R. K. Rajput	Thermal Engg.	Laxmi Publication, Delhi
04	Patel, Karmchandani	Heat Engine Vol. I, II & III	Acharya Publication
05	P.K. Nag	Engg. Thermodynamics	Tata McGraw Hill 23 <sup>rd</sup> edition
06	S. K. Kulshrestha	Thermal Engineering	Vikas Publishing House Pvt. Ltd.

## 5. IMPLEMENTATION STRATEGY:

### 5.1 Planning of Lectures for a Semester with Content Detailing:

Topic I

Name: **IC ENGINE**

Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning more meaningful.  
e.g.

Knowledge Category	Example/s of category	Teaching methodology
<b>FACT</b>	<b>IC engine and various parts such as piston, cylinder, crank shaft etc.</b>	Actual demo. of cut section of IC engine in lab and also show animated videos to explain working of IC engine
<b>CONCEPT</b>	<b>Chemical energy converted in to mechanical energy by developing power from heat, CI &amp; SI Engine 2 Stroke &amp; 4 stroke engine</b>	Show the processes in IC engine for development of power using chalk & board
<b>PRINCIPLE</b>	<b>Law of conservation of energy</b>	Explain the process how energy is transfer from chemical energy to heat energy & heat energy to mechanical energy.
<b>PROCEDURE</b>	<b>Working of IC engine (CI &amp; SI Engine 2 Stroke &amp; 4 stroke engine)</b>	Demonstrate through models/PPT/Actual videos/Chalk & board
<b>APPLICATION</b>	<b>2Wheeler, 4Wheeler, Generator</b>	Give information about practical field application and ask questions to student to explore the other day today application of IC engine

Learning Resources:

**Books:**

**Title:** 1) I. C. Engines By V. Ganeshan  
2) Thermal Engg. By R. K. Rajput

**Teaching Aids:** Animated videos of working of IC engine from **You Tube**, Cut section model of IC engine operated using motor, charts, Chalk & Boards.

	<p><b>PPTs:</b> PPTs of Working principles of SI and CI Engines, <a href="http://www.slideshare.net">www.slideshare.net</a> (Search for relevant PPT from Home Page).</p> <p><b>Websites:</b> <a href="http://www.youtube.com">http://www.youtube.com</a> (Search for relevant videos from Home Page), <a href="http://www.animatedengines.com">www.animatedengines.com</a></p>
Lecture No.	Topic/ Subtopic to be covered
1	Basics of P-V & T-S diagram using IC engine, Carnot cycle, representation of Carnot cycle on P-V, T-S diagram
2	Otto cycle, representation of Otto cycle on P-V, T-S diagram, Simple numerical on Otto cycle & Carnot cycle
3	Diesel cycle, representation of Diesel cycle on P-V, T-S diagram, Difference between Otto cycle & Diesel cycle, Dual cycle & Brayton cycle & its representation on P-V, T-S diagram
4	Construction and working Four stroke Engines, Difference between 2Stroke & 4 Stroke engine in brief.
5	valve timing Diagram (Theoretical & actual) for 4stroke petrol & diesel engine, Turning moment diagram
6	combustion in SI & CI engine, Difference between SI & CI engine, need of scavenging
7	In brief abnormal combustion, Pre-ignition, Detonation, various factor affecting on Pre-ignition & detonation in brief
8	supercharging, turbo charging, air fuel ratio requirements
9	MPFI : Throttle body injection, Port injection, D- MPFI, L- MPFI along with block diagram
10	Types of sensors, fuel injection pump, battery ignition in SI Engines
Topic 2	<p>Name: <b><u>I.C. Engine Testing and Pollution Control</u></b></p> <p><b>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative</b></p>

methods to make students learning meaningful.  
e.g.

Knowledge Category	Example/s of category	Teaching methodology
<b>FACT</b>	<b>Dynamometer, Gas analyzer , IC engine test rig.</b>	Show dynamometer in laboratory and explain how loading is done on engine using dynamometer also show Gas analyzer in lab & demonstrate its working.
<b>CONCEPT</b>	<b>To measure and improve efficiency of engine and control pollution.</b>	Show all calculation using Chalk & board before going for actual testing.
<b>PRINCIPLE</b>	<b>No load, full load working condition</b>	Show and Explain the behavior of engine for various loading conditions
<b>PROCEDURE</b>	<b>Testing procedure using Morse test, procedure for heat balance sheet, PUC checking.</b>	Demonstrate & show complete procedure for testing of IC engine to calculate efficiency. Draw heat balance sheet, also show how PUC is checked using gas analyzer
<b>APPLICATION</b>	<b>Testing and certifying new manufactured vehicles at automobile industries</b>	Give information about specific applications. Make the students to collect catalogues of various 2 wheelers & 4 wheelers and study various technical specifications.

