



## West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)  
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

<b>Name of the Course :</b> Diploma in Mechanical Engineering		
<b>Subject Title: Fluid Mechanics &amp; Machinery</b>		
<b>Course code: ME/</b>	<b>Semester : Fifth</b>	
<b>Duration : 17 weeks</b>	<b>Maximum Marks : 150</b>	
<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	
Theory : 3 hrs/week	<b>Internal Assessment:</b> 20 Marks	
Tutorial: hrs/week	<b>Teacher's assessment (Assignment &amp; Quiz):</b> 10 Marks	
Practical : 2 hrs/week	<b>End Semester Exam:</b> 70 Marks	
Credit: 4	<b>Practical: Internal Sessional continuous evaluation:</b> 25 Marks	
	<b>Practical: External Sessional Examination:</b> 25 Marks	
<b>Aim :-</b>		
<b>S.No</b>		
1	To develop and apply the concepts introduced in Fluid Mechanics to engineering applications in turbo machinery and flow measurement.	
2	To introduce and apply to concepts of similarity and scaling within fluid mechanics.	
3	To review flow measurement devices / techniques, from industrial machines to modern, laser-based methods.	
<b>Objective :-</b>		
<b>S No</b>	The student will able to	
1	Know different machine elements and mechanisms.	
2	Understand Kinematics and Dynamics of different machines and mechanisms.	
3	Select Suitable Drives and Mechanisms for a particular application.	
4	Appreciate concept of balancing and Vibration.	
5.	Develop ability to come up with innovative ideas	
<b>Pre-Requisite:-</b>		
<b>S.No</b>		
<b>Contents</b>		
<b>Chapter</b>	<i>Name of the Topic</i>	<b>Hrs/week</b>
<b>GROUP:A</b>		
01	<b>Properties of fluid</b> 1.1 Density, Specific gravity, Specific Weight, Specific Volume 1.2 Dynamic Viscosity, Kinematics Viscosity, Surface tension, Capillarity 1.3 Vapour Pressure, Compressibility	<b>04</b>
02	<b>Fluid Pressure &amp; Pressure Measurement</b> 2.1 Fluid pressure, Pressure head, Pressure intensity. 2.2 Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. 2.3 Simple and differential manometers, Bourden pressure gauge. 2.4 Concept of Total pressure on immersed bodies(flat vertical, flat inclined), center of Pressure, Pr. Distribution diagram. <b>Note:</b> Numericals on Manometers, Total Pressure & Centre of pressure.	<b>08</b>
<b>GROUP:B</b>		

03	<b>Fluid Flow</b> 3.1 Types of fluid flows: steady-unsteady, uniform-non-uniform, laminar-turbulent. 3.2 Continuity equation 3.3 Bernoulli's theorem 3.4 Venturimeter – Construction, principle of working, Coefficient of discharge, Derivation for discharge through venturimeter. 3.5 Orifice meter – Construction, Principle of working, hydraulic coefficients, Derivation for discharge through Orifice meter 3.6 Pitot tube – Construction, Principle of Working <b>Note:</b> - Numericals on Venturimeter, orifice meter, pitot tube.	08
04	<b>Flow Through Pipes</b> 4.1 Laws of fluid friction ( Laminar and turbulent) 4.2 Darcy's equation and Chezy's equation for frictional losses. 4.3 Minor losses in pipes 4.4 Hydraulic gradient and total gradient line. 4.5 Hydraulic power transmission through pipe <b>Note:</b> Numericals to estimate major and minor losses.	05
<b>GROUP:C</b>		
05	<b>Impact of jet</b> 5.1 Impact of jet on fixed vertical, moving vertical flat plates. 5.2 Impact of jet on curved vanes with special reference to turbines & pumps <b>Note</b> - Simple Numericals on work done and efficiency.	06
06	<b>A] Centrifugal Pumps</b> 6.1 Construction , principle of working and applications 6.2 Types of casings and impellers. 6.3 Concept of multistage 6.4 Priming and its methods, Cavitation 6.5 Manometric head, Work done, Manometric efficiency, Overall efficiency, NPSH Note:- Numerical on calculations of overall efficiency and power required to drive pumps. <b>B] Reciprocating Pump</b> 6.6 Construction, working principle and applications of single and double acting reciprocating pumps. 6.7 Concept of Slip, Negative slip, Cavitation and separation 6.8 Use of Air Vessel. 6.9 Indicator diagram with effect of acceleration head & frictional head. Note:- No Derivations and Numericals on reciprocating pumps.	14
	<b>Total</b>	<b>45</b>

**Practical:**

Skills to be developed:

Intellectual Skills:

- 1) Select and use appropriate flow measuring device.
- 2) Select and use appropriate pressure measuring device.
- 3) Analyze the performance of pumps.

Motor Skills:

- 1) Use flow measuring device.
- 2) Use pressure measuring device.
- 3) Operate pumps.

**List of Practical: (Any Five)**

01. Calibration of Bourden pressure gauge with the help of Dead Weight Pressure gauge.
02. Verification of Bernoulli's Theorem.

03. Determination of Coefficient of Discharge of Venturimeter.  
 04. Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of orifice meter.  
 05. Measurement of velocity of flow through pipe with the help of Pitot tube.  
 05. Determination of coefficient of friction of flow through pipes.  
 06. Trial on centrifugal pump to determine overall efficiency.  
 07. Trial on reciprocating pump to determine overall efficiency.

**List of Books:**

<b>Author</b>	<b>Title</b>	<b>Publication</b>
Ramamrutham S.	Hydraulic, fluid mechanics & fluid machines	Dhanpat Rai and Sons ,New Delhi
C.S.P.Ojha	Fluid Mechanics & Machinery	Oxford University Press
Modi P. N. and Seth S. M.	Hydraulics and fluid mechanics including Hydraulic machines	Standard Book House. New Delhi
Streeter Victor, Bedford K.W., Wylie E.B	Fluid Mechanics	McGraw Hill Int.
K. Subramanya	One Thousand Solved Problems in Fluid Mechanics	Tata McGraw Hill
Garde	Fluid Mechanics	CITECH
R.K.Rajput	Fluid Mechanics & Hydraulic machines	S.Chand
D.S.Kumar	Fluid Mechanics & Hydraulic machines	S.K.Kataria
S.Pati	Fluid Mechanics & Hydraulic machines	Tata McGraw Hill
R.D.Bansal	Fluid Mechanics & Hydraulic machines	Laxmi Publication
Jagadishlal	Fluid Mechanics & Hydraulic machines	Metropolitan Book Company
Das,saikia & Das	Hydraulics & Hydraulic machines	P.H.I
Ramamurtham	Fluid Mechanics & Hydraulic machines	Dhanpat Rai
K.L.kumar	Fluid Mechanics	S.Chand
R.V.Raikar	Lab Manual Hydraulics &	P.H.I

	Hydraulic machines	
Ojha	Fluid Mechanics & Machinery	Oxford
Munson	Fundamentals of Fluid Mechanics	Wiley
Pump manufactures' catalogs such as Kirloskar Brothers, KSB, Kishor pumps etc.		

**Reference books :- Nil**

**Suggested List of Laboratory Experiments :- Nil**

**Suggested List of Assignments/Tutorial :-**

1. Numericals on Manometers, Total Pressure & Centre of pressure
2. Numericals on Venturimeter, orifice meter, pitot tube
3. Numericals to estimate major and minor losses
4. Simple Numericals on work done and efficiency on impact of jet.
5. Numericals on calculations of overall efficiency and power required to drive pumps.

**End Semester Examination Scheme. Maximum Marks-70, Time Allotted-3 hrs**

Group	unit	Objective Questions		Subjective Questions			
		No. of questions to be set	Total marks	No. of questions to be set	To answer	Marks per question	Total marks
A	01,02	7	20	3	5, taking at least one from each group	10	50
B	03,04	7		4			
C	05,06	6		3			

### **EXAMINATION SCHEME FOR PRACTICAL SESSIONAL**

<b>Internal Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Five No. of Experiments / Study attended & respective lab note submitted in due time.	5 x 3 = 15		
VIVA VOCE	10		
<b>TOTAL</b>	25		
<b>External Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Submission of Signed Lab Note Book (for	5 x 2 = 10		

five experiments / study)			
On spot experiment / study (one for each group consisting 15 students / explanation on study item)	10		
VIVA VOCE	5		
<b>TOTAL</b>	<b>25</b>		

<b>Name of the Course : MECHANICAL AND PRODUCTION ENGINEERING / PRODUCTION TECHNOLOGY</b> (Subject Title: ADVANCED MANUFACTURING PROCESS)			
<b>Course code:</b>		<b>Semester : Fifth</b>	
<b>Duration : 17 weeks</b>		<b>Maximum Marks : 200</b>	
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Theory : 2 hrs/week		Semester Exam: <b>70</b> Marks	
Tutorial: hrs/week		Teacher's Assessment (Assignment & Quiz): <b>10</b> Marks	
Practical : 3 hrs/week		Internal Assessment: <b>20</b> Marks	
Credit:4		Practical Sessional internal continuous evaluation: <b>50</b> Marks	
		Practical Sessional external examination: <b>50</b> marks	
<b>Aim :-</b>			
<b>S.No</b>			
1	To know about the advancements in the area of manufacturing and production processes. To impart knowledge & skills necessary for working in modern manufacturing environment. To get familiarized with working principles and operations performed on non traditional machines, machining center, SPM, automated machines and maintenance of machine tools.		
<b>Objective :-</b>			
S No	The student will able to		
1	• Know different non traditional machining processes, CNC milling machines.		
2	• Understand the working of Special Purpose Machines.		
3	• Work as maintenance engineer.		
4	• Know the Operation and control of different advanced machine tools and equipments.		
5	• Produce jobs as per specified requirements by selecting the specific machining process.		
6	• Adopt safety practices while working on various machines.		
7	• Develop the mindset for modern trends in manufacturing and automation.		
<b>Pre-Requisite:-</b>			
<b>S.No</b>			
1	Knowledge of basic manufacturing processes.		
<b>Contents</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hrs/week</b>	<b>Marks</b>
01	<b>Non traditional machining processes</b> 1.1 Electrical discharge Machining. Principle of working, Setup of EDM, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, Applications e.g. microhole drilling, curve hole drilling. 1.2 Wire cut EDM - Principle of working, Setup of WEDM, controlling Parameters, Applications. 1.3 Laser Beam Machining. Physical principle of Laser, Laser action in ruby rod, Types of Lasers. Set-up for LBM. Characteristics, controlling Parameters, Applications, Application Of Laser Beam for Welding (LBW) 1.4 Principle of working & Applications of ECM & USM .	10	
	<b>Jigs and Fixtures</b> Introduction. Difference between jig and fixture Different components of Jig/ fixture 3-2-1 principle of location. Types of locators and clamping devices.	4	

