

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

TEACHING SCHEME (w.e.f. 18th July '2011)

SEMESTER- V

SR. NO	SUB. CODE	SUBJECT	TEACHING SCHEME (HOURS)			CREDITS
			THEORY	TUTORIAL	PRACTICAL	
1	2352001	Fundamentals of Thermal and Fluid Devices	4	0	0	4
2	2352002	Machine Design	3	0	0	3
3	2351903	Machine Tools Technology	3	0	0	3
4	2352003	Programmable Logic Controllers	2	0	0	2
5	2352008	Material Science	3	0	2	5
6	2352004	Machine Element Design and Drafting	0	0	2	2
7	2352005	Machine Tools Practices	0	0	2	2
8	2352006	Programmable Logic Controllers Practices	0	0	2	2
9	2352007	Fundamentals of Thermal and Fluid Devices Practices	0	0	2	2
10	2352009	Project- I	0	0	4	4
		Total	15	0	14	29

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHATRONICS ENGINEERING
Semester – V

Subject Code : **2352001**

Subject Name : **Fundamentals of Thermal and Fluid Devices**

Sr. No.	Subject Content	Hrs.
1.	<p>Fundamentals of Thermodynamics:</p> <p>1.1 Thermodynamic systems, properties, and classification 1.2 Forms of energy and energy interaction 1.3 Concepts of heat, work, process and cycles. 1.4 Law of conservation of energy 1.5 Steady flow energy equation 1.6 Continuity of mass flow 1.7 Zeroth law 1.8 First law of thermodynamics 1.9 Concepts of heat reservoir, source-sink, heat engine, heat pump and refrigerator. 1.10 Second law of thermodynamics 1.11 Concept of two phase system 1.12 Concept of specific heat 1.13 Different Thermodynamic processes and its representation on P-V and T-S diagrams 1.14 P-V, T-S and H-S diagrams of pure substance 1.15 Steam formation process on above diagrams</p>	14
2.	<p>Thermodynamic Cycles:</p> <p>2.1 Concept and definition of thermodynamic cycle 2.2 Close loop and open loop system 2.3 Reversibility and irreversibility 2.4 The following cycles on P-V and T-S diagram and related expression (no derivation) <ul style="list-style-type: none"> • Carnot cycle • Otto cycle • Diesel cycle • Brayton cycle • Rankine cycle • Refrigeration cycle with COP 2.5 Simple examples on above cycles.</p>	10
3.	<p>Fundamentals of Fluid Mechanics:</p> <p>3.1 Properties of fluid 3.2 Classification of fluids 3.3 Important terms and laws in fluid static's</p>	5

	3.4 Types of fluid flow and its expression (no derivation) 3.5 Bernoulli's theorem	
4.	<p>Hydraulic Devices:</p> <p>Sketch, constructional features, (constructional & flow diagram with symbols), working and applications of following devices</p> <ul style="list-style-type: none"> • Various control valves • Manifold • Various fittings and consumables • Various types of pumps which includes centrifugal, gear, reciprocating & rotary • Water turbines (Pelton, Kaplan & Francis) • Intensifier • Hydraulic lift • Hydraulic ram • Accumulator • Hydraulic press 	11
5.	<p>Pneumatic Devices:</p> <p>5.1 Sketch (constructional & flow diagram with symbols), constructional features, working and applications of following devices</p> <ul style="list-style-type: none"> • Various flow control valves (for air/gas) • Directional control valves (DCV) • Pressure control elements • Air motor • Air cylinder • Various types of signal/switching devices • Air compressor <p>5.2 Logic circuits (simple circuit including operating of double acting cylinder, quick return mechanism, press machine etc)</p> <p>5.3 Methods to detect air/gas leakages</p> <p>5.4 Precautions required to avoid leakages</p>	8
6.	<p>Lubrication Systems:</p> <p>6.1 Need</p> <p>6.2 Different types of lubricants, their designation, standards, properties and applications.</p> <p>6.3 Methods of lubrication and lubricating devices.</p>	2
7.	<p>Heat Transfer:</p> <p>7.1 Various mode of heat transfer.</p> <p>7.2 Conduction heat transfer, Fourier's law, thermal conductivity and heat transfer Through composite wall and cylinders.</p> <p>7.3 Convection heat transfer, Newton's law of convection, Free and forced convection, Coefficient of convection.</p> <p>7.4 Radiation heat transfer, Stefan and Boltzmann's law, Black body concept, Emissivity, absorptivity.</p> <p>7.5 Overall heat transfer coefficient.</p> <p>7.6 Heat exchanger: introduction, types and applications.</p> <p>7.7 Important coolants, their properties and applications.</p>	6