Learning Resources::

**Books:** 1) Thermodynamics by Domkundwar and Domkundwar  
2) I. C. Engines By V. Ganeshan

**Teaching Aids:** Models, Actual working engines mounted on foundation with testing setup, videos showing testing of engine, Chalk & board.

**PPT with Sample:** [www.slideshare.net](http://www.slideshare.net) (Search for relevant PPT from Home Page),  
Thermodynamic II.pptx



	<b>Websites :</b> <a href="http://www.youtube.com">www.youtube.com</a> (Search for relevant videos from Home Page).
<b>Lecture No.</b>	<b>Topic/ Subtopic to be covered</b>
1	Engine terminology: Stroke, bore, compression & cut-off ratio, TDC, BDC, Swept volume, clearance volume with the help of labeled sketch.
2	Definition & formulae on I.P., B.P. Mechanical, Thermal, relative efficiency and BSFC, need of engine testing, Motoring test.
3	Calculation of indicated power with indicated diagram & calculation of B.P by using Morse test.
4	Concept of Heat Balance sheet & preparation of Heat Balance sheet.
5	Problems on Heat Balance sheet.
6	List of fuel, lubricant additives and their advantages.
7	Different types of Pollutants present in exhaust gases of petrol and diesel engines & their effects on environment & human being.
8	Exhaust gas analysis for petrol and diesel engine,
9	Function of Catalytic Converter, Construction & working of 2way & 3way catalytic converter along with suitable sketch.
10	Necessity of pollution control norms in brief, Details of Bharat stage III, IV norms.

Topic 3	<b>Name: <u>Air Compressor</u></b> <b>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning meaningful.</b> <b>e.g.</b>
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	Knowledge Category	Example/s of category	Teaching methodology
	<b>FACT</b>	<b>Air compressor, electric motor, receiver tank</b>	Explain the uses of compressed air and show actual compressor in laboratory, run the compressor & show how compression takes place.
	<b>CONCEPT</b>	<b>Air can be compressed using Piston Cylinder (reciprocating compressor) or rotary compressor</b>	Explain the student how compression of air can be obtained using single stage & multistage with the help of Chalk & board
	<b>PRINCIPLE</b>	<b>Gas Law: <math>PV = mRT</math></b>	Explain to the student that when volume is reduced pressure increases using the example of bicycle air filling pump
	<b>PROCEDURE</b>	<b>Procedure to start reciprocating or rotary air compressor</b>	Run the compressor available in lab & show the increase in pressure of air in reservoirs on the pressure gauge connected to the tank.
	<b>APPLICATION</b>	<b>Industrial &amp; Commercial application of compressed air like pneumatic tool, sand blasting, spray painting etc.</b>	Explain uses & application of compressed air in daily uses & Industrial uses giving common examples.
<p>Learning Resources::</p> <p><b>Books:</b> Thermal Engg. By R. K. Rajput</p> <p><b>Teaching Aids:</b> Models, Charts , Test rig of compressor available in the laboratory</p> <p><b>PPT with Sample:</b> <a href="http://www.slideshare.net">www.slideshare.net</a> (Search for relevant PPT from Home Page)</p> <p><b>Websites :</b> <a href="http://www.youtube.com">www.youtube.com</a> (Search for relevant videos from Home Page).</p>			
Lecture No.	Topic/ Subtopic to be covered		
1	Uses of compressed air, Classification of air compressors, Construction and working of single stage Reciprocating Air Compressor.		