	General principles of jig/fixture design. Types of jigs and fixtures.		
	<p><b>CNC Machine Tools:</b> Concept of NC &amp; CNC, CNC Turning Centre, Advantages &amp; Disadvantages of CNC machine tools, Applications of NC/CNC Machine, Classification of CNC M/C Tools (Based on motion type, based on control loops, based on axis, based on power supply), Different components of CNC machine tools &amp; their functions, Components of CNC System (function &amp; application): Stepper motor, Servo motor, Encoders (rotary &amp; linear encoder), Recirculating ball screw, Automatic tool changer, Tool magazine. work holding methods for turning centre(name &amp; relative advantage &amp; disadvantage), work holding methods for machining centre(name &amp; relative advantage &amp; disadvantage), steps in CNC process.</p> <p>Part Programming: concept of part programming, reference point (Machine Zero, Program Zero, Part Origin), Axis identification of Turning Centre &amp; Machining Centre, CNC Codes for manual part programming G – codes, M- Codes, Spindle speed control, feed rate control, Tool selection) part programming for turning centre using different codes &amp; fixed cycles (canned cycle, do-loop &amp; Subroutine) to get step, taper, plain &amp; circular turning, facing, external threading &amp; parting off operation. part programming for machining centre considering Cutter radius compensation, ramp on/off motion, tool offset and using different codes, canned cycles &amp; subroutine for generating different milled surface. CNC part program verification.</p> <p>Principles of computer aided part programming.</p>	12	
4	<p><b>FMS:</b> Concept, Basic components of FMS (Different workstations, Automated material handling &amp; storage system, computer control system), types of FMS layout, objectives of FMS, advantages &amp; disadvantages of FMS.</p>	4	
	<b>Total</b>	30	

**Practical:**

Skills to be developed:

Intellectual skills:

- 1) To select an appropriate non conventional machining process for required component.
- 2) To write programs for CNC milling machine.
- 3) To specify the requirement for special purpose machines and automation.
- 4) To select the maintenance procedure for given machine tool.

Motor Skills:

- 1) To execute part programs on CNC milling machine / machining center.
- 2) To repair and maintain machine tools and sub systems.
- 3) To use and operate different hand tools required for repair and maintenance.
- 4) To identify and rectify the faults in the given sub assembly.

**Notes:** 1. The workshop instructors should prepare specimen job in each shop as demonstration practice before the student (as per the drawing given by subject teacher / workshop superintendent)

2. Theory behind practical is to be covered by the concerned subject teacher / workshop Superintendent.

3. Workshop diary should be maintained by each student duly signed by respective shop instructors

**List of Practical:(Any five):**

- 1) Study of Non traditional machining process like EDM, Wire EDM , ECM ,USM & also one assignment on the processes.
- 2) Study of CNC lathe & CNC Milling machine & identify different parts, drives , automatic tool changer and also tool magazine
- 3) Practice on making Eccentric turning in a round job using centre lathe.
- 4) One assignment on part programming of straight turning , taper turning , radius forming operation in a

turning centre

- 5) Practice on making simple job like straight turning , taper turning ,radius forming by CNC lathe machine
- 6) One assignment on part programming on machining centre
- 7) Practice on making simple job by CNC machining centre
- 8) Practice on making face milling, slotting, contour machining on a machining centre
- 9) One assignment on machine tool installation process

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Amitabh Ghosh , Mallik	Manufacturing Science		East-West Press Pvt. Ltd.
HMT Bangalore	Production Technology		Tata McGraw-Hill
H.P.Garg	Industrial maintenance		S. Chand & Co. Ltd.
S. K. Hajra Chaudary, Bose, Roy	Elements of workshop Technology – Volume I & II		Media Promoters and Publishers limited
P. K. Mishra	Non conventional Machining		Narvasa Publishing House
Lindley R. Higgins	Maintenance Engg. Handbook		Mc-Graw Hill
B. L. Juneja	Fundamental of metal cutting and machine tools		New age international limited.
Steve Krar, Albert Check	Technology of Machine Tools.		Mc-Graw-Hill International
O. P. Khanna and Lal	Production Technology - Volume I & II		Dhanpat Rai Publications.
W.A.J. Chapman, S.J.Martin	Workshop Technology - Volume I , II & III		Viva Books (p) Ltd.
O.P. Khanna	A text book of Foundry Tech.		Dhanpat Rai Publications.
R.B. Gupta	Production Technology		Satya Prakashan New Delhi
H.S.Bawa	Workshop Technology Volume-I& II		Tata McGraw-Hill
John A. Schey	Introduction to Manufacturing Processes		McGraw-Hill
M. Adithan A. B. Gupta	Manufacturing Technology		New age International
Pabla B. S. M. Adithan	CNC machines		New age international limited.
B. L. Juneja	Fundamental of metal cutting and machine tools		New age international limited.
Steve Krar, Albert Check	Technology of Machine Tools.		McGraw-Hill International
P. N. Rao	CAD/CAM Principals and Applications		Tata McGraw-Hill
P. N. Rao	Manufacrating Technology Metal Cutting & Machne tools		Tata McGraw-Hill

<b>Reference books :- Nil</b>	
<b>Suggested List of Laboratory Experiments :- Nil</b>	
<b>Suggested List of Assignments/Tutorial :- Nil</b>	

**Examination Schedule Internal practical Sessional:**

Making job (4 task) & submitting job sheet in scheduled time		4X5 = 20	
Viva - voce		4X2.5 = 10	
Attending classes for studying different machines and submitting respective assignment		3X4 = 12	
Viva voce & skill in operating machine		8	
Total:		50	

**Examination Schedule: External practical Sessional examination**  
**Examiner : Lecturer in Mechanical Engineering & Foreman (Work Shop).**

For Making job (4 task) & submitting signed job sheet in scheduled time		4X2.5 = 10	
On spot job		20	
viva voce on study		20	
		50	

**End Semester EXAMINATION SCHEME**

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2	10	20	1	20	5	FIVE (AT LEAST TWO FROM EACH GROUP)	10	50
B	3,4	10				5			



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<b>Name of the Course :</b> Diploma in Mechanical Engineering		
Subject Title: Measurement & Control		
<b>Course code:</b> ME/	<b>Semester :</b> Fifth	
<b>Duration :</b> 17 weeks	<b>Maximum Marks :</b> 100	
<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	
	<b>Internal Assessment:</b> 10 Marks	
Theory : 2 hrs/week	<b>Teacher's assessment (Assignment &amp; Quiz):</b> 05 Marks	
Tutorial: hrs/week	<b>End Semester Exam:</b> 35 Marks	
Practical : 2 hrs/week	<b>Practical: Internal Sessional continuous evaluation:</b> 25 Marks	
Credit: 3	<b>Practical: External Sessional Examination:</b> 25 Marks	
<b>Aim :-</b>		
	<p style="text-align: center;">The art of measurement plays an important role in all branches of engineering. With advances in technology, measurement techniques have also taken rapid changes, with many types of instrumentation devices, innovations, refinements. The course aims at making a Mechanical Engineering student familiar with the principles of instrumentation, transducers &amp; measurement of non electrical parameters like temperature, pressure, flow, speed, force and stress.</p>	
<b>S No</b>	The student will able to	
	<ol style="list-style-type: none"> <li>1. Understand the principle of operation of an instrument.</li> <li>2. Identify different functional elements of measuring system</li> <li>3. Appreciate the concept of calibration of an instrument.</li> <li>4. Select Suitable measuring device for a particular application.</li> <li>5. Measure different mechanical measuring quantity</li> <li>6. Know the working principle of transducers.</li> </ol>	
<b>Pre-Requisite:-</b>		
<b>S.No</b>		
	<b>Contents</b>	<b>Hrs/week</b>
<b>Chapter</b>	<i>Name of the Topic</i>	<b>Hours</b>
<b>Group A</b>		
01	<p><b>Introduction to measuring system:</b> Significance Of Measurement, block diagram of a measuring system, Functional Elements Of measurement System, Classification Of Instrument.</p> <p><b>Introduction to Control system:</b> Function of control system, Block diagram of open loop &amp; closed loop system, Basic elements of closed loop system.</p>	05

	<b>Example</b> of measurement & control system for Heating a room at specific temperature, Maintain a particular shaft speed.	
02	<b>Displacement measurement:</b> Working principle & use of Potentiometer, Differential transformer (LVDT & RVDT), Capacitive element & Optical encoders.	<b>04</b>
03	<b>Speed Measurement:</b> Mechanical tachometer, Electrical Tachometer, incremental optical encoder, Eddy current drag cup tachometer, Magnetic pickup tachometer, Stroboscopic tachometer, Photoelectric tachometer, non contacting electrical tachometer (inductive pick up & capacitive pick up)	<b>06</b>
<b>Group B</b>		
04	<b>Temperature measurement:</b> Pressure thermometer, Resistance Temperature Detector, Platinum resistance thermometer, Thermistors, Thermocouple, Quartz thermometer, radiation pyrometer, optical pyrometer.	<b>03</b>
05	<b>Flow Measurement:</b> Variable area meter – Rotameter, Variable velocity meter – Anemometer, Special methods – ultrasonic flow meter, hot wire anemometer, electromagnetic flow meter.	<b>03</b>
06	<b>Miscellaneous Measurement:</b> <b>Acoustic Measurement:</b> Characteristics of Sound, sound measuring system Sound level meter (using Piezo – electric crystal type microphone). <b>Force measurement:</b> Electromechanical method, strain gauge load cell. <b>Shaft power measurement:</b> Eddy current dynamometer, Strain gauge transmission dynamometer <b>Strain measurement:</b> strain gauge materials, resistance strain gauge – unbounded & bonded, wire gauge, foil gauge & semiconductor gauge, strain gauge rosettes. <b>Humidity measurement:</b> Hair hygrometer, humistor hygrometer. <b>Liquid level:</b> floats, differential pressure cell	<b>06</b>
07	<b>Control systems:</b> Servomotor, mechanism & comparison of hydraulic, pneumatic, electronic control systems, proportional control action.	<b>03</b>
<b>Total</b>		<b>30</b>

**Practical:**

Skills to be developed:

Intellectual skills:

1. Analyse the result of calibration of thermister.
2. Interpret calibration curve of a rotameter.
3. Evaluate the stress induces in a strain gauge.

4. Verify the characteristics of photo transistor and photo diode.

Motor skills:

1. Test and calibration of a thermocouple.
2. Handle various instruments.
3. Draw the calibration curves of rotameter and thermister.
4. Measure various parameters using instruments.

**List of Practical: (Any five)**

1. Measurement of strain by using a basic strain gauge and hence determine the stress induced.
2. Measurement of velocity of compressible fluid across a duct using Anemometer.
3. Speed Measurement by using Stroboscope / Magnetic / Inductive Pick Up.
4. Measurement of flow by using Rotameter.
5. Calibration of given LVDT.
6. Temperature control using Thermal Reed switch & Bimetal switch.
7. Temperature measurement using Thermocouple.
8. Determination of negative temperature coefficient and calibration of a Thermister.
9. Measurement of force & weight by using a load cell.
10. Liquid Level Measurement by using floats/ differential pressure cell system.
11. Verify characteristics of photo transducer & photo diode.

**Examination Schedule Internal practical Sessional:**

Attending classes, practicing programs & submitting respective assignment in time		5 x 4 =20	
Viva - voce		5	
Total:		25	

**Examination Schedule: External practical Sessional examination**  
 Examiner: **Lecturer**

For submission of assignment in scheduled time		5 x 2 = 10	
On spot experiment		10	
viva voce		05	
Total		25	

**Reference books :- Nil**

**Suggested List of Laboratory Experiments :- Nil**

**Suggested List of Assignments/Tutorial :-**

G R O U P	Chapter	ONE OR TWO SENTENCE ANSWER QUESTIONS				G R O U P	Chapter	SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS			TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A		5	10	1	1 X 10 = 100	A		5	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	5	5 X 5 = 25
B		5				B		5			

### List of Books:

Sr. No.	Author	Title	Publication
	Beckwith	Mechanical Measurement	Pearson
	Doebelin	Measurement Systems	Mc Graw Hill
	N V Raghavendra L Krishnamurthy	Engineering Metrology & Measurements	Oxford
	R.K.Rajput	Mechanical Measurement & Instrumentation	S.K. Kataria & Sons
	A.K.Sawhney	Mechanical Measurements & Instrumentation	Dhanpat Rai & Sons, New Delhi.
	R.V. Jalgaonkar	Mechanical Measurement & Control	Everest Publishing House, Pune
	Figliola	Theory & Design for Mechanical Measurements, 3ed, w/cd	Wiley
	Katta Narayana Reddy P.S.R. Krishnudu	Instrumentation & Control System	SCITECH
	John Turner Martyn Hill	Instrumentation for Engineers and Scientists	Oxford
	D.S.Kumar	Mechanical Measurements & Control	Metropolitan Publications, New Delhi
	C.S. Narang	Instrumentation Devices & Systems	Tata McGraw Hill Publications
	R.K.Jain	Mechanical & Industrial Measurements	Khanna Publications, New Delhi
	B.C.Nakra and K.K.Chaudhry	Instrumentation, Measurement and Analysis	Tata Mc Graw Hill Publication
	Bewoor	Metrology & measurement	Tata Mc Graw Hill Publication

<b>Name of the Course : Mechanical Engineering</b>				
<b>Subject: POWER ENGINEERING</b>				
<b>Course code: ME</b>		<b>Semester: Fifth.</b>		
<b>Duration: 17 weeks</b>		<b>Maximum Marks : 150</b>		
<b>Teaching Scheme</b>		<b>Examination Scheme:</b>		
Theory : 3 hrs/week		Internal Assessment: 20 Marks		
Tutorial: hrs/week		Teacher's Assessment (Assignment & Quiz): 10 Marks		
Practical : 2 hrs/week		End Semester Exam: 70 Marks		
Credit: 4		Practical: Internal Sessional continuous evaluation: 25 Marks		
		Practical: External Sessional examination: 25 marks		
<b>Aim :-</b>				
<b>S. No.</b>				
1	To study the Internal Combustion Engine.			
2	To understand the fundamentals of Steam Nozzle and Diffuser.			
3	To study working principle and construction of different types of Steam Turbines.			
4	To study the working principle of Gas Turbine and its industrial application.			
5	To understand the fundamentals of Jet Propulsion.			
6	To study the working principle of Hydraulic Turbines and their application in actual power generation.			
<b>Objective :-</b>				
<b>S. No.</b>	The Students should be able to:			
1	<ul style="list-style-type: none"> <li>Describe Internal Combustion Engine and should be able to calculate various performance characteristics of IC Engines by conducting trial.</li> </ul>			
2	<ul style="list-style-type: none"> <li>Explain the working principle and application of Steam Nozzle and Diffuser.</li> </ul>			
3	<ul style="list-style-type: none"> <li>Describe construction and working of various types of Steam Turbines.</li> </ul>			
4	<ul style="list-style-type: none"> <li>Understand working of Gas Turbine and its application.</li> </ul>			
5	<ul style="list-style-type: none"> <li>Explain the basic principle of Jet Propulsion.</li> </ul>			
6	<ul style="list-style-type: none"> <li>Understand working of Hydraulic Turbines and their application in actual power generation.</li> </ul>			
<b>Pre-Requisite:</b> Elementary knowledge on Physics, basic Mathematics, Thermal Engineering-I, Thermal Engineering-II and Fluid Mechanics.				
<b>Contents</b>			<b>Hrs/week</b>	
<b>POWER ENGINEERING</b>				
<b>Chapter</b>	<b>Name of the Topic</b>		<b>Hours</b>	<b>Marks</b>
<b>GROUP-A</b>				
	1.0	<b>I.C. Engine and Pollution Control:</b> Basic Principle, representation on P-V & T-S diagrams and deduction of Thermal Efficiency of Otto Cycle, Diesel Cycle and Dual Combustion Cycle. (Simple numerical) Classification of I.C. Engines. Working Principle, Construction with function of components and Comparison of Two-Stroke and Four-Stroke (Petrol and Diesel) Engines.	<b>14</b>	
	1.1			
	1.2			
	1.3			

	1.4	Hypothetical & Actual Indicator Diagram of Two-Stroke and Four-Stroke (Petrol and Diesel) Engines.		
	1.5	Valve Timing Diagram of Two-Stroke and Four-Stroke (Petrol and Diesel) Engines.		
	1.6	Brief Description of I.C. Engine Combustion (SI & CI), Firing-order of Multi-cylinder I.C. Engine, Scavenging, Preignition, Detonation, Supercharging, Turbo-charging, Simple Carburetor, M.P.F.I. and Fuel Injection Pump.		
	1.7	Basic Concept of Governing of I.C Engine, Lubrication of I.C Engine and Cooling of I.C Engine.		
	1.8	Performance of I. C Engine – Indicator Power, Brake Power, Morse Test, Mechanical Efficiency, Thermal Efficiency, Relative Efficiency (Efficiency Ratio), Volumetric Efficiency, Specific Fuel Consumption and Heat Balance Sheet. (Simple numerical)		
	1.9	Pollutants in Exhaust Gases of Petrol and Diesel Engines, their effects on environment and possible ways of reducing the Pollutants in the Exhaust Gases.		
<b>GROUP-B</b>				
	2.0	<b>Nozzles / Diffusers and Steam Turbines:</b>	<b>10</b>	
	2.1.0	<b>Nozzles / Diffusers:</b>		
	2.1.1	Working Principle, Classification and Application of Steam Nozzles & Diffusers.		
	2.1.2	Continuity Equation, Sonic Velocity and concept of Mach Number.		
	2.1.3	Steady Flow Energy Equation for flow through Steam Nozzles. (Simple numerical)		
	2.1.4	Concept of Critical Pressure and Critical Pressure Ratio.		
	2.2.0	<b>Steam Turbines:</b>		
	2.2.1	Classification of Steam Turbines		
	2.2.2	Working Principle, Construction with function of components of Simple Impulse Turbine and Simple Impulse-Reaction Turbine.		
	2.2.3	Velocity Diagrams, Work done, Power and Efficiency of Simple Impulse Turbine. (Simple numerical by using Graphical Method only)		
	2.2.4	Concept of Compounding of Steam Turbine.		
	2.2.5	Concept of Governing of Steam Turbine.		
	3.0	<b>Gas Turbine and Jet Propulsion:</b>	<b>10</b>	
	3.1.0	<b>Gas Turbine:</b>		
	3.1.1	Basic Principle, representation on P-V & T-S diagrams and deduction of Thermal Efficiency of Brayton or Joule Cycle. (No numerical)		
	3.1.2	Classification and Applications of Gas Turbine.		
	3.1.3	Comparison, labelled schematic flow diagram and function of components of Closed Cycle & Open Cycle Gas Turbines.		
	3.1.4	Methods to improve thermal efficiency of gas turbine		

		(Regeneration, Inter- Cooling, Reheating using T-S Diagram). (No analytical treatment)		
	3.2.0	<b>Jet Propulsion:</b>		
	3.2.1	Jet Propulsion – Basic Principles of Turbojet, Turbo Propeller & Ram Jet.		
	3.2.2	Rocket Propulsion- Solid Propellants and Liquid Propellants and Components & Function of Liquid Propellants Rocket Engine.		
<b>GROUP-C</b>				
	4.0	<b>Hydraulic Turbines:</b>	<b>11</b>	
	4.1	Classification of Hydraulic Turbines.		
	4.2	Construction and working principle of Pelton Wheel, Francis and Kaplan Turbine.		
	4.3	Draft Tubes – working principle and types, Concept of Cavitation in Turbines		
	4.4	Velocity Diagrams, Work done, Power and Efficiency of Pelton Wheel & Francis Turbine. (Simple numerical)		
	4.5	Basic concept of Governing of Turbine.		
	4.6	Specific Speed and Selection of turbine on the basis of head and discharge available.		
	4.7	Schematic Layout of Hydroelectric Power Plant.		
Sub Total:			<b>45</b>	
<b>Internal Assessment Examination &amp; Preparation of Semester Examination</b>			<b>6</b>	
<b>Total</b>			<b>51</b>	
<b>Practical:</b>				
<b>Skills to be developed:</b>				
<b>Intellectual Skill :</b>				
<ol style="list-style-type: none"> <li>1. Understand working principle and construction of (four-stroke / two-stroke) Petrol and Diesel Engine.</li> <li>2. Understand working principle and construction of Steam Turbines.</li> <li>3. Understand working principle of Gas Turbine.</li> <li>4. Understand working principle and construction of Hydraulic Turbines.</li> </ol>				
<b>Motor Skills :</b>				
<ol style="list-style-type: none"> <li>1. Conduct dismantling and reassembling an I.C. Engine.</li> <li>2. Conduct trial on I.C. Engine Test Rig to find out the Heat Balance in an I.C. Engine.</li> <li>3. Conduct trial on suitable Test Rig to determine I.P., B.P., Mechanical Efficiency and Thermal Efficiency of an I.C. Engine.</li> <li>4. Report on visit to Hydroelectric Power Plant.</li> </ol>				
<b>List of Practical:</b>				
<ol style="list-style-type: none"> <li>1. Study of (four-stroke / two-stroke) Petrol and Diesel Engine. (If possible conduct the study by dismantling and reassembling an I.C. Engine)</li> <li>2. Study of valve timing diagram of four-stroke Petrol and Diesel Engine.</li> <li>3. Determination of I.P., B.P., Mechanical Efficiency and Thermal Efficiency of an I.C. Engine through suitable method.</li> <li>4. Conduct trial on I.C. Engine Test Rig to find out the Heat Balance in an I.C. Engine.</li> <li>5. Conduct Morse Test on Multi-cylinder Diesel / Petrol Engine.</li> </ol>				

6. Study of Cooling System generally installed in four-stroke (single / multi-cylinder) I.C. Engine.
7. Study of Lubrication System generally installed in two-stroke I.C. Engine.
8. Study of Steam Turbines.
9. Study of Gas Turbine.
10. Study of Water Turbines.
11. Study of schematic layout of Hydroelectric Power Plant.

**Note:** At least **FIVE (05)** nos. of Practical / Study are to be conducted.

#### Text Books

Name of Authors	Titles of the Book	Edition	Name of the Publisher
V.M. Domkundwar	A Course in Thermal Engineering.		Dhanpat Rai & Co.
Dr. D.S.Kumar	Engineering Thermodynamics (Principles & Practices)		S.K. Kataria & Sons
P. L. Ballaney	A Course in Thermal Engineering.		Khanna Publishers
R. S. Khurmi	A text book of Thermal Engineering.		S. Chand & co. Ltd.
R. K. Rajput	A Course in Thermal Engineering.		Laxmi Publication, Delhi
Patel and Karmchandani	Heat Engine Vol. - I & II		Acharya Publication
P. K. Nag	Engineering Thermodynamics		Tata McGraw Hill
B. K. Sarkar	Thermal Engineering		Tata McGraw Hill
A.R. Basu	Thermal Engineering (Heat Power)		Dhanpat Rai & Co.
R. k. Jain	Automobile Engineering		Tata McGraw Hil
S. Ramamrutham	Hydraulic & Fluid Machines		Dhanpat Rai and Sons New Delhi
SAWHNEY	Thermal and Hydraulic Machines		PHI

#### **Suggested List of Assignments / Tutorial :-**

1. Simple numerical on Otto Cycle, Diesel Cycle, Dual Combustion Cycle and Performance of I. C Engine.
2. Simple numerical related to Velocity Diagrams, Work done, Power and Efficiency of Simple Impulse Turbine by using Graphical Method only.
3. Draw labelled schematic flow diagram and write function of components of Closed Cycle & Open Cycle Gas Turbines.
4. Simple numerical related to Velocity Diagrams, Work done, Power and Efficiency of Pelton Wheel & Francis Turbine.

### **EXAMINATION SCHEME: END SEMESTER EXAMINATION**

GROUP	MODULE OR CHAPTER	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1	08	ANY 20	1	20	4	FIVE, ( AT LEAST	10	50

B	2,3	07				3	ONE FROM EACH GROUP)		
C	4	05				3			

**EXAMINATION SCHEME FOR PRACTICAL SESSIONAL**

<b>Internal Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Five No. of Experiments / Study attended & respective lab note submitted in due time.	5 x 3 = 15		
VIVA VOCE	10		
<b>TOTAL</b>	25		
<b>External Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Submission of Signed Lab Note Book (for five experiments / study)	5 x 2 = 10		
On spot experiment / study (one for each group consisting 15 students / explanation on study item)	10		
VIVA VOCE	5		
<b>TOTAL</b>	25		

<b>Name of the Course : DIPLOMA IN MECHANICAL ENGINEERING (AUTOMOBILE ENGINEERING (ELECTIVE – I))</b>		
<b>Course code:</b>	<b>Semester : Fifth</b>	
<b>Duration :</b>	<b>Maximum Marks : 100</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme:</b>	
Theory : 3 hrs/week	<b>Internal Assessment:</b> 10 Marks	
Tutorial: hrs/week	<b>Teacher's assessment (Assignment &amp; Quiz):</b> 05 Marks	
Practical : 2 hrs/week	<b>End Semester Exam:</b> 35 Marks	
Credit: 4	<b>Practical: Internal Sessional continuous evaluation:</b> 25 Marks	
	<b>Practical: External Sessional Examination:</b> 25 Marks	
<b>Aim :-</b>		
<b>S.No</b>		
1	To understand & apply the knowledge about various system, subsystems & their inter-relationships of the automobile for the manufacturing of advanced automotive techniques.	
<b>Objective :-</b>		
S No	The student will able to	
1	Know automotive market in India.	
2	Identify various automotive systems & subsystems.	
3	Explain working & construction of various automotive systems & subsystems..	
4	Carry out preventive maintenance & performance resting of vehicle.	
<b>Pre-Requisite:-NIL</b>		
<b>Contents</b>		<b>Hrs/week</b>
<b>Chapter</b>	<i>Name of the Topic</i>	<b>Hours</b>
<b>Group:A</b>		
01	<b>Introduction of Automobile</b> 1.1 Classification of automobiles 1.2 Vehicle layout & types 1.3 Body construction - Types & Nomenclature of car body. Introduction to aerodynamic body shapes 1.4 Automobile market in India of "on road vehicles", major manufacturers, their products & their collaborations.	03
02	<b>Fuel supply system</b> 2.1 Fuel feed system in S.I engine, types, gravity & pump feed system, layout of S.I engine fuel pump system, function of each components 2.2 Fuel mixing & circuit control system, carburetor, types, working principle of simple carburetor, requirement of air- fuel ratio, defects of carburetor & its remedy Circuits of carburetor, float, starting, idling, low speed, high speed & accelerating circuit Petrol injection system, types, layout & working principle of multi point fuel injection system, advantages & disadvantages 2.3 Fuel supply system in C.I engine, layout, components ,function, types, working & line diagram of common rail, individual pump system, fuel injectors, single orifice, multiple orifice	05
<b>Group:B</b>		
03	<b>Automobile Transmission</b> 3.1 Clutch- necessity, construction & working of coil spring & diaphragm spring type clutch. 3.2 Gear Box- tractive effort and tractive resistance, types of G.B construction & working of constant mesh G.B., & synchromesh G.B., Epicyclic G.B., Torque converter, Overdrive, Transfer case 3.3 Final drive- necessity, construction & working of propeller shaft & differential. 3.4 Axle- Type of rear axles, front axles & their applications	10

04	<b>Control Systems</b> 4.1 Steering system- Requirement of steering system. Construction and working of steering linkage. Steering gear box- construction & working of rack and pinion & re-circulating ball type gearbox. Introduction to Power steering, Steering geometry- camber, caster, toe-in, toe-out, Kingpin inclination & their effects. 4.2 Brake system- construction & working of hydraulic & Pneumatic brakes. Comparison of disc & drum brake.	10
<b>Group:C</b>		
05	<b>Suspension systems, wheels &amp; Tyres</b> 5.1 Necessity & classification of suspension system. 5.2 Working & construction of Leaf spring, rigid axle suspension. 5.3 Introduction to air suspension 5.4 Construction & working of McPherson & wishbone, trailing link suspensions. 5.5 Construction & working of telescopic shock absorbers. 5.6 Construction & working of spoked wheel, disc wheel & light alloy cast wheel. 5.7 Types of rims, their construction & working. 5.8 Construction, working & comparison of radial, cross-ply and tubed, tubeless tyre & tyre specifications 5.9 Factors affecting tyre life 5.10 Wheel Alignment and Balancing	8
06	<b>Automobile Electrical Systems &amp; Body</b> 6.1 Battery- working, construction & rating of battery. 6.2 Ignition system- construction & working of electronic and CDI ignition system. 6.3 Starting system- construction & working of starting motor. 6.4 Charging system- construction & working of alternator 6.5 Wiring system-harnessing & colour codes. 6.6 Lighting system-head light, tail light, indicator light & their circuits. 6.7 Gauges- construction & working of Fuel level gauge, oil gauge and water temperature gauge. 6.8 Use of microprocessor in automobile control systems	8
	<b>Total</b>	44
<b>Practical:</b> Skills to be developed: Intellectual Skills: 1. Select tools and equipments 2. Find fault of battery and charging system 3. Identify component and system 4. Use service manual for information search 5. Compare conventional fuels with LPG and CNG fuels for automobiles 6. Observe various components and systems like transmission, braking and charging Motor Skills: 1. Understand proper handling of tools, equipments 2. Adopt the recommended procedures of maintenance, testing – as mentioned in service manual 3. Handle components of CNG and LPG kit <b>List of Practical: (Any five)</b> 1. Carrying out preventative maintenance of four wheeler as per manufacturers specifications. 2. Carrying out preventative maintenance of two wheeler as per manufacturers specifications. 3. Demonstration of single plate coil spring & diaphragm spring type clutch. 4. Demonstration of synchromesh gearbox. 5. Demonstration of differential. 6. Demonstration of rack & pinion steering gearbox. 7. Demonstration of rigid axle suspension. 8. Demonstration of hydraulic brake system		

9. Testing of battery and charging system.  
 10. Study of LPG / CNG kit retrofitting.  
 11. Visit to four- wheeler service station & any automobile manufacturing unit.  
 12. Mini project :- Student will prepare a project report & present a seminar  
 Title:- Automotive market In India.  
 Collect following information.  
 a) Top 10 Car/MUV/2W/Heavy vehicle Manufacturers in India & their sale in last 2 Years.  
 b) Top 5 models of Car/MUV/2W/Heavy vehicle Manufacturers in India.  
 c) New models launched in last 3 years of Car/MUV/2W/Heavy vehicle. Survey modern features in these vehicle.  
 d) Proposed launches in next two years in Car/MUV/2W/Heavy vehicle. Survey modern features in these vehicle

### EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2	6	10	1	10	3	FIVE AT LEAST ONE FROM EACH GROUP	5	25
B	3,4	6				4			
C	5,6	6				3			

Name of Authors	Titles of the Book	Edition	Name of the Publisher
K. K. Jain and R.B. Asthana	Automobile Engineering		Tata Mcgraw hill
William Crouse	Automobile Mechanics		Tata Mcgraw hill
SRINIVASAN	Automobile Mechanics		Tata Mcgraw hill
H.M.Sethi	Automotive Technology		Tata Mcgraw hill
G.B.S. Narang	Automobile Engineering		Khanna Publication
Harold T. Glenn	Auto Mechanics		Bennett & Mckknight
Kirpal Singh	Automobile Engineering Vol. I and Vol. II		Standard Publication
S.K.Gupta	A text book in Automobile Engineering		S.Chand
K.Ramakrishna	Automobile Engineering		P.H.I
R.K.Singal	Automobile Engineering		S.K.Kataria

#### **C. D.**

- C. D. Prepared By MSBTE under its CAI Package Program.
- C. D. on various Topics of Automobile Engineering By SAE

#### **Reference books :- Nil**

#### **Suggested List of Laboratory Experiments :- Nil**

<b>Suggested List of Assignments/Tutorial :- Nil</b>	

**EXAMINATION SCHEME FOR PRACTICAL SESSIONAL**

<b>Internal Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Five No. of Experiments / Study attended & respective lab note submitted in due time.	5 x 3 = 15		
VIVA VOCE	10		
<b>TOTAL</b>	25		
<b>External Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Submission of Signed Lab Note Book (for five experiments / study)	5 x 2 = 10		
On spot experiment / study (one for each group consisting 15 students / explanation on study item)	10		
VIVA VOCE	5		
<b>TOTAL</b>	25		



## West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)  
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

<b>Name of the Course :</b> Diploma in Mechanical Engineering		
Subject Title: Mechatronics ( Elective I)		
<b>Course code:</b> ME/	<b>Semester :</b> Fifth	
<b>Duration :</b> 17 weeks	<b>Maximum Marks :</b> 100	
<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	
Theory : 3 hrs/week	<b>Internal Assessment:</b> 10 Marks	
	<b>Teacher's assessment (Assignment &amp; Quiz):</b> 05 Marks	
Tutorial: hrs/week	<b>End Semester Exam:</b> 35 Marks	
Practical : 2 hrs/week	<b>Practical: Internal Sessional continuous evaluation:</b> 25 Marks	
Credit: 4	<b>Practical: External Sessional Examination:</b> 25 Marks	
<b>Aim :-</b>		
<b>S.No</b>		
1	The integration of electronics engineering, electrical engineering, computer technology, and intelligent control engineering with mechanical engineering is increasingly forming a crucial part in the design, manufacture and maintenance of wide range of engineering products and processes. As a consequence there is a need for a diploma engineers to understand systems used in automation.	
<b>S No</b>	Students should be able to:	
	<ol style="list-style-type: none"> <li>1. Identify various input and output devices in an automated system.</li> <li>2. Understand and draw ladder diagrams.</li> <li>3. Write simple programs for PLCs.</li> <li>4. Interpret and use operations manual of a PLC manufacturer.</li> <li>5. Use simulation software provided with the PLC.</li> <li>6. Understand interfacing of input and output devices.</li> </ol>	
<b>Pre-Requisite:-</b>		
<b>S.No</b>		
1	Elementary knowledge on basic electronics, basic electrical engineering, mechanical device, hydraulic & pneumatic circuit, transducer & sensor.	
<b>Contents</b>		
<b>Chapter</b>	<i>Name of the Topic</i>	<b>Hrs/week</b> <b>Hours</b>
<b>Group A</b>		
01	Concept of Mechatronics, Constituents of Mechatronics System, Application of Mechatronics in manufacturing, Introduction to Sensors & transducers, Principle of working and applications of Limit switches, proximity switches like inductive, capacitive and optical (deflecting and through beam type) , Thumb wheel switches , magnetic reed switches, Optical encoders-displacement measurement, rotary, incremental.	03

02	<b>Pneumatic, Hydraulic &amp; Electrical Actuation System</b> : Actuator – solenoids – on-off applications, latching, triggering, Types of relays- solid state, Types of motors – DC motors, DC brushless motors, AC motors, stepper motors, servo motors	<b>03</b>
03	<b>Computing Elements in Mechatronics: 8085 Microprocessor</b> - Architecture, Pin configuration, working of microprocessor, and applications. Introduction to ICs used for interfacing such as – Programmable peripheral devices , USART, memory, keyboard, display – LCD,LED,I/O device, ADC, DAC.  <b>8051 Microcontroller</b> - Architecture, Pin configuration, working of microcontroller, Applications. Comparison of microprocessor and microcontroller , advantages and disadvantages <b>Programmable Logic Controller</b> - Introduction, PLC definition, PLC block diagram, Difference between relay panel and PLC, power supply, input/output modules (analog, digital) concepts of sink/source, set/reset, latch/unlatch, advantages and disadvantages. Installation , troubleshooting and maintenance of PLC	<b>05</b>  <b>03</b>  <b>08</b>
<b>Group B</b>		
04	<b>PLC Programming</b> – Ladder diagrams and sequence listing, large process ladder diagram construction, flowcharting as a programming method , Basic PLC functions. Register basics, timer functions, counter functions Intermediate functions – Arithmetic functions, number comparison and number conversion functions  Data handling functions- SKIP, Master control relay, Jump, Move, Block move, Table to register and register to table move functions. FIFO and LIFO functions, File Arithmetic and Logic function PLC digital bit functions and applications Sequencer functions and cascading of sequencers PLC matrix functions Discrete and analog operation of PLC, Networking of PLCs. PLC auxiliary commands and functions,	<b>21</b>
05	Online, offline, stop/run modes of operations, uploading/downloading between PLC and PC, Introduction to SCADA and DCS	<b>02</b>
<b>Total:</b>		<b>45</b>
<b>Suggested List of Assignments/Tutorial :- Nil</b>		

**Practical:**

Intellectual Skills:

1. Identification of various sensors and transducers used in automated systems
2. Interpretation of circuits in automation
3. Interpretation and use

Motor skills:

1. Use of simulation software for PLCs
2. Preparation of ladder diagrams
3. Testing of interfacing ICs

**List of Practical: (Sl. No. 3 compulsory & Atleast three from the rest)**

Term work shall consist of detailed report on the following experiments:

1. Identification and demonstration of different sensors and actuators.
2. Demonstration of the working of various digital to analog and analog to digital converters.
3. Development of ladder diagram, programming using PLC for (any four)
  - a) measurement of speed of a motor
  - b) motor start and stop by using two different sensors
  - c) simulation of a pedestrian traffic controller
  - d) simulation of four road junction traffic controller
  - e) lift / elevator control
  - f) washing machine control
  - g) tank level control
  - h) soft drink vending machine control
4. Trace, interpret and demonstrate working of at least two electro pneumatic systems.
5. Trace, interpret and demonstrate working of at least two electro hydraulic systems.

**List of Books:**

Sr.No.	Author	Title	Publication
01	Bolton W.	Mechatronics- Electronic control systems in Mechanical and Electrical Engineering	Pearson Education Ltd.
02	Histand B.H. and Alciatore D.G.	Introduction to Mechatronics and Measurement systems	Tata McGraw Hill Publishing
03	John W. Webb and Ronald Reis	Programmable Logic Controllers	Prentice Hall of India
04	NIIT	Programmable Logic Control – Principles and Applications	Prentice Hall of India
	Mitra & Sengupta	Programmable Logic Controller & Industrial Automation	Penram International Publishing
	Paul P.L. Regtien	Sensors for Mechatronics	Elsevier
	Appu Kuttan K.K.	Introduction to Mechatronics	Oxford
	Surekha Bhanot	Process Control Principles & Applications	Oxford
05	Kolk R.A. and Shetty D.	Mechatronics systems design	Vikas Publishing, New Delhi

06	Mahalik N.P.	Mechatronics principles, concepts and applications	Tata McGraw Hill Publishing
	R.K.Rajput	A Text book of Mechatronics	S. Chand
	H.M.T	Mechatronics	Tata McGraw Hill Publishing
	Ramachandran	Mechatronics	Wiley

### Internal practical Sessional examination Scheme

Attending classes, practicing programs & submitting respective assignment in time		5x4= 20	
Viva - voce		5	
Total:		25	
<b>Examination Schedule: External practical Sessional examination</b>			
Examiner: <b>Lecturer / Jr. Lecturer</b>			
For submission of assignment in scheduled time		5x2= 10	
<b>On spot activity</b>		10	
viva voce		05	
Total		25	

G R O U P	Chapter	ONE OR TWO SENTENCE ANSWER QUESTIONS				G R O U P	Chapter	SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS			TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2,3	5	10	1	1 x 10 = 10	A	1,2,3	5	FIVE, TAKING AT LEAST TWO FROM EACH GROUP	5	5 x 5 = 25
B	4,5	5				B	4,5	5			

<b>Name of the Course : DIPLOMA IN MECHANICAL ENGINEERING (POWER PLANT ENGINEERING (ELECTIVE-I))</b>		
<b>Course code:</b>	<b>Semester : Fifth</b>	
<b>Duration :</b>	<b>Maximum Marks : 100</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme:</b>	
Theory : 3 hrs/week	<b>Internal Assessment:</b> 10 Marks	
Tutorial: hrs/week	<b>Teacher's assessment (Assignment &amp; Quiz):</b> 05 Marks	
Practical : 2 hrs/week	<b>End Semester Exam:</b> 35 Marks	
Credit: 4	<b>Practical: Internal Sessional continuous evaluation:</b> 25 Marks	
	<b>Practical: External Sessional Examination:</b> 25 Marks	
<b>Aim :-</b>		
<b>S.No</b>		
1	Industries are expected to generate their own power and supply the excess power to national grid. Alternate energy sources are also harnessed to meet the increasing demand. To study the layout, components of different power plants and economic aspects of power plants.	
<b>Objective :-</b>		
S No	The student will able to	
1	Get familiar with present and future power scenario of India.	
2	Calculate efficiency of power generation cycles.	
3	Understand working of high pressure boilers, coal and ash handling systems of power plant.	
4	Draw layout, understand the working and compare different power plants.	
5	Enlist sources of waste heat and explain method of heat recovery.	
6	Explain constructional features of non conventional energy source devices.	
7	Appreciate economical and operational aspects of power plants.	
<b>Pre-Requisite:-</b>		
	Knowledge of basic thermodynamics & heat power	
<b>Contents</b>		<b>Hrs/week</b>
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>
<b>Group:A</b>		
01	<b>Introduction to power plant</b> 1.1 Power scenario in India 1.2 Types of power plants – Hydro, Nuclear, Thermal, Future trends in Power sector.	02
02	<b>Steam power plant</b> 2.1 Layout of steam power plant, general features of selection of site 2.2 High pressure boilers – Construction and working of Sub-critical and Super-critical boilers. 2.3 Chronological development of Boilers [Stoker Fired,Pulvarised Fuel Fired Boiler, Front Fired boilers, Tangentially Fired Boiler, Bottom Fired Boiler] 2.4 Coal and ash handling system- equipments for in plant handling of coal such as belt conveyor, screw conveyor, bucket elevator, Coal crushing, Pulverized fuel handling system, Ball mill, Pulverized fuel and their advantages, Multi retort stoker, Pulverized fuel burner, Hydraulic and pneumatic ash handling, Electrostatic precipitator. 2.5 Boiler Feed water treatment 2.6 Environmental aspects of steam power plant - water pollution, air pollution, emission standard and its control 2.7 Generator Cooling System.	08
<b>Group:B</b>		

03	<b>Nuclear power plant</b> 3.1 Fusion and fission reaction, general criteria for selection of site. 3.2 Elements of nuclear power station, layout, types of nuclear reactors. 3.3 Nuclear fuels, coolant & moderators. 3.4 Working of PWR, BWR, CANDU, BREEDER type reactor. 3.5 Safety precautions and waste disposals.	05
04	<b>Gas turbine power plant</b> 4.1 General Layout, selection of site, Gas turbine power plants in India. 4.2 components of gas turbine plants, gas turbine Fuels. 4.3 Comparison of Gas turbine plant with diesel and Steam power plant. 4.4 Environmental impact of gas turbine power plant. Waste Heat recovery	05
<b>Group:C</b>		
05	5.1 Sources of waste heat 5.2 Heat recovery forms & methods – Sensible and latent Heat recovery. 5.3 Use of waste heat- Agricultural, green house, Animal shelter, Aqua cultural uses, process heating. 5.4 waste Heat recovery boilers	05
06	<b>Non conventional power generation plants</b> 6.1 Geothermal power plant- types, economical justification 6.2 Tidal power plant- factors affecting suitability of site, working of different tidal power plants, advantages and disadvantages 6.3 Wind power plant- different types, advantages and Disadvantages. 6.4 Solar power plant 6.5 Magneto Hydro dynamics power plant 6.6 Small hydro power plant 6.7 Introduction to Plasma technology in Power Generation.	10
07	<b>Economics and operational aspects</b> 7.1 Prediction of load, selection of types of generation, number of generating units. 7.2 Load duration curves, cost analysis, elements, controlling the cost of power plant (simple numerical) 7.3 Major electrical equipments in power station- generator, step-up transformer, switch gear, electrical motors	8
	<b>Total</b>	43

**Practical:**

Skills to be developed:

Intellectual skills:

1. Understand working of various power plants.
2. Understand constructional features and working of devices used in non conventional energy sources.
3. Understand economical and operational aspects of power plants.
4. Calculate the efficiency of power generation cycles.

Motor skills:

**List of Experiments/Studies:**

1. List technical details of components and subsystems of power plants.
  - a)HP & LP Heater feed cycle
  - b)Condenser Cooling System including Cooling Tower.
  - c) Generator Cooling System.
  - d)HP & LP Bypass system.
  - e)Turbine sealing system.
2. Draw layouts of different power plants
3. Operate devices using solar energy inputs

Name of Authors	Titles of the Book	Edition	Name of the Publisher
P. K. Nag	Power plant engineering		Tata Mcgraw hill
Fredrick T. Mosse	Power plant engineering		East-West press
A. Chkrabarti and M. L. Soni	A text book of Power System Engineering		Dhanpat Rai and Co
Arora and Domkundwar	A course in power plant engineering		Dhanpat Rai and Co
Thomas C. Elliott,	Standard handbook of power plant engineering 1997		Tata McGraw Hill
M.K.Gupta	Power plant engineering		P.H.I
<b>2. Computer Based Training Packages/Computer Aided Instructions Packages/CDs:</b> 1. Power Plant Familiarization Vol-I to IV. - Ash Handling System. - Gas Turbine and combined cycle power plant. - Power Station Safety. - Environmental pollution & pollution control. - Pulverizes and feeders. - Renewable energy sources, ( Developed by National Power Training Institute , South Ambazari Road, Nagpur )			
<b>Reference books :- Nil</b>			
<b>Assignments:</b>			
	Visit to steam power plants/nuclear power plants/wind power plants/ Hydro power plants and prepare a report.(Any one Plant).		
	Collect information & Technical details of nuclear power plants.		
	Collect information & Technical details of Steam power plants.		
	Collect information & Technical details of Solar & Wind power plants.		
	Study of economic and operational aspects of power plants (simple numerical).		
	Assignment on Coal & Ash Handling system.		
	Assignment on Waste Heat recovery systems.		
<b>Suggested List of Laboratory Experiments :- Nil</b>			
<b>Suggested List of Assignments/Tutorial :- Nil</b>			

### EXAMINATION SCHEME FOR PRACTICAL SESSIONAL

<b>Internal Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Five No. of Experiments / Study attended & respective lab note submitted in due time.	5 x 3 = 15		
VIVA VOCE	10		
<b>TOTAL</b>	<b>25</b>		
<b>External Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			

Submission of Signed Lab Note Book (for five experiments / study)	5 x 2 = 10		
On spot experiment / study (one for each group consisting 15 students / explanation on study item)	10		
VIVA VOCE	5		
	25		

### **EXAMINATION SCHEME**

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2	6	10	1	10	3	FIVE AT LEAST ONE FROM EACH GROUP	5	25
B	3,4	6				4			
C	5,6,7	6				4			

<b>Name of the Course : DIPLOMA IN MECHANICAL ENGINEERING (TOOL ENGINEERING (ELECTIVE – I))</b>		
<b>Course code:</b>	<b>Semester : Fifth</b>	
<b>Duration :</b>	<b>Maximum Marks : 100</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme:</b>	
Theory : 3 hrs/week	<b>Internal Assessment:</b> 10 Marks	
Tutorial: hrs/week	<b>Teacher's assessment (Assignment &amp; Quiz):</b> 05 Marks	
Practical : 2 hrs/week	<b>End Semester Exam:</b> 35 Marks	
Credit: 4	<b>Practical: Internal Sessional continuous evaluation:</b> 25 Marks	
	<b>Practical: External Sessional Examination:</b> 25 Marks	
<b>Aim :-</b>		
<b>S.No</b>		
1	To impart, concepts, principles & procedures of tool engineering to achieve highest productivity and perform duties as a technician in tool room, shop floor, quality control & assist tool Engineer in design of tools and production processes	
<b>Objective :-</b>		
S No	The student will able to	
1	Select cutting tools and its material using data book and manufacturer's catalogue.	
2	Estimate tool wear and tool life.	
3	Use press tools and dies effectively.	
4	Design strip layout for given component.	
5	Decide appropriate cutting fluid for machining process improvement	
<b>Pre-Requisite:-NIL</b>		
<b>Contents</b>		
<b>Chapter</b>	<b>Name of the Topic</b>	
	<b>Hrs/week</b> <b>Hours</b>	
01	<b>Metal Cutting</b> <b>1.1</b> Mechanics of Metal cutting: requirements of tools, cutting forces – types of chips, chip thickness ratio, shear angle – simple numericals only, types of metal cutting process – orthogonal, oblique and form cutting. Cutting fluids – types, characteristics and applications. Tool wear, Types of wear, Tool life - Tool life equations. Machinability – definition, factors affecting machinability, machinability index. <b>1.2</b> Tool materials: Types, characteristics, applications. Heat treatment of tool steels, Specification of carbide tips, Types of ceramic coatings. <b>1.3</b> Cutting Tool Geometry: Single point cutting tool, drills, reamers, milling cutters.	18
02	<b>Press Tools</b> <b>2.1 Presses:</b> Types, Specification. <b>2.2 Types of dies and construction:</b> Simple Die, Compound Die, Progressive Die, Combination Die. Punch & die mountings, pilots, strippers, misfeed detectors, Pressure Pads, Knock outs, stock guide, Feed-Stop, guide bush, guide pins. <b>2.3 Die Design Fundamentals:</b> Die Operations- blanking, piercing, shearing, cropping, notching, lancing, coining, embossing, stamping, curling, drawing, bending, forming. Die set, Die shoe, Die area, Calculation of clearances on die and punch for blanking and piercing dies, Strip layout, Calculation of material utilization factor. <b>2.4 Forming Dies:</b> Bending: methods, Bending Dies, bend allowance, spring back, spanning, bending pressure, pressure pads, development of blank length. Drawing: operations, Metal flow during drawing. Calculation of Drawing blank size, variables affecting metal flow during drawing, single action and double action dies, combination dies.	16
03	<b>Fundamentals of Other Tools</b> Constructional features of - Pressure Die casting dies, metal extrusion dies, injection	10

	molding dies, forging dies, plastic extrusion dies.	
	<b>Total</b>	44

**Practical:**

Intellectual skills:

- To understand & differentiate types of presses & press operation.
- To understand types of dies & their working principles.
- To select suitable strip layout for a given work piece.
- To calculate blank length & blank diameter of a given work piece.
- To understand tool angles of various cutting tools & their importance.
- To select suitable punch, pilot & stripper for a given application
- To calculate cutting force & shear angle.

Motor Skills:

- To draw strip layout & other figures
- To draw different types of dies.
- To draw types of cutting tools showing various angles.
- To design & draw drawing die for a given component.

**List of Practical:(Any Five)**

1. Report on Visit to press shop for study of presses.
2. Sketches of Combination Die, Progressive Die, Compound die, Inverted Die, Drawing Die and Bending Die.
3. Drawing of strip layout of simple component (Different component for every student), and calculation of material utilization factor.
4. Sketches of Injection Moulding die, Pressure die-casting die, forging die.
5. Two assignments on calculation of Cutting forces and shear angle based on Merchant's circle.
6. One assignment each on development of blank length for bending operation and single stroke drawing operation.
7. One assignment on designation of carbide tools.
8. Sketches of different types of cutting tools showing details of tool angles.
9. One assignment on types of Punches and pilots, strippers
10. Design of blanking die – Drawing sheets showing assembly & details.

**EXAMINATION SCHEME**

CHAPTER	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTION			
	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
1	5	10	1	10	4	FIVE AT LEAST ONE FROM EACH CHAPTER	5	25
2	5				3			
3	3				2			

**Text Books:**

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Donaldson Anglin	Tool Design		Tata Mcgraw hill

P. C. Sharma	A Text Book OF Production Engineering		S Chand & Co.
H. M. T.	Production Technology		Tata Mcgraw hill
R. K. Jain	Production Technology		Khanna Publishers
A.S.T.M.E.	Fundamental of tool design.		Prentice-Hall of India.
M.H.A. Kempster	Introduction to Jig and Tool Design		Viva publ.
P. H. Joshi	Jigs and Fixtures		Tata Mc Graw Hill
P. H. Joshi	Press Tools		Tata Mc Graw Hill
American Society of Tool and Manufacturing Engineers	Tool engineers handbook 1959		McGraw-Hill
<b>C. D.</b>			
<ul style="list-style-type: none"> <li>• C. D. Prepared By MSBTE under its CAI Package Program.</li> <li>• C. D. on various Topics of Automobile Engineering By SAE</li> </ul>			
<b>Reference books :- Nil</b>			
<b>Suggested List of Laboratory Experiments :- Nil</b>			
<b>Suggested List of Assignments/Tutorial :- Nil</b>			

### EXAMINATION SCHEME FOR PRACTICAL SESSIONAL

<b>Internal Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Five No. of Experiments / Study attended & respective lab note submitted in due time.	5 x 3 = 15		
VIVA VOCE	10		
<b>TOTAL</b>	<b>25</b>		
<b>External Examination: Examiner-</b> Lecturer in Mechanical Engg. / Jr. Lecturer			
Submission of Signed Lab Note Book (for five experiments / study)	5 x 2 = 10		
On spot experiment / study (one for each group consisting 15 students / explanation on study item)	10		
VIVA VOCE	5		
<b>TOTAL</b>	<b>25</b>		

<b>Name of the Course : Mechanical Engineering</b>		
<b>Subject: INDUSTRIAL PROJECT AND ENTREPRENEURSHIP</b>		
<b>Course code:</b>	<b>Semester : Fifth</b>	
<b>Duration : 17 weeks</b>	<b>Maximum Marks : 50</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	
Theory : 1hrs/week	Internal Assessment: Marks	
Tutorial: hrs/week	Teacher's Assessment (Assignment & Quiz): Marks	
Practical : 2 hrs/week	End Semester Exam: Marks	
Credit: 2	Practical: Internal Sessional continuous evaluation: 25 Marks	
	Practical: External Sessional examination: 25 marks	
<b>Aim :-</b>		
<b>S.No</b>		
1	To explore the emerging opportunities and to inculcate the entrepreneurial values during their educational tenure. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.	
<b>Objective :-</b>		
S No	The student will able to	
1	To identify and train potential entrepreneurs.	
2	To motivate the entrepreneurial instinct.	
3	To develop necessary knowledge and skills among the participants.	
4	To help in analyzing the various options to select the most appropriate product suiting to the entrepreneur and the market.	
5	To give a clear picture about the process and procedures involved in setting up an small scale Industrial unit or a bigger unit.	
6	To impart basic managerial skills and understandings to run the project efficiently and effectively.	
7	To analyze the environmental issues to be addressed relating to the proposed project.	
<b>Pre-Requisite:-Nil</b>		
<b>PART A) Industrial Project 15hrs</b>		
Following activities related to project are required to be dealt with, during this semester		
1. Form project batches & allot project guide to each batch. (Max. 4 students per batch)		
2. Each project batch should select topic / problem / work by consulting the guide & / or industry. Topic / Problem / work should be approved by Head of department.		
3. Each project batch should prepare action plan of project activities & submit the same to respective guide.		
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.		
5. Action Plan should be part of the project report.		
<b>Part B: Entrepreneurship Development 15hrs</b>		
<b>OBJECTIVES:</b>		
Students will be able to		
1) Identify entrepreneurship opportunity.		
2) Acquire entrepreneurial values and attitude.		
3) Use the information to prepare project report for business venture.		
Develop awareness about enterprise management.		
<b>Contents</b>		
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hrs/week</b>
01	<b>Entrepreneurship, Creativity &amp; Opportunities</b> 1.1) <b>Concept, Classification &amp; Characteristics of Entrepreneur</b> 1.2) <b>Creativity and Risk taking.</b> 1.2.1) <b>Concept of Creativity &amp; Qualities of Creative person.</b> 1.2.2) <b>Risk Situation, Types of risk &amp; risk takers.</b>	

	<p><b>1.3) Business Reforms.</b>  <b>1.3.1) Process of Liberalization.</b>  <b>1.3.2) Reform Policies.</b>  <b>1.3.3) Impact of Liberalization.</b>  <b>1.3.4) Emerging high growth areas.</b>  <b>1.4) Business Idea</b>  <b>Methods and techniques to generate business idea.</b>  <b>1.5) Transforming Ideas in to opportunities</b>  <b>transformation involves Assessment of idea</b>  <b>&amp;Feasibility of opportunity</b>  <b>1.6) SWOT Analysis</b></p>	
02	<p><b>Information And Support Systems</b>  <b>2.1) Information Needed and Their Sources.</b>  Information related to project, Information related to support system,  Information related to procedures and formalities  <b>2.2) SUPPORT SYSTEMS</b>  1) Small Scale Business Planning, Requirements.  2) Govt. &amp; Institutional Agencies, Formalities  3) Statutory Requirements and Agencies.</p>	
03	<p><b>Market Assessment</b>  3.1) Marketing -Concept and Importance  3.2) Market Identification, Survey Key components  3.3) Market Assessment</p>	
04	<p><b>Business Finance &amp; Accounts</b>  <b>Business Finance</b>  4.1) Cost of Project  1) Sources of Finance  2) Assessment of working capital  3) Product costing  4) Profitability  5) Break Even Analysis  6) Financial Ratios and Significance  <b>Business Account</b>  4.2) Accounting Principles, Methodology  1) Book Keeping  2) Financial Statements  3) Concept of Audit.  4)Budget.</p>	
05	<p><b>Business Plan &amp; Project Report</b>  5.1) Business plan steps involved from concept to commissioning  Activity Recourses, Time, Cost  5.2) <b>Project Report</b>  1) Meaning and Importance  2) Components of project report/profile (<b>Give list</b>)  5.3) <b>Project Appraisal</b>  1) Meaning and definition  2) Technical, Economic feasibility  3) Cost benefit Analysis</p>	
06	<p><b>Enterprise Management And Modern Trends</b>  6.1) <b>Enterprise Management:</b> -  1) Essential roles of Entrepreneur in managing enterprise  2) Product Cycle: Concept And Importance  3) Probable Causes Of Sickness  4) Quality Assurance  Importance of Quality, Importance of testing  6.2) E-Commerce</p>	

	Concept and process <b>02</b> 6.3) Global Entrepreneur				
	<b>Total</b>		30 hours		
<b>Text Books:</b>					
Name of Authors	Titles of the Book	Edition	Name of the Publisher		
Entrepreneurship Development	E. Gorden K.Natrajan		Himalaya Publishing. Mumbai		
Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.		Tata Mc Graw Hill Publishing co. ltd. New Delhi.		
A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	<p>EDI STUDY MATERIAL  Ahmadabad (Near Village Bhat , Via Ahmadabad Airport &amp; Indira Bridge), P.O. Bhat 382428 , Gujrat,India  P.H. (079) 3969163, 3969153  E-mail :  ediindia@sancharnet.in/olpe@ediindia.org  Website : <a href="http://www.ediindia.org">http://www.ediindia.org</a></p>			
A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi				
National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar				
New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmuni Gupta				
A Handbook of New Entrepreneurs	P.C.Jain				
Evaluation of Entrepreneurship Development Programmes	D.N.Awasthi , Jose Sebeastian				
The Seven Business Crisis & How to Beat Them.	V.G.Patel				
Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises				Pearson Education, New Delhi
Special Edition for MSBTE	Entrepreneurship Development				McGraw Hill Publication
Entrepreneurship Theory and Practice	J.S. Saini B.S.Rathore				Wheeler Publisher New Delhi

Entrepreneurship Development			TTTI, Bhopal / Chandigarh
Mary Coulter.	<i>Entrepreneurship in Action.</i>	2008.	Prentice Hall of India Pvt. Ltd., New Delhi.
Mohanty, S.K.	<i>Fundamentals of Entrepreneurship</i>	2009	India Pvt. Ltd., New Delhi.
Bedi	Management & Entrepreneurship		Oxford
Khatua	Project Management & Appraisal		Oxford
Nandan	<i>Fundamentals of Entrepreneurship</i>		P.H.I
Schaper	<i>Entrepreneurships</i>		Wiley
S.S.Khanka	<i>Entrepreneurial Development</i>		S.Chand

## 2) VIDEO CASSETTES

NO	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : <a href="http://www.ediindia.org">http://www.ediindia.org</a>
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	

## GLOSSARY:

### INDUSTRIAL TERMS

Terms related to finance, materials, purchase, sales and taxes.

### Components of Project Report:

1. Project Summary (One page summary of entire project )
2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower ( Skilled, unskilled )
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market ( Survey, Demand & Supply )
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

### Reference books :- Nil

### Suggested List of Experiments :-

- 1] Field visit to successful enterprise - study of characteristics of successful entrepreneurs - case study
- 2] Communication skills - listening and note taking - simulated exercises
- 3] Development of project proposals - SWOT analysis
- 4] Development of project proposals - formulation of project plan

### Suggested List of Assignments/Tutorial :-

- 1 Assess yourself-are you an entrepreneur?
- 2 Prepare a project report and study its feasibility.