	Total	56
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Reference Books:

1. Fundamentals of fluid mechanics, by. Dr.D.S.Kumar.
2. Fluid mechanics & hydraulic machines (in S.I.Units), by. R.S.Khurmi.
3. Hydraulic machines and fluid mechanics, Dr. Jagdishlal (Vol 1 & 2).
4. Thermodynamics for engineers, by. M.L.Mathur.
5. Heat engines, by C.S.Shah & N.C.Pandya.
6. Heat engines, by P.L.Balleny.
7. Thermodynamics, by SAAD.
8. Engineering thermodynamics, by P.K.Nag.
9. Applied thermodynamics, by R.C.Patel.
10. Standards/Manual for lubricating mediums.
11. Thermal engineering, by P.L.Balleny.
12. Heat engines, by Pandya & Shah.
13. Fundamentals of Heat Engines and Hydraulics, by Bessra Benicovk.
14. Hydraulic references Rexroth.
15. Pneumatic basic level part no. 93131 Festo.
16. Hydraulic text book basic level part no 93281 festo.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : **2352002**

Subject Name : **Machine Design**

Sr. No.	Subject Content	Hrs.
1.	Introduction: 1.1 General consideration and factors influencing the design of machine elements, design process. 1.2 Various materials used in manufacture of machine elements (Metallic, Non-metallic, ferrous and non-ferrous - I.S. designation). 1.3 Types of loads, types of stresses, concept of stress concentration and factor of safety. 1.4 Standardization and preferred numbers.	4
2.	Design of Machine Elements Subjected to Direct Stresses: 2.1 Simple examples of machine elements e.g. link of chain, eye bolt, Punching operation, etc. 2.2 Design of knuckle Joint. 2.3 Design of cotter Joint. 2.4 Design of riveted Joint. 2.5 Threaded fasteners. 2.6 Design procedure of the screw for power transmission.	8
3.	Design the Machine Elements Subjected to Bending: 3.1 Concept of bending moment. Fundamental equation of Bending, Section modulus of various sections, examples of pure bending like levers, beams, axle, etc. 3.2 Design procedure for levers. Types of levers, design of cross- section of arms, bosses and pins. 3.3 Design of leaf spring.	8
4.	Design of Machine Elements Subjected to Direct Twisting Moments: 4.1 Fundamental equation of Twisting Moment and design procedure. 4.2 Design of shafts (solid and hollow) on basis of strength. 4.3 Design of keys - types and design procedure. 4.4 Types and applications of couplings. Design of muff and flange coupling. 4.5 Design of closed coiled helical spring, calculation of dimensions (wire diameter, stiffness , number of coils, free length), helical spring-tension and compression both.	8
5.	Design Machine Element Subjected to Direct and Bending Stresses: 5.1 Eccentric loading - frame of a machine, clamp, bracket. 5.2 Various types of load on bolts in assembly - design of bolt under static load and calculation of size of foundation bolt for pillar crane.	6

6.	Pressure Vessels: 6.1 Types of pressure vessels used in process industries. 6.2 Design of thick cylinders. 6.3 Design of thin cylinders and thin spherical shell.	5
7.	Selection Procedure for Bearings: 7.1 Bearings - types, characteristics and commonly used Materials, designation as per IS. 7.2 Design of journal bearings. 7.3 Antifriction bearings: types, advantages, applications. 7.4 Selection procedure of anti-friction bearing. 7.5 Different calculation of bearings : basic dynamic load, load rating, equivalent load, bearing life.	3
	Total	42