2	Definitions of Pressure ratio, Compressor capacity, Free Air Delivered, Swept volume. Volumetric, Isothermal and Mechanical efficiency, Construction and working of two stage Reciprocating Air Compressor.		
3	P-V & T-S Diagram for isothermal, isentropic & polytropic compression. Need of multi staging & advantages of multi staging,		
4	Concept of intercooling & after cooling.		
5	Calculation of work done on the reciprocating air compressor & efficiency of reciprocating air compressor. Simple numerical on single stage reciprocating air compressor.		
6	Numerical on two stage reciprocating air compressor.		
7	Construction and working of screw type Rotary Compressor, Construction and working of lobe type Rotary Compressor.		
8	Construction and working of Vane type Rotary Compressor, Comparison between reciprocating and rotary compressors		
9	Applications of rotary compressors, Purification of air to remove oil, moisture and dust.		
10	Methods of energy saving in air compressors. Revision on numerical of reciprocating air compressor		
Topic 4	<b>Name: <u>Gas Turbine And Jet Propulsion</u></b>		
	<b>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning more meaningful.</b>		
	<b>e.g.</b>		
	<b>Knowledge Category</b>	<b>Example/s of category</b>	<b>Teaching methodology</b>
	<b>FACT</b>	<b>Gas turbine, jet engines, compressor</b>	Explain with the help of charts PPTs & animated videos. Show equipment in laboratory.
	<b>CONCEPT</b>	<b>Expansion of gases, hot gases</b>	Explain the concept using the example of jet engine.
	<b>PRINCIPLE</b>	<b>Newton's third law of motion</b>	Show videos of jet engine operation and explain the working principle using chalk and board.
	<b>PROCEDURE</b>	<b>Working of Gas turbine and jet engines</b>	Explain construction and working of gas turbine using chalk and board. Demo on working model
	<b>APPLICATION</b>	<b>turbojet engine, marine engine, supercharging, Railway engine, electric power</b>	Explain with charts, chalk & board

	generation.	
	<p>Learning Resources:</p> <p><b>Books:</b></p> <p>Title: 1) Thermal Engg. By R. K. Rajput</p> <p>2) information available on internet</p> <p><b>Teaching Aids:</b> Charts, animated videos</p> <p><b>PPTs:</b> <a href="http://www.slideshare.net">www.slideshare.net</a> (Search for relevant PPT from Home Page)</p> <p><b>Websites:</b> <a href="http://www.youtube.com">www.youtube.com</a> (Search for relevant videos from Home Page).</p>	
Lecture No.	Topic/ Subtopic to be covered	
1	Gas turbine construction & working, Classification, Application.	
2	Constant pressure gas turbines.	
3	Closed cycle and Open cycle gas turbines, Advantages and disadvantages of closed cycle.	
4	Comparison between Open type gas turbine & Close type gas turbine.	
5	Methods to improve thermal efficiency of gas turbine by Regeneration method with T-S Diagram.	
6	Methods to improve thermal efficiency of gas turbine by inter- cooling & reheating method with T-S Diagram.	
7	Jet Propulsion, Turbojet engine.	
8	Turbo propeller engine, Ram jet	

Topic 5	<p>Name: <b><u>Refrigeration and Air- Conditioning</u></b></p> <p><b>Teacher shall implement the methodology/ techniques mentioned in the following table while teaching the topics. Along with this teacher may use additional/alternative methods to make students learning meaningful.</b></p> <p><b>e.g.</b></p>
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	Knowledge Category	Example/s of category	Teaching methodology
	<b>FACT</b>	<b>Refrigerator. Air conditioners and various accessories</b>	Show equipment in laboratory. Show working models to explain working principles using charts, chalk & board.
	<b>CONCEPT</b>	<b>Heat Transfer modes conduction , convection and radiation</b>	Explain with the help of schematic flow diagram how cooling effect is obtained using charts, chalk and black board
	<b>PRINCIPLE</b>	<b>Laws of Thermo-dynamics, Dalton's law of Partial pressure</b>	Explain using chalk and black board
	<b>PROCEDURE</b>	<b>Working of Refrigerator and Air conditioners</b>	Explain with the help of circuit diagram how a refrigerator and air conditioner works using charts, chalk and black board
	<b>APPLICATION</b>	<b>Water cooler, ice plant, cold storage plant, domestic refrigerator, air conditioner,</b>	Give information about applications. Explain with the help of circuit diagram how various applications of refrigeration and air conditioning works using charts, chalk and black board
<p>Learning Resources::</p> <p><b>Books:</b> 1) Refrigeration &amp; air conditioning by Domkundwar Arora &amp; Domkundwar.  2) Refrigeration &amp; air conditioning by Manohar Prasad.  3) Refrigeration &amp; air conditioning by Khurmi &amp; Gupta.</p> <p><b>Teaching Aids:</b> Charts, working models</p> <p><b>PPT with Sample:</b> <a href="http://www.slideshare.net">www.slideshare.net</a> (Search for relevant PPT from Home Page)</p> <p><b>Websites:</b> <a href="http://www.youtube.com">www.youtube.com</a> (Search for relevant videos from Home Page).</p>			
Lecture No.	Topic/ Subtopic to be covered		
1	Definition of refrigeration, basics of refrigeration, definition of Tonnes of Refrigeration & coefficient of performance. Difference between heat pump & refrigerator.		
2	Different methods of refrigeration & its application in brief, Basic components of Vapour Compression Cycle & their function with neat sketch.		