<b>Examination Scheme:</b>	
<b>Internal Practical Sessional Examination</b>	
<b>Chapter</b>	
<b>1 – Submission of Report within scheduled date</b>	<b>5</b>
<b>2 - submission of two assignment on scheduled date</b>	<b>5</b>
<b>3 – Practice of Assignment on Entrepreneurship</b>	<b>10</b>
<b>Viva - voce</b>	<b>5</b>
<b>Total:</b>	<b>25</b>
<b>External Practical Sessional Examination</b>	
<b>Report &amp; assignment</b>	<b>5</b>
<b>On spot formation of report on Entrepreneurship</b>	<b>10</b>
<b>Viva voce</b>	<b>10</b>
<b>Total:</b>	<b>25</b>



## West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)  
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

<b>Name of the Course :</b> Diploma in Mechanical Engineering		
<b>Subject Title:</b> Computer Programming		
<b>Course code: ME/</b>	<b>Semester :</b> Fifth	
<b>Duration : 17 weeks</b>	<b>Maximum Marks : 50</b>	
<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
Theory : 1 hrs/week	Mid Semester Exam: Marks	
Tutorial: hrs/week	Assignment & Quiz: Marks:	
Practical : 2 hrs/week	End Semester Exam: Marks	
Credit: 2	<b>Practical: Internal Sessional continuous evaluation:25 Marks</b>	
	<b>Practical: External Sessional Examination:25 Marks</b>	
<b>Aim :-</b>		
<b>S.No</b>		
1		
<b>Objective :-</b>		
To understand how to give instructions to computers.		
To expose a student to the basic principles of programming through a structured programming language like 'C'.		
To enable the students to learn about any advanced Object Oriented programming Language.		
<b>S No</b>	The student will able to	
1	Break a given task into subtasks.	
2	Enhance logical thinking.	
3	Develop 'C' programs for simple applications.	
<b>Pre-Requisite:-</b>		
<b>S.No</b>		
1	Sound knowledge of computer.	
<b>Contents</b>		
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hrs/week</b>
		<b>Hours</b>
01	Problem, definition and analysis, algorithm, flow charts, tracing and dry running of algorithms. Introduction to 'C' programming, simple program using Turbo 'C' compiler and execution of 'C' program	<b>02</b>
02	C Fundamentals: Character set, constants, data types, identifiers, key words, variable declarations, Types of Operators – unary, binary, arithmetic, relational, logical, assignment. Hierarchy of operators, expressions, library functions, Use of input/ output functions viz. Printf(), Scanf(), getch(), putch()	<b>03</b>
03	Use of Control Statements:- if-else, if-else-if, switch-case, while loop, do – while loop, for loop, break and continue. Writing, Compiling, Executing and debugging programs	<b>05</b>
04	Introduction to Subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and writing	<b>03</b>
05	Concept of String, string input / output functions Defining and accessing a user defined functions, Passing of arguments, declaration of function prototypes Storage classes: automatic, external, static variables	<b>03</b>
	<b>Total</b>	<b>16</b>

**Practical:**

Skills to be developed:

Intellectual Skills:

- Prepare and interpret flow chart of a given problem.
- Represent data in various forms.
- Use various control statements and functions

Motor Skills:

- Write program in 'C' language.
- Run and debug 'C' program successfully.

**LIST OF PRACTICALS**

To write simple programme having engineering application involving following statements

1. Use of Sequential structure: atleast **two** problems
2. Use of if-else, if-else-if statements: atleast **three** problems
3. Use of for statement: atleast **five** problems
4. Use of Do-While Statement: atleast **two** problems
5. Use of While statement: atleast **three** problems
6. Use of break and Continue statement: atleast **one** problems
7. Use of multiple branching Switch statement: atleast **one** problems
8. Use of different format specifiers using Scanf( ) and Printf( ): atleast **two** problems
9. Use of one dimensional array e.g. String, finding standard deviation of a group data: atleast three problems
10. Use of two dimensional array of integers/ reals: atleast **one** problems
11. Defining a function and calling it in the main: atleast **three** problems

**Examination Schedule Internal practical Sessional:**

Attending classes, practicing programs & submitting respective assignment in time		20	
Viva - voce		5	
Total:		25	

**Examination Schedule: External practical Sessional examination**Examiner: **Lecturer**

For submission of assignment in scheduled time		10	
On spot program		10	
viva voce		05	
Total		25	

.	
<b>Reference books :- Nil</b>	
<b>Suggested List of Laboratory Experiments :- Nil</b>	
<b>Suggested List of Assignments/Tutorial :- as mentioned in list of practical</b>	

**List of Books:**

<b>Author</b>	<b>Title</b>	<b>Publication</b>
Yashwant Kanitkar	Let us 'C'	BPB publications
Balguruswamy	Programming in 'C'	Tata Mc- Graw Hill
Pradip Dey & Manas Ghosh	Programming in 'C'	Oxford Higher Education
Byron Gotfried	Introduction to 'C' programming	Tata McGraw Hill
H.Arolkar	Simplifying c	Dreamtech

<b>Name of the Course : Mechanical Engineering</b>		
<b>Subject Title: Professional Practices-III</b>		
<b>Course code:</b>	<b>Semester : Fifth</b>	
<b>Duration :</b>	<b>Maximum Marks : 50</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	
Theory : hrs/week	Practical: Internal Sessional Continuous Evaluation: <b>25 Marks.</b>	
Tutorial: hrs/week	Practical: External Sessional Examination: <b>25 Marks.</b>	
Practical : 2 hrs/week		
Credit: 1		
<b>Aim :-</b>		
<b>Sl. No.</b>		
1	To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.	
<b>Objective :-</b>		
<b>Sl. No.</b>	The student will able to:	
1	<ul style="list-style-type: none"> <li>• Acquire information from different sources.</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Prepare notes for given topic.</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Present given topic in a seminar.</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Interact with peers to share thoughts.</li> </ul>	
5	<ul style="list-style-type: none"> <li>• Prepare a report on industrial visit, expert lecture.</li> </ul>	
<b>Pre-Requisite:-Nil</b>		
<b>Contents</b>		
		<b>Hrs/week</b>
<b>Chapter</b>	<b>Name of the Topic</b>	
01	<b>Student Activities:</b> Students in a group of 3 to 4 shall perform <b>ANY ONE</b> of the following activities (Other similar activities may be considered) and write a report as a part of term work. <b>Activities :</b> <ol style="list-style-type: none"> <li>1. Collection of data regarding loan facilities or other facilities available through different organizations / banks to budding entrepreneurs.</li> <li>2. Survey and interviews of successful entrepreneurs in nearby areas.</li> <li>3. Survey of opportunities available in thrust areas identified by Government or DIC.</li> <li>4. Measuring Screw thread parameters on floating carriage dial micrometer and select the optimum diameter of wire.</li> <li>5. Survey of data regarding different types of pumps with specifications from manufacturer's catalogue, local markets, end users (any other engineering products may be considered for survey).</li> <li>6. Survey of farm implements used by farmers.</li> </ol>	05 Hrs.
02	<b>Group Discussion :</b> The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are: ( <b>any one</b> ) <ol style="list-style-type: none"> <li>i) CNG versus LPG as a fuel.</li> <li>ii) Petrol versus Diesel as a fuel for cars.</li> <li>iii) Trends in automobile market.</li> </ol>	05 Hrs.

	iv) Load shading and remedial measures. v) Rain water harvesting. vi) Trends in refrigeration Technology. vii) Disaster management. viii) Safety in day to day life. ix) Energy Saving in Institute. x) Nano technology.		
	<b>CAM SOFTWARE COURSE:</b> 1. Introduction of <b>CAM</b> software. 2. Identify Different <b>icons</b> and <b>tool bar</b> on the Screen. 3. Import <b>Model</b> for machining. 4. <b>Position</b> the Model to <b>Reference zero</b> point. 5. <b>Measure</b> the Model for Tool Selection. 6. Define the <b>Block</b> from which the part will be cut. 7. Define the cutting <b>Tools</b> to be used. 8. Define the cutting <b>feed, rapid movement and rpm</b> . 9. Define Set up options ( <b>Rapid Move Heights – Start and End Point</b> ). 10. Define <b>Boundary</b> for selected area machining. 11. Create a <b>Roughing Tool Path</b> Strategy. 12. Create a <b>Finishing Tool Path</b> Strategy. 13. Edit <b>Tool Path</b> . 14. Tool Path <b>Transformation</b> . 15. <b>Animate</b> and <b>simulate</b> the tool path. 16. Create an <b>NC Program</b> and output as a post-processed <b>nc</b> data file. 17. <b>Save</b> the <b>CAM Project</b> to an external directory.	20 Hrs.	
	<b>Total</b>	30 Hrs.	
<b>Text Books</b>			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
Mark Ratner and Daniel Ratner	Nanotechnology		Pearson Educatuion, New Delhi
Yoram Korem	Computer Control of Manufacturing System		Mcgraw Hill Publication
Sunil Chopra, Peter Meindl	Supply Chain Management		Pearson Education, New Delhi
<b>Reference books :- Nil</b>			
<b>Suggested List of Laboratory Experiments :- Nil</b>			
<b>Suggested List of Assignments/Tutorial :- Nil</b>			

<b>Examination Scheme:</b>	
<b>Internal Practical Sessional Examination</b>	
<b>Topic</b>	<b>Marks</b>
<b>1 - Submission of report on student activity on scheduled date.</b>	<b>5</b>
<b>2 - Performance and submission of assignment on group discussion on scheduled date.</b>	<b>5</b>
<b>3 - Practice of CAM software.</b>	<b>10</b>
<b>4 - Viva – voce.</b>	<b>5</b>

<b>Total:</b>	<b>25</b>
<b>External Practical Sessional Examination</b>	
<b>Topic</b>	<b>Marks</b>
<b>1 - Submission of signed report &amp; assignment.</b>	<b>5</b>
<b>2 - On spot CAM activity.</b>	<b>15</b>
<b>3 - Viva voce.</b>	<b>5</b>
<b>Total:</b>	<b>25</b>