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : 2351903

Subject Name : **Machine Tools Technology**

Sr. No.	Subject Content	Hrs.
1.	<p>Introduction to Machine Tools Technology:</p> <p>1.1 Need, Scope & importance of Machine tools technology in industries.</p> <p>1.2 List of major industries having machine tools in GUJARAT.</p> <p>1.3 Need of attitude, knowledge & skill required for shop floor supervisor in Machine tools based industries.</p> <p>1.4 Recall fundamentals: definitions of machine tool, cutting speed, feed, depth of cut, metal removal rate, surface finish symbols and values, cutting tools and their geometry.</p>	2
2.	<p>Grinding and Superfinishing Processes:</p> <p>2.1 Cutting action of Grinding Wheel.</p> <p>2.2 Grinding Wheels: Types, materials , nomenclature, selection criteria and applications.</p> <p>2.3 Terms associated with Grinding wheel operations.</p> <p>2.4 Grinding and super finishing operations and machines : definition, constructional features, working principles, cutting parameters for “commonly used grinding wheels and work piece materials” and applications of following machine tools.</p> <ul style="list-style-type: none"> • Surface (rotary and sliding) grinding machines. • Cylindrical (centre less, internal, external)grinding machines. • Bench and portable grinder. • Tool and cutter grinding machine. • Profile grinding. • Honing, Lapping and Super finishing. <p>2.5 Static and dynamic balancing of grinding wheels-need and Methods.</p> <p>2.6 Methods of mounting work piece on cylindrical grinding Machines (Including chuck and mandrel).</p>	8
3.	<p>Gear Manufacturing and Gear Finishing Processes:</p> <p>3.1 Nomenclature of spur and helical gear, types of gears.</p> <p>3.2 Generating and forming processes.</p> <p>3.3 Gear forming methods –Machine tools specification, working principles, process, cutting tools used with nomenclatures and cutting angles, cutting parameters.</p> <p>3.4 Gear generating methods –Machine tools specification, working principles, process, cutting tools used with nomenclatures and cutting angles, cutting parameters.</p> <p>3.5 Gear finishing methods-methods and working principles.</p>	8

4.	Thread Production Methods: 4.1 Various methods of thread productions, constructional features of thread production machines/processes, their working principles, cutting tools and cutting parameters, applications, advantages and limitations.	4
5.	Broaching Machines: 5.1 Need, types, constructional features and applications. 5.2 Broaching methods. 5.3 Shapes which can be broached. 5.4 Special features and comparison.	2
6.	Jig Boring Machine: 6.1 Need, constructional features, working principle and applications.	2
7.	Single Spindle and Multi Spindle Automats: 7.1 Need, constructional features, working principle and applications.	2
8.	Special Purpose Machine Tools: 8.1 Need, factors affecting constructional design and applications. 8.2 Comparison of SPM with other automates.	2
9.	Nonconventional Methods of Machining: 9.1 Need, constructional features, working principles ,tools, working parameters and applications: (ECM, EDM, USM, ECG, AJM, Plasma beam, laser, plasma arc machining, Electro beam machining, chemical machining.)	6
10	CNC Machines (Computerised Numerical Control): 10.1 Evolution of CNC, definitions of NC, CNC, CAM and DNC. 10.2 Need of CNC. 10.3 Concept of numerical control. 10.4 Selection criteria for CNC. 10.5 Methods of machine controls. 10.6 Constructional features of CNC, elements of CNC and their functions with working principles. 10.7 Classifications of CNC Machines. 10.8 Various motors and controls used . 10.9 Axes nomenclature. 10.10 Latest development in CNC machines.	6
	Total	42

References Books:

1. Machine tools technology, G. S. Kandaswami.
2. All about machine tools, Gerling.
3. Machine tools, B. Chennov.
4. Machine tool Vol.-I to IV, Achercan.
5. Metal cutting technology & Experiments, K. G. Chaniramani.
6. Engineering Productivity Vol.1 & 2, W F Walker.
7. Principles of Engineering Production, Lissamay & Martin.
8. Production Engineering Sciences, Dr. P. C. Pande & C. K. Singh.
9. Fundamental of Metal Machining and Machine Tools, Boothroyd.
10. The Art of Tool & Cutter Grinding, S. P. Narang.
11. Production Technology, HMT.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : **2352003**

Subject Name : **Programmable Logic Controllers**

Sr. No.	Subject Content	Hrs.
1.	<p>Idea of Programmable Logic:</p> <p>1.1 Automation: Objectives, functions and technology 1.2 Different types of logic 1.3 Idea of a programmable processor 1.4 Types of timer instruction 1.5 Counter instruction 1.6 Communication with the outside</p> <ul style="list-style-type: none"> • Interface between programmable logic and process • Communication between man and machine <p>1.7 Contribution of Industrial PLC 1.8 Areas of application of PLCs.</p>	7
2.	<p>Architecture of Programmable Logic Controllers:</p> <p>2.1 Block diagram of PLC and its environment 2.2 Sinking and sourcing configuration 2.3 Exchange of data: The bus concept 2.4 The processor</p> <ul style="list-style-type: none"> • Registers • Stacks • Data flow <p>2.5 Types of Memory 2.6 Scan time of a cycle 2.7 Error Handling 2.8 Industrial input - output</p> <ul style="list-style-type: none"> • Architecture of input-output system • Bitwise input - output • Numerical input - output. 	8
3.	<p>Accessories with P.L.C:</p> <p>3.1 Discrete interfaces 3.2 Analog interface 3.3 Special interface</p> <ul style="list-style-type: none"> • stepper motor interface • D.A.C. card 	9

4.	The Software of Industrial PLC: 4.1 Low level languages • Ladder diagram 4.2 Low level language - Boolean language 4.3 High level language – functional block diagram, computer type language	3
5.	AVAILABLE PLC 5.1 ABB process automation Inc. 5.2 Allen - Bradley company 5.3 Siemens industrial automation inc.	1
	Total	28

Reference Books:

1. Programmable logic controllers architecture & applications, Gilles Michael & John Wiley & Sons.
2. Programmable controllers hardware, software & applications, George L. Batten.
3. Programmable controllers operations & applications, Ian G. Warnock.
4. Industrial Control Handbook, E.A.Parr.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : 2352008

Subject Name : **Materials Science**

Sr. No.	Subject Content	Hrs.
1.	<p>Introduction and Properties of Engineering Material :</p> <p>1.1 Introduction, need, classification of metals and non-metals.</p> <p>1.2 Materials Properties.</p> <ul style="list-style-type: none"> • Mechanical • Chemical Properties • Thermal Properties • Electrical / Electromagnetic <p>1.3 Stress and strain-concept, relationship</p>	3
2.	<p>Metallurgical Consideration of Metals :</p> <p>2.1 The concept of crystalline structure of metal, BCC, FCC, HCP.</p> <p>2.2 The concept of solidification of metals, crystal, grain, grain boundaries, dendritic solidification, effect of cooling rates on material properties.</p> <p>2.3 Equilibrium diagrams</p> <p>2.5 TTT Curve, applications. TTT curve for stainless steel</p> <p>2.6 Iron-carbon equilibrium diagram and its characteristic.</p>	10
3.	<p>Ferrous Metals and its Alloys:</p> <p>3.1 Introduction and classification of ferrous metals.</p> <p>3.2 Flow diagram for production of Iron and steel.</p> <p>3.3 Ferrous metals – standards & designations (According to BIS, EN, ASME, JIS, DIN), composition, properties and uses.</p> <p>3.4 Alloying of metals-properties and effect</p> <p>3.5 Shape memory alloys-concepts, materials, properties, applications</p> <p>3.6 Coding of alloy steels as per BIS, DIN, ASME, EN and JIS, comparisons and equivalents. Introduction and designation/standards (as per BIS, DIN, ASME, EN and JIS) of sponge iron, properties and applications</p> <p>3.7 Microstructures study of ferrous metals</p>	4

4.	Non Ferrous Metals and its Alloys: 4.1 Role of non ferrous metals and its alloys related to engineering field. 4.2 Types, properties ,capabilities, designations (According to BIS, EN,ASME,JIS, DIN),composition, and industrial applications of : <ul style="list-style-type: none">• copper alloys.• aluminum alloys.• bearing metals. 4.3 Microstructure study of all non ferrous metals.	4
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5.	Non Metallic and Composite Materials: 5.1 Introduction ,main composition and applications of non metallic material -Plastic, rubbers, ceramic, refractories, insulators, abrasives, lubricants, adhesives, fiber and Teflon. 5.2 Composite materials-concept, structure, common materials, properties ,advantages and industrial applications.	4
6.	Heat Treatment: 6.1 Introduction to heat treatment 6.2 Types, method /process, process parameters and applications of various heat treatment processes/methods 6.2 Study of quenching medias and their properties.	5
7.	Selection and Specification of Materials: 7.1 Types of commercially available materials. 7.2 Specification of metals as per BIS, EN,ASME,JIS, and DIN 7.3 Factors to be considered while selecting material.	3
8.	Non-Destructive Testing: 8.1 Working principle, working, equipment specification, process parameters ,procedure, and applications of various nondestructive testing methods.	3
9.	Powder Metallurgy: 9.1 Basic concept of powder metallurgy and its applications, merits, demerits. 9.2 Manufacturing process of powder metallurgy.	3
10.	Surface Coatings: 10.1 Needs and scope of surface coatings 10.2 Procedure and method of preparing surface 10.3 Procedure of various surface coating methods 10.2 Types of surface coatings and applications	3
	Total	42

Laboratory Experiences :

Experience Number	Description of Laboratory Experience	Hrs.
1	Given various items of metals, identify materials of them. Also state the criteria to identify the material. State properties of each material. Also identify main alloying elements and reasons to add them.	2
2	Demonstration and study of Microscope.	2

3	Prepare ferrous micro specimens and examine them. Also prepare report on this.	4
4	Prepare non-ferrous micro specimen and examine it. Also prepare report on this.	4
5	Demonstration and study of Heat treatment furnaces.	4
6	Perform hardening process on various steel components. Measure the hardness of hardened components.	2
7	Perform hardening process specific material. Vary the quenching media and temperature. Prepare a comparative report on hardness of component varying quenching media and temperature.	2
8	Seminar preparation and representations by students. Each student is expected to deliver the talk for 10 minutes. Topic should be covered from the chapters not being covered in practicals.	4
9	Demonstration/Industrial visit on non destructive testing/heat treatment processes/surface coating/powder metallurgy. Also prepare industrial visit report.	4
	Total	28

NOTES :

1. Term work report content of each experience should also include following.
 - a. Experience description / data and objectives.
 - b. Skill/s which is / are expected to be developed in student after completion of experience.
 - c. Drawing of experience / setup with labels/nomenclature to carry out the experience
 - d. The specifications of machines / equipments / devices / tools / instruments /items/elements which is / are used to carry out and to check experience.
 - e. Process parameters / setup settings' values applied to carry out experience.
 - F. Steps / Process description to execute experience.
 - g. Observations
 - h. Information on recent machines / equipments / devices / tools / instruments /items available in market to carry out the experience. e.g. Special / Additional notes or remarks.
2. Term work report of student of regular mode should exclude Distance Learning manual, photocopies , printed content, etc. Focus should be on developing the term work as original efforts of students.
3. Term work content of industrial visit report should also include following.

- a. Brief details of industry visited.
 - b. Type ,location, products, rough layout, human resource, etc of industry.
 - c. Details, description and broad specifications of machineries/processes observed.
 - d. Safety norms and precautions observed.
 - e. Student's own observation on Industrial environment, culture and attitude.
 - f. Any other details / observations asked by accompanying faculty.
4. Term work also includes experience logbook duly certified by subject teacher/s.

Reference Books:

- | | |
|---|-----------------------|
| 1. Materials & Metallurgy | - G.B.S. Narang |
| 2. Workshop Technology Vol.I | - Hajara & Chaudhary. |
| 3. Material Science & Processes | - G.R.Nagpal |
| 4. Elements of Engg. Metallurgy | - S.P.Nayak |
| 5. Elements of Metallurgy | - Dr.Swaroop |
| 6. Heat Treatment of Metals | - Zakharov |
| 7. B.I.S.,ASME.DIN.JIS for materials. | |
| 8. Materials science for engineers – James F. Shackelford, Madanapalli K. Murlidhara, PEARSON Education | |

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHATRONICS ENGINEERING
Semester – V

Subject Code : 2352004

Subject Name : **Machine Element Design and Drafting**

Laboratory Experiences:

Sr. No.	Experiments	Hrs.
1.	Prepare report on design of cotter joint and knuckle joint.	2
2.	Prepare details and assembly production drawing of above designed joints using AutoCAD.	6
3.	Prepare report on design of flange coupling or flexible coupling.	2
4.	Prepare details and assembly production drawing of above designed couplings using AutoCAD.	6
5.	Prepare report on design of screw jack or screw type hand press.	2
6.	Prepare details and assembly production drawing of above designed power screw using AutoCAD.	6
7.	Prepare report on design of shaft and key(one problems)	2
8.	Prepare report on design of helical and leaf spring.(one problem each)	2
	Total	28

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : **2352005**

Subject Name : **Machine Tools Practices**

Laboratory Experiences:

Experience Type	Experience Number	Description of Laboratory Experience	Hrs.
Preperatory Activity (Includes Home Assignments)	1	a. Cutting speed, feed, depth of cut and Metal Removal Rate (MRR). b. Various cutting tools materials, properties and applications. c. Various carbide inserts and ISO codification. d. Calculate RPMs for Lathe, Milling cutter and drill spindle based on given data. Use equations. e. Calculate strokes/minute for shaping machine based on given data. Use equations. f. Basic machine tools processes	2
Demonstration And Study (Video / Movie May Be Used In Absence Of Machine Tools)	2	Kinematics and motion transmission of Cylindrical Grinding Machine.	8
	3	Kinematics and motion transmission of broaching Machine.	
	4	Kinematics and motion transmission of gear hobbing and gear shaping machine.	
	5	Constructional features of CNC.	
	6	Tool changing on CNC using Automatic Tool Changer.	
	7	Grinding various cutting tool angles on Tool and Cutter Grinding Machine.	
Job Preperation	10	Grind Single point cutting tool.	18
	11	Prepare a job on centre lathe as per the given drawing (Including plain turning, knurling, threading, boring and cylindrical grinding.)	
	12	Prepare composite job which includes turning, milling, drilling, shaping, boring, threading, slotting, grinding, etc...(Available all major operations). and prepare a report on process planning and route sheet with shop floor layout for given	

		composite job.	
	13	Prepare a plain surface and inclined surface on shaping and surface grinding machine. Also predrill and tap minimum two holes.	
	14	Prepare a job having gear tooth cutting on milling machine using indexing head.	
	15	Prepare a multi start/square thread job-bolt and nut .	
		Total	28

Notes:

1. Term work report content of applicable experience should also include following.
 - a. Experience description / data and objectives.
 - b. Skill/s which is / are expected to be developed in student after completion of experience.
 - c. Drawing of experience / setup with labels/nomenclature to carry out the experience
 - d. The specifications of machines / equipments / devices / tools / instruments /items/elements which is / are used to carry out and to check experience.
 - e. Process parameters / setup settings' values applied to carry out experience.
 - f. Steps / Process description to execute experience.
 - g. Information on recent machines / equipments / devices / tools / instruments /items available in market to carry out the experience.
 - h. Special / Additional notes or remarks.
2. Term work report of student of regular mode should exclude Distance Learning manual, photocopies , printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
3. Term work content of industrial visit report should also include following.
 - a. Brief details of industry visited.
 - b. Type, location, products, rough layout, human resource, etc. of industry.
 - c. Details, description and broad specifications of machineries/processes observed.
 - d. Safety norms and precautions observed.
 - e. Student's own observation on Industrial environment, culture and attitude.
 - f. Any other details / observations asked by accompanying faculty.
4. Term work should also includes workshop log book and experience logbook duly certified by workshop instructors and subject teachers.
5. Term work is to be defended (along with term work) with practical examination by external and internal examiners .Practical examination will include followings:
 - Viva

- Job preparation of given drawing

Reference Books:

1. Machine tools technology, G. S. Kandaswami.
2. All about machine tools Gerling.
3. Machine tools B.Chennov.
4. Machine tool Vol.-I to IV Achercan.
5. Metal cutting technology & Experiments, K.G.Chaniramani
6. Engineering Productivity Vol.1 & 2, WFWalker.
7. Principles of Engineering Production, Lissamay & Martin.
8. Production Engineering Sciences, Dr. P. C. Pande & C. K. Singh.
9. Fundamental of Metal Machining and Machine Tools, Boothroyd.
10. The Art of Tool & Cutter Grinding, S. P. Narang.
11. Production Technology, HMT.

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : **2352006**

Subject Name : **Programmable Logic Controllers Practices**

Laboratory Experiences:

Sr. No.	Experiments	Hrs.
1.	Building blocks of PLC system	2
2.	Ladder diagram	4
3.	Timer operations <ul style="list-style-type: none"> • On delay timer • Off delay timer • Retentive timer • On delay with pulse on • On delay with pulse off • Off delay with pulse on • Off delay with pulse off • Flash timer 	4
4.	Counter operations	2
	Input - output system for architecture of PLC	4
5.	Demonstration of PLC	2
6.	PLC programming – 1 with the use of ladder diagram	2
7.	PLC Programming - 2 with the use of ladder diagram	2
8.	PLC Programming - 3 with the use of ladder diagram	2
9.	PLC Programming – 4 with the use of ladder diagram	2
10.	PLC Programming - 5 with the use of ladder diagram	2
	Total	28

GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHATRONICS ENGINEERING
Semester – V

Subject Code : 2352007

Subject Name : **Fundamentals of Thermal and Fluid Devices Practices**

Laboratory Experiences:

The sample experiments to be performed include, but are not limited to the following.

Sr. No.	Experiments	Hrs.
1.	Demonstration of Bernoulli's theorem.	2
2.	Experiment to determine Reynold's number.	2
3.	Demonstration of reciprocating or gear pump.	2
4.	Demonstration of centrifugal pump.	2
5.	Demonstration of Pelton turbine.	2
6.	Demonstration of air compressor.	2
7.	Selection & Study of types of lubricants.	2
8.	Demonstration of measuring emissivity.	2
9.	Demonstration of counter flow / Parallel flow heat exchanger.	4
10.	Three practical on hydraulic systems to be performed using suitable trainer kit and two practical on pneumatic systems to be performed using suitable trainer kit.	8
	Total	28

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN MECHATRONICS ENGINEERING

Semester – V

Subject Code : **2352009**

Subject Name : **Project – I**

OBJECTIVE:

After completing this, the student should be able

1. Acquaint with practical applications of Mechatronics.
2. Experience industrial environment.
3. Operate Mechatronic machines/systems/equipments.
4. Select, prepare & defend a report. Report will be based on the problems given by industries.
5. Identify & locate problem areas and offer solutions/develop alternative solutions.
6. Select and prepare the project.

Students deputed for the industries may select the specific problems based on the concurrence given by the industries. It may be related to maintenance, designing automation systems, implementation of controlling elements. Student has to prepare and submit complete industrial report. Student has to defend this report during practical examinations also. Students are also required to select and prepare project and project report approved by institute and industry guides.

GUIDELINES

1. Searching real time problems in industries by student
2. Student will prepare report based on field relevant problems.
3. Report should consist of the following
 - Introduction of industry.
 - Problem discription
 - Couses /Diagnosis of Problem
 - Possible remedies, Improvements, Research.
 - Feasibility study.
 - Cost estimation.
 - Literatute survey.
 - Scope of implementation of solution.
4. Format of Report.
 - Main Project title: 16 point, bold, Capital, Times New Roman.
 - '12' point time new roman.
 - '1.5' line spacing.
 - '12' point bold times new roman title

SOME SUGGESTED LIST OF PROBLEMS WHICH MAY BE TAKEN UP BY STUDENT

1. CNC X-Y co-ordinate Table.
2. Prepare any automation system needed by Industry.
3. Study & analysis based on dismantling & assembling of any mechatronic system. Also prepare model with simulation using available CAD software.
4. Design & simulation of complete mechatronic system based on given parameters.
5. Performing maintenance of CNC/Robot/any mechatronic system and deriving experience/ conclusion.