3	Basics of P-H & T-S diagram, representation of V.C.C on P-H & T-S diagram.
4	Concept of sub cooling and superheating, its representation on P-H, T-S diagrams, simple numerical based on V.C.C
5	Simple vapour absorption refrigeration system, actual vapour absorption refrigeration system, Difference between heat Vapour Compression Cycle & Vapour absorption cycle.
6	Applications- Water cooler, Domestic refrigerator, Ice plant & cold storage.
7	Definition of dry air, moist air, saturated air, Properties of moist air such as DBT, WBT, DPT, Specific humidity, relative humidity, Dalton's law of partial pressure.
8	Necessity and outline of Psychometric chart, representation of various properties of moist air on Psychometric chart
9	Psychometric process-sensible heating/cooling, humidification, dehumidification, evaporative cooling and its representation on Psychometric chart.
10	Definition of air conditioning , classification of air conditioning, construction and working of window air conditioners and split air conditioners

## 5.2 Planning and Conduct of Test:

- The time table and sample test paper for the test should be displayed minimum 10 days before the test.
- Each test will be of 25 marks.
- First test should cover about 40% of curriculum and second test should cover remaining curriculum.
- Format for question paper should be as per the sample question paper supplied by MSBTE.
- Guidelines for Setting Class Test Question Paper:
  - Question no.1 Attempt any three out of four (3X3=9 Marks)
  - Question no.2 Attempt any two out of three (2X4=8 Marks)
  - Question no.3 Attempt any two out of three (2X4=8 Marks)

## 5.3 Details about conduct of assignments:

- \* Give one assignment after completing each chapter .
- \* Explain the student how to write the answer to the questions given. Give submission date to the students and
- \* check the assignment in front of each students during practical. Display best answers for reference to all the students.
- \*The subject Teacher may give separate set of question for a group of every 5 students in the class. This will generate a question bank with best possible solutions

## 5.4 Strategies for Conduct of Practical:

#### 5.4.1 Suggestions for effective conduct of practical and assessment:

- 1) Explain the objectives behind conducting any practical
- 2) Involve every student of a group in conduct of practical,
- 3) Rotate the students to carry out different task or observations during the practical
- 4) Question the students related to the principles, concept or procedure during conduction of practical.

For example: Conduction of Trial on IC Engine.

Sr. No	Time in Minutes	Activity of teacher	Activity of student
1	10	Explain the objective of experiment	Note down in their note book
2	20	Explain the experimental setup and procedure for conduction of practical	Observe and note down points
3	30	Inform about skills to be developed like proper handling and setting of equipment, Correct reading and noting. Also observe & Guide the student for conducting practical.	Conduct practical & note down the reading.
4	30	Observe & Guide the student for calculating end results. Ask students to show the calculation on board for the reading taken.	Carry out calculation based on the observation and readings taken
5	15	Discussion on end results and clearing queries of the students' .Allot few question related to the experiment.	Correction of results (if any) on the basis of discussions and queries. Students should prepare short answers and write it in manual.
6	15	Checking manuals/Journals and ask few questions to get feedback and follow continuous assessment by giving marks out of 10.	Completion of manuals for assessment, students will answer the questions asked.

#### 5.4.3 Preparation for conduct of practical

- 1) Ask the student to keep the write up of experiment, tabular column before starting the practical
- 2) Check whether the equipments are in good working condition.
- 3) Check for accuracy of instruments.
- 4) See that proper safety will be maintained during the conduction of entire Practical.
- 5) Keep all required consumables and tools ready before starting of

practicals.

## 6. Mode of assessment:

### 6.1.1 Class Test:

- There will be two tests each of 25 marks.
- The tests will be conducted as per the MSBTE schedule.
- Teacher should prepare model answer of class test question papers.
- After completion of test, subject teacher should display model answer on Department Notice Board.
- Teacher should show the answer paper of class test to the student and discuss about the mistakes.
- Teacher should maintain the record of class test as per MSBTE norms (CIAAN)

### 6.1.2 Sample Test Papers:

#### Sample Test Paper I

<b>Roll No.</b>				
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<b>17529</b>
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Institute Name: