IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020410	Fluid Mechanics and Fluid Power	5	-	-	5
4020420	Manufacturing Technology II	5	-	-	5
4020430	Electrical Drives and Controls	5	-	-	5
4020440	Production and Quality Management	5	-	-	5
4020450	Strength of Materials and Fluid Mechanics Practical	-	-	4	4
4020460	Manufacturing Technology II Practical	-	-	4	4
4020470	Electrical Drives and Control Practical	-	-	4	4
		20		12	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	Marks			Minimum marks for pass	Duration of ExamHours
		Internal Assessment	* Board Examination	Total		
4020410	Fluid Mechanics and Fluid Power	25	100	100	40	3
4020420	Manufacturing Technology II	25	100	100	40	3
4020430	Electrical Drives and Controls	25	100	100	40	3
4020440	Production and Quality Management	25	100	100	40	3
4020450	Strength of Materials and Fluid Mechanics Practical	25	100	100	50	3
4020460	Manufacturing Technology II Practical	25	100	100	50	3
4020470	Electrical Drives and Control Practical	25	100	100	50	3

* Examinations will be conducted for 100 Marks and will be converted 75 Marks.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020410
Semester : IV
Subject Title : Fluid Mechanics and Fluid Power

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020410 Fluid Mechanics and Fluid Power	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Properties of Fluids & Fluid Pressure	12
II	Fluid Flow, Flow Through Pipes & Impact of Jet	17
III	Hydraulic Turbines, Centrifugal Pumps & Reciprocating Pumps	16
IV	Hydraulic Systems	16
V	Pneumatic Systems	12
Test and Model Exam		7
Total		**80**

RATIONALE:

The purpose of this subject is to teach the students the fundamentals of engineering fluid mechanics in a very general manner so that they can understand the way that forces are produced and transmitted by fluids that are, first, essentially at rest and, second, in motion. This will allow them to apply the physical principles behind some of the most common applications of fluid mechanics in engineering.

OBJECTIVES:

- To study the basic fluid properties and types of flow;
- To understand the transmission of pressure in liquids and its application to hydraulics;
- To calculate hydrostatic forces on plane and curved submerged surfaces;
- To employ the concept of continuity of flow and use Bernoulli's equation to measure flow rate and velocity;
- To apply the momentum principle to liquids in jets and pipes.
- To understand the working of hydraulic machines like, turbines, pumps.
- To identify the various components of a Hydraulic & Pneumatic systems and select them for design of hydraulic and pneumatic circuits for Engineering applications.

4020410 FLUID MECHANICS AND FLUID POWER

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**PROPERTIES OF FLUIDS & FLUID PRESSURE**	
	Chapter: 1.1: Properties of Fluids	4
	Fluid – definition-classification. Properties – density, specific gravity, specific weight, specific volume, dynamic viscosity, kinematic viscosity, surface tension, capillarity, vapour pressure and compressibility – Problems	
	Chapter: 1.2: Fluid Pressure & Its Measurement	8
	Fluid Pressure – Hydrostatic law - Pressure head, Pascal's Law – proof -	

	applications - Hydraulic press- Hydraulic jack. Concepts of absolute, vacuum, gauge and atmospheric pressures. Pressure measurements – Simple U tube manometers and differential manometers and their types – Problems - Bourdon tube pressure gauge. Pressure sensor technologies - classification only. Total Pressure, Centre of pressure on immersed bodies (flat vertical., flat vertical) – Problems.	
II	**FLUID FLOW, FLOW THROUGH PIPES & IMPACT OF JET** **Chapter: 2.1: Fluid Flow** Types of Fluid flow - Laminar, turbulent, steady, unsteady, uniform, non-uniform, rotational, irrotational. Continuity equation, Bernoulli's theorem - assumptions- derivation - applications and limitations - Problems. Venturimeter – Construction - working principle, coefficient of discharge - derivation for discharge. Orificemeter - Construction working principle, coefficient of discharge- derivation for discharge. Problems. Pitots Tube – Construction and working principle only. **Chapter: 2.2: Flow through Pipes** Laws of fluid friction for Laminar and turbulent flow- Darcy's equation and Chezy's equation for frictional losses – Problems. Minor Losses - description. Hydraulic gradient line and Total energy line. Hydraulic Power transmission through pipes – problems. **Chapter: 2.3: Impact of Jet** Impact of jet on fixed vertical plate - Impact of jet on moving vertical flat plates in the direction of jet - Impact of jet on a series of moving plates or vanes - Problems on work done and efficiency.	6 6 5
III	**HYDRAULIC TURBINES, CENTRIFUGAL PUMPS & RECIPROCATING PUMPS** **Chapter: 3.1: Hydraulic Turbines** Classification of hydraulic turbines and their applications. Construction and working principle of Pelton wheel, Francis and Kaplan turbine. Draft tubes – types and construction, Concept of cavitation in turbines, Surge tank and its need.	4

	Chapter: 3.2: Centrifugal Pumps Construction - Principle of working. Types of casings and impellers. Concepts of multistage. Priming and its methods. Manometric head, work done, manometric, mechanical and overall efficiencies - problems **Chapter: 3.3: Reciprocating Pumps** Construction, working principle and applications of single and double acting reciprocating pumps. Discharge - Theoretical power required coefficient of discharge – Problems Concepts of slip – negative slip. Cavitation and separation. Use of air vessel. Indicator diagram with effect of acceleration head and friction head.	6 6
IV	**HYDRAULIC SYSTEMS** **Chapter: 4.1: Introduction to Fluid power systems** Fluid power systems - general layout - components of hydraulic & Pneumatic systems. Practical applications of Fluid power systems. Comparison - Advantages and limitations. **Chapter: 4.2: Components of Hydraulic systems** Types, construction, working Principle and symbol of the following components. Pump – vane, gear and piston pumps. Valves: Pressure Control valves – pressure relief . valve, pressure reducing valve, pressure unloading valve. Direction control valve – poppet valve, spool valve, 3/2, 4/2 & 4/3 DC valves, sequencing valve.Flow control valve – pressure compensated – non pressure compensated.Actuators – Linear actuactors – single acting & double acting – rotory actuators – hydraulic motors. Accessories – Intensifiers and Accumulators. **Chapter: 4.3: Hydraulic Circuits** Double acting cylinder with Meter in, Meter out circuits, Pump unloading cut, Bleed off circuit, sequencing circuit. Hydraulic circuits for milling machine, shaping machine. Motion synchronisation circuit.	4 8 4
V	**PNEUMATIC SYSTEMS** **Chapter: 5.1: Components of pneumatic systems** Types, construction, working Principle and symbol of the following components. Compressor – Reciprocating & Rotary Compressors.	8

	Valves. Pressure Control valves – pressure relief valve, pressure regulating valves.Direction control valves – 3/2, 5/2 & 5/3 DC valves, sequencing valve.Flow control valve – throttle valves – shuttle valves- quick exhaust valves. Actuators – Linear actuactors – single acting & double acting – rotary actuators – air motors.Accessories.- FRL unit. **Chapter: 5.2: Pneumatic Circuits** Double acting cylinder with Meter in, Meter out circuits, speed control circuit and sequencing circuit	4

Reference Books:

1. A Textbook of Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publications (P).,Ltd, New Delhi, 2010
2. Hydraulics and Fluid Mechanics, Modi P.N. and Seth, S.M. Standard Book House, New Delhi, 2013.
3. Fluid Power with Applications, Anthony Esposito,, Pearson Education 2005.
4. A Textbook of Fluid Mechanics, R. K Rajput, S.Chand & Co, New Delhi, 2019
5. Engineering Fluid Mechanics, Kumar K. L., Eurasia Publishing House (P) Ltd., New Delhi, 2016.
6. Oil Hydraulics Systems- Principles and Maintenance", Majumdar S.R., Tata McGraw- Hill, 2001.
7. Hydraulic and Pneumatic Controls, Shanmugasundaram.K, Chand & Co, 2006

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020420
Semester : IV
Subject Title : Manufacturing Technology - II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020420 Manufacturing Technology - II	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Theory of Metal Cutting, Drilling Machine & Abrasive Process	15
II	Reciprocating Machines and Broaching	15
III	Milling Machines and Gear Generating	14
IV	Unconventional Machining Processes	14
V	CNC Machine and CNC Programming	15
Test and Model Exam		7
Total		**80**

RATIONALE:

In the process of manufacturing we should possess adequate and through knowledge about the working of conventional as well as non-conventional machines. The topics included aim to inculcate in the students the skills of metal cutting, milling, grinding, CNC machines and other machining processes which are very much essential.

OBJECTIVES:

- Study the working of various machine tools: Planer, Shaper, Drilling and Slotter.
- Study the various work holding devices
- Study various types of milling cutter.
- Study the different types of grinders and grinding wheels.
- Study the broaching operation and their applications.
- Study the milling procedure for spur, helical and bevel gears.
- Study the various types of gear generating processes
- Study the use of non-conventional machining processes.
- Study the CNC machines working principle and its components.

4020420 MANUFACTURING TECHNOLOGY – II

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THEORY OF METAL CUTTING, DRILLING MACHINE & ABRASIVE PROCESS**	
	Chapter: 1.1: Theory of metal cutting	4
	Introduction – orthogonal cutting – oblique cutting – single point cutting tool – nomenclature – types of chips – chip breakers – cutting tool materials – properties – tool wears – factors affecting tool life – cutting fluids – functions – properties of cutting fluid.	
	Chapter: 1.2: Drilling machines	4
	Drills – flat drills – twist drills – nomenclature of twist drill – types of	

	drilling machines – bench type – floor type – radial type – gang drill – multi spindle type – principle of operation in drilling – methods of holding drill bit – drill chucks – socket and sleeve – drilling operation – reaming, counter sinking, counter boring, spot facing, tapping and deep hole drilling. **Chapter: 1.3: Abrasive process** Types and classification – specifications – rough grinding – pedestal grinders - portable grinders – belt grinders. Precision grinding – cylindrical grinder – centerless grinders - surface grinder – tool and cutter grinder – planetary grinders – principles of operations – grinding wheels – abrasives – natural and artificial diamond wheels – types of bonds – grit, grade and structure of wheels – wheel shapes and sizes – standard marking systems of grinding wheels – selection of grinding wheel – mounting of grinding wheels – dressing and truing of wheels – balancing of grinding wheels.	7
II	**RECIPROCATING MACHINES** **Chapter: 2.1: Planer** Introduction – description of double housing planner – specifications – principles of operation – drives – quick return mechanism – feed mechanism - operations. **Chapter: 2.2: Shaper** Introduction – specifications – principles of operations – standard shaper – quick return mechanism – crank and slotted link – hydraulic shaper – feed mechanism – operations. **Chapter: 2.3: Slotter** Introduction - specifications – method of operation – whitworth quick return mechanism - feed mechanism – types of tools. **Chapter: 2.4: Broaching** Types of broaching machine – horizontal, vertical and continuous broaching – principles of operation – types of broaches – classification – broach tool nomenclature – broaching operations.	4 4 3 4

III	**MILLING MACHINES AND GEAR GENERATING PROCESSES** **Chapter: 3.1: Milling machines** Types – column and knee type, plain, vertical and universal milling machines – principles of operation – specification of milling machines – work holding devices – tool holding devices – arbor – stub arbor – spring collet – adaptor. Milling cutters – cylindrical milling cutter - slitting cutter – side milling cutter – angle milling cutter – T slot milling cutter – woodruff milling cutter – fly cutter – nomenclature of cylindrical milling cutter. Milling operations – straddle milling - gang milling – vertical milling attachment. Indexing plate – differential indexing – simple indexing and compound indexing – simple problems. **Chapter: 3.2: Generating processes** Gear shaper – gear hobbing – principle of operations only. Gear finishing processes – burnishing – shaving – grinding and lapping – gear materials.	10 4
IV	**UNCONVENTIONAL MACHINING PROCESSES** **Chapter: 4.1: Mechanical energy based process** Introduction – classification – process selection – advantages – limitations – demerits of conventional processes. Mechanical energy based process: Introduction – abrasive jet machining – metal removal rate process parameters – water jet machining – hydrodynamic jet machining – ultrasonic machining process – advantages – disadvantages – applications – compare ultrasonic machining with traditional abrasive machining. **Chapter: 4.2: Electrical energy based processes** Introduction – electrical discharge machine (EDM) – flushing system in EDM – tool (electrode) materials - tool wear – metal removal rate and surface finish - factors affecting the metal removal rate – advantages – disadvantages – applications – wire cut EDM , features of wire cut EDM – difference between EDM and wire cut EDM. **Chapter: 4.3: Thermal energy based processes** Introduction – electron beam machining – laser beam machining – lasing materials – machining applications of laser – plasma arc machining –	5 5 4

	gases used in plasma arc machining – types of plasma arc torches – advantages – disadvantages – applications.	
V	**CNC MACHINE AND ITS COMPONENTS** **Chapter: 5.1: CNC machines** Numerical control – definition – working principle of a CNC system – features of CNC machines – advantages of CNC machines – difference between NC and CNC – construction and working principle of turning centre – construction and working principle of machining centre - machine axes conventions turning centre and machining centre – co-ordinate measuring machine – construction and working principle. **Chapter: 5.2: Components of CNC machine** Slide ways – requirement – types – friction slide ways and anti-friction slide ways – linear motion bearing – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – encoders – in process probing – tool material – tool inserts. **Chapter: 5.3: CNC Programming** Introduction – Cartesian coordinate system – Polar coordinate system – Absolute and incremental positioning – Purpose of G and M codes. Basic codes – basic CNC program. CNC turning program using linear interpolation and circular interpolation. Machine control panel – Homing position – Offset setting – Auto. CNC milling program using linear interpolation and circular interpolation. Compensation – Machine control panel – Home position – Work offset setting procedure – Tool offset .	5 4 6

Reference Book:

1. Elements of Workshop Technology- Vol. I & II, Hajra Choudry & Battacharya, Edn. 11, published by Media Promoters and Publishers Pvt. Ltd., Seervai Buildings `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Production Technology, Jain & Gupta, Khanna Publishers, 2-B, North Market, Naisarak, New Delhi – 110 006 – 2006.
3. Production Technology, HMT, Edn. 18, published by Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.

4. Manufacturing process, Myro N Begman, , Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
5. Workshop Tech Vol I,II, III, WAJ. Chapman, published by Viva Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
6. Production processes, NITTTR, published by 5, Tata McGraw Hill Publishing Co. Ltd., West Patel Nagar, New Delhi 110 008.
7. Principles of the manufacturing of Composite materials – Suong V Hoa, DES tech publication. Inc, 439, North Duke street, Lancaster, Pennsylvania – 17602 U.S.A.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020430
Semester : IV
Subject Title : Electrical Drives and Control

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020430 Electrical Drives and Control	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Dc Circuits and Dc Machines	15
II	Ac Circuits and Ac Machines	15
III	Special Machines & Drives	15
IV	Power Supplies, Control Elements and Electrical Safety	14
V	Display Devices, Logic Gates and PLC	14
Test and Model Exam		7
Total		**80**

RATIONALE:

The automation is being the order of the day to improve the production with high quality consciousness. Such automation involves electrically operated switches, sensors controlled through electrically driven motors and actuators. The subject aims in introducing the basic electrical DC and AC circuits and motors and also focuses on the various special control devices like stepper, servo drives and its controlling elements.

OBJECTIVES:

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

4020430 ELECTRICAL DRIVES AND CONTROL

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC CIRCUITS AND DC MACHINES** **Chapter: 1.1:** Definition- Electric Current, Voltage and Resistance -Ohm's law and Kirchoff's law. Resistance in series, parallel and series parallel – simple problems - Electromagnetism (definitions only) – Magnetic flux, Fluxdensity, Magnetic field intensity, MMF, Permeability,	7

	Reluctance,Faraday's law of Electromagnetic induction, Electrical and Mechanical units. **Chapter: 1.2:** DC Generators – Construction, Principle of operation and Applications. DC Motors: - Construction, Principle of operation and Applications. Necessity of starters: Three point, four point starters.	8
II	**AC CIRCUITS AND AC MACHINES** **Chapter: 2.1:** Fundamentals of AC voltage, and current – Peak, Average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only). Transformer: Principle of operation and construction – EMF equation - Losses in Transformer – Efficiency – Applications. Alternator construction – Principle of operation and Applications. **Chapter: 2.2:** AC machine: AC Motors- Principle of operation of Single Phase, Capacitor Start induction motor - universal motor - Applications- Three Phase Induction Motors – Squirrel Cage and Slip ring Induction motors (Construction and Working Principle only) - Applications – Speed control of 3Φ Induction Motor - DOL and star/delta starter.	7 8
III	**SPECIAL MACHINES & DRIVES** **Chapter: 3.1:** PMDC Motor, Stepper motor- Construction and Working Principle and Applications - Servo motor – types. Permanent Magnet Servo motor Construction and Applications. Brushless Servo motor - Construction and Applications. **Chapter: 3.2:** Industrial drives- types, Group drive, Individual drive, Multi motor drive. Block diagram of Variable Frequency Drive (VFD). Stepper motor Drive: Single stepping and Half stepping Servo drives. DC Servo drive, AC Servo drive and BLDC Servo drive.	7 8

IV	**POWER SUPPLIES, CONTROL ELEMENTS AND ELECTRICAL SAFETY** **Chapter: 4.1:** Rectifiers – Half wave, Full wave and Bridge rectifiers – Necessityof Filters- Regulated Power Supplies: IC Voltage Regulators.Batteries - Working, Constructions, Maintenances and Trouble shooting. **Chapter: 4.2:** Fuses – Selection of Fuse – Necessity of Fuse- Fuse switch units. Sensors: Photo electric sensor, Inductive Proximity sensors, Temperature sensors. Contactors - usage – Necessity of Contactor- Solenoid type Contactor. **Chapter: 4.3:** Circuit breakers – Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB). Electrical Safety: - Importance of Earthing - Electric shock: First aid, Precautions - Causes of Accident and their Preventive measures.	5 5 4
V	**DISPLAY DEVICES, LOGIC GATES AND PLC** **Chapter: 5.1:** Display devices – LED, 7 segments LED, LCD, applications. **Chapter: 5.2:** Logic gates: Positive and Negative Logic, Definition, Symbol and truth table.Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates. Universal Logic Gates: NAND, and NOR. **Chapter: 5.3:** Features of PLC - PLC Block diagram - PLC scan. Fixed and Modular PLC. Ladder logic - NO, NC contacts - Coils - AND logic, OR logic.	4 5 5

Reference Books

1. Fundamentals of physics, Brijlal and Subramaniam.
2. Fundamentals of Electricity, D.N. Vasudeva, S. Chand & co.
3. Electric motors and drives, Austin Hughes
4. A text bookof Electrical Technology, Volume II, B.L.Theraja, S. Chand & co.
5. Programmable Logic Controllers – John R Hackworth Frederick D.Hackworth Jr., Pearson Education.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020440
Semester : IV
Subject Title : Production and Quality Management

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020440 Production and Quality Management	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Process Planning and Selection	15
II	Basic concepts of Total Quality Management	14
III	TQM Tools	14
IV	Statistical Fundamentals & Charts	15
V	Lean Manufacturing Concepts	15
Test and Model Exam		07
Total		**80**

RATIONALE:

In the product manufacturing the process selection and planning are important. Quality and customer satisfaction in every product and every activity is the order of the day. As there is a shift from quality control to quality management in all activities, the concept Total Quality Management and the pillars of TQM are to be given to Engineers, who are designing products and production systems.

OBJECTIVES:

- Understand the process planning.
- Study the process selection.
- Define quality and appreciate its signature.
- Explain the concept of TQM.
- Appreciate the use of principles of TQM to meet customer satisfaction.
- Solve problem using the Quality control tools.
- Apply Brainstorming and quality circle to solve problems.
- Use PDCA cycle for continuous improvement.
- Appreciate the benefits of implementing 5S concepts.
- Collect, classify and present the data.
- Determine the process capability of a manufacturing process.
- Practice on management planning tools.
- Use Bench Mark and JIT concepts.

4020440 PRODUCTION AND QUALITY MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Process Planning And Selection** **Chapter: 1.1:** **Production:** Types of Production – Mass production, batch production and job order production **Chapter: 1.2:** **Process Planning:** Introduction – concept – Information required to do processplanning – factors affecting process planning – process	 3 6

	planningprocedure – Make (or) Buy decision using Break Even Analysis – simple problems. Manual process planning – Introduction ofAutomated process planning and generator process planning –Advantage of computer aided process planning – Principle of linebalancing – need for line balancing – Value Engineering –Definition – cost control Vs cost reduction – value analysis when todo – steps information needed – selection of product. **Chapter: 1.3:** **Process Selection:** Process selection – technological choice – specific componentchoice – Process flow choice – Factors affecting process selection– machine capacity – analysis of machine capacity – process andequipment selection procedure – Determination of man, machineand material requirements – simple problems – selection ofmaterial – jigs – fixtures etc. – Factors influencing choice of machinery – selection of machinery – simple problems – Preparation of operation planning sheet for simple components.	6
II	**Chapter: 2.1: Basic Concepts Of Total Quality Management** Quality-Definitions – Dimensions of quality – Brainstorming and itsobjectives – Introduction to TQM - Characteristics – Basic concepts – Elements - Pillars – Principles – Obstacles to TQMimplementation - Potential benefits of TQM - Quality council – duties – Responsibilities - Quality statements – Vision – Mission – Quality policy statements – Strategic planning – Seven steps tostrategic planning – Deming philosophy – Customer – Input / Output process model – Juran Trilogy - PDCA (Deming Wheel) cycle.	14
III	**TQM Tools** **Chapter: 3.1:** **Seven tools of quality control (Q 7 tools):** Check sheet – Types of check sheet – Histogram – Cause and effect diagram – Pareto diagram – Stratification Analysis – Scatter diagram-Graph/run charts – Control charts – Construction of above diagrams.Quality circle – concept of quality circle – Organisation of Qualitycircle and objectives of Quality circle. Zero Defect Concepts.	14

	Chapter: 3.2: **Management Planning Tools (M 7 Tools)** Affinity diagram – Radar Diagram – Inter Relationship diagram (Inter Relationship diagram) – Tree diagram – Prioritization matrix – Matrix diagram – Decision tree – Arrow diagram – Matrix data analysis diagram – Construction of above diagrams.	
IV	**Statistical Fundamentals And Control Charts** **Chapter: 4.1:** Types of Data – Collection of Data – Classification of Data – Tabular presentation of Data - Graphical representation of a frequency distribution – Comparison of Frequency distribution – Mean - Median – Mode – Comparison of measures of central tendency - Introduction to measures of dispersion – Sample – sampling – Normal curve – Sigma – Concept of six sigma – Principles – Process - Problems. **Chapter: 4.2: Control Charts** Control chart – Types of control charts – Control chart for variables – Construction of X bar and R charts – control limits Vs specification limits – Process capability – Method of doing process capability Analysis – Measures of process capability – Problems. Attributes – Control charts - P chart – np chart – c chart – u chart – Construction of above diagrams – Problems – Comparison between variable chart and Attribute chart.	7 8
V	**Capter 5.1: Lean Manufacturing Concepts** 5S Concepts (SEIRI, SEITON, SEISO, SEIKETSU and SHITSUKE) – needs and objectives – effective implementation of 5S concepts in an organisation – Housekeeping – Kaizen – Kanban System.Bench marking - Objectives of bench marking – Types – Benchmarking process – Benefits of Bench marking – Pit falls of Benchmarking-Just In Time(JIT) concepts and its objectives – TotalProductive Maintenance(TPM) – Introduction, Objectives of TPM –steps in implementing TPM. – Overall Equipment Effectiveness(OEE)–Lean Six Sigma – Value Stream Mapping – DMAIC(Define, Measure, Analyse, Improve, Control) – DMADV (Define , Measure, Analyse, Design, Verify)	15

Reference Books:

1. Industrial Engineering & Management – O.P Khanna
2. Industrial Engineering & Production Management – Martand Telsang
3. Total Quality Management, Date H.Besterfiled, Pearson Education Asia.
4. Total Quality Management, V.Jayakumar, Lakshmi Publications.(reprint 2005)
5. Training manual on ISO 9001 : 2000 & TQM, Girdhar J.Gyani, Raj PublishingHouse, Second Edition 2001
6. Quality Management, Howard Cuitlow, Tata Mc Graw Hill, 1998
7. Production Engineering – P.C.Sharma.
8. Production and Costing – GBS Narang and V.Kumar
9. Mechanical Estimating and Costing – Banga & Sharma.
10. Total Quality Management, Oakiand.J.S. Butterworth Heinemann Ltd. Oxford1989.
11. Quality Management – Concepts and Tasks- Narayana.V and
12. Sreenivasan.N.S., New Age International 1996.
13. Total Quality Management for engineers, Zeiri. Wood Head Publishers. 1991.
14. Quality Planning and Analysis, Juran J.M and Frank M.Gryna Jr., TMH. India.1982
15. ISO 9001, Brain Rethry, Productivity and Quality Publications.
16. ISO 9001, Brain Rethry, Productivity and Quality Publishing Pvt. Ltd. 1993.
17. Quality Auditing D.Mills, Chapman and Hall, 1993.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

(To be implemented for the students admitted from the year 2020 – 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020450
Semester : IV
Subject Title : Strength of Materials and Fluid Mechanics Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020450 Strength of Materials and Fluid Mechanics Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Acquire skills on different types of testing methods of metals.
- Conduct material testing on elasticity, hardness, shear strength
- Determine modulus of rigidity of open coil spring and closed coil springs.
- Determine the co-efficient of discharge of venturimeter and mouth piece
- Determine the co-efficient of friction in pipes.
- Conduct performance test on reciprocating pump.
- Conduct performance test on impulse turbine.

4020450 STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL
DETAILED SYLLABUS

Experiments:

PART A : Strength of Materials Laboratory

1. **Test on Ductile Materials:**
   Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.
2. **Hardness Test:**
   Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.
3. **Torsion test:**
   Torsion test on mild steel – relation between torque and angle of twist- determination of shear modulus and shear stress.
4. **Impact test:**
   Finding the resistance of materials to impact loads by Izod test and Charpy test.
5. **Tests on springs of circular section:**
   Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open or Closed coil spring)
6. **Shear test:**
   Single or double shear test on M.S. bar to finding the resistance of material to shear load.

PART B: Fluid Mechanics Laboratory

1. Verify the Bernoulli's Theorem.
2. Determination of co-efficient of discharge of a mouth piece by variable head method.
3. Determination of co-efficient of discharge of a venturimeter.
4. Determination of the friction factor in a pipe.
5. Performance test on reciprocating pump and to draw the characteristics curves.
6. Performance test on impulse turbine and to find out the Efficiency.

BOARD EXAMINATION

Note:

- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part-A	:	**45 marks**
Procedure / Observation	10	
Tabulation / Calculations	25	
Result / Graph	10	
Part-B	:	**45 marks**
Procedure / Observation	10	
Tabulation / Calculations	25	
Result / Graph	10	
Viva-voce	:	**10 marks**
Total	:	**100 Marks**

LIST OF EQUIPMENTS:
(To accommodate a batch of 30 students in Practice / Board Examinations)

1.	UTM.	01
2.	Rockwell's Hardness Testing Machine.	01
3.	Torsion testing machine.	01
4.	Impact testing machine.	01
5.	Spring testing arrangements.	01
6.	Shear testing machine.	01
7.	Vernier calliper.	02
8.	The Bernoulli's Apparatus.	01
9.	An open tank fitted with an external mouth piece and a collecting tank with Piezometer.	01
10.	An arrangement to find friction factor of pipe.	01
11 .	A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristics curves.	01
12.	A impulse turbine with an arrangement for calculating data to find out the efficiency.	01
13.	An arrangement of Venturimeter fitted in horizontal water pipe line to find coefficient of discharge.	01

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering

Subject Code : 4020460

Semester : IV

Subject Title : Manufacturing Technology - II Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020460 Manufacturing Technology - II Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

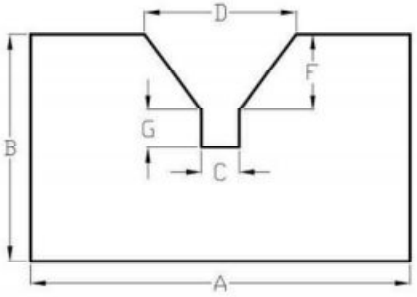
OBJECTIVES:

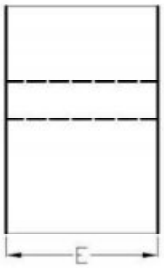
- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify shaper, Slotter and its parts
- Identify the tools and instruments used in milling.
- Study the components of the CNC machine and setting.
- Handle the different types of work holding devices
- Machine a component using different machine tools.
- Calculate the indexing for a work
- Machine a gear using milling machine.
- Machine a cutting tool using Tool and Cutter grinder.
- Machine a plug gauge using Cylindrical grinding machine.
- Machine components by shaping machine
- Machine components by slotting machine.
- Machine components by the CNC machines.

4020460 MANUFACTURING TECHNOLOGY - II PRACTICAL
DETAILED SYLLABUS

EXERCISES: **Raw Material: M.S. / C.I**

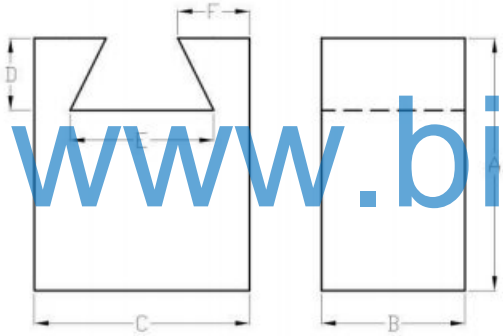
1. Make 'V' Block using shaping machine





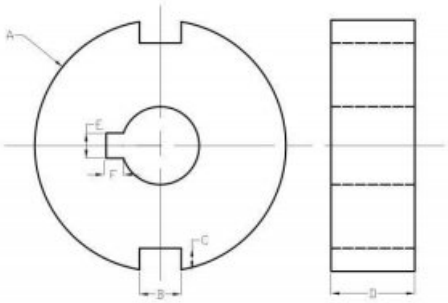
Dimensions			
Sl.No	Part Name	Actual	Obtained

2. Make dovetail using shaping machine



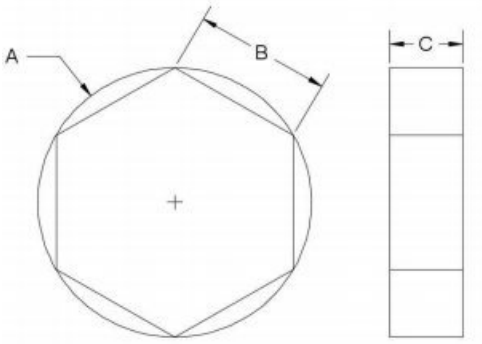
Dimensions			
Sl.No	Part Name	Actual	Obtained

3. Make groove cut using slotting machine



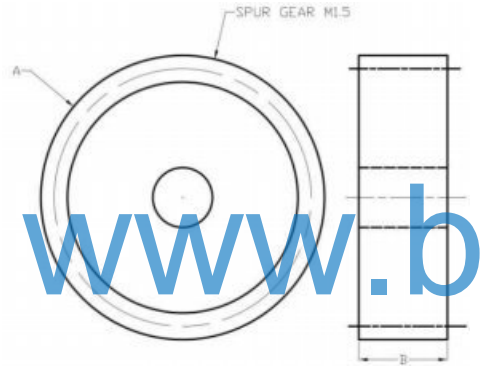
Dimensions			
Sl.No	Part Name	Actual	Obtained

4. Make round to hexagon in milling machine.



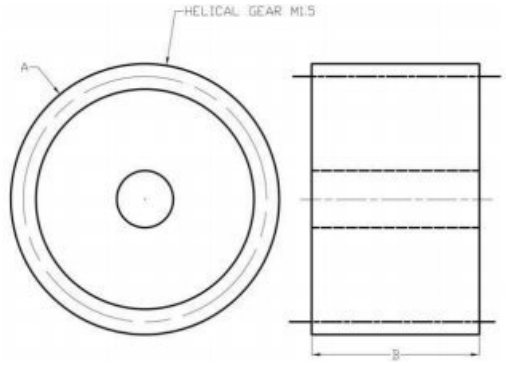
Dimensions			
Sl.No	Part Name	Actual	Obtained

5. Make Spur Gear using milling machine.



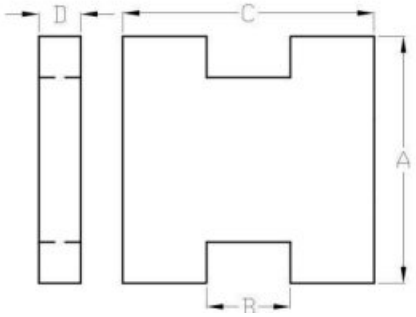
Dimensions			
Sl.No	Part Name	Actual	Obtained

6. Make Helical Gear using milling machine.



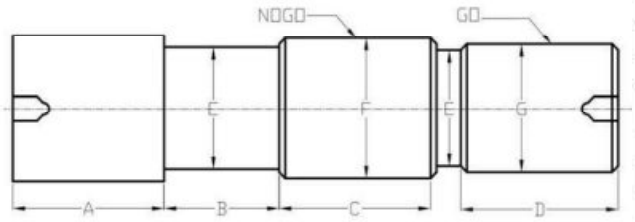
Dimensions			
Sl.No	Part Name	Actual	Obtained

7. Make slot cut using milling machine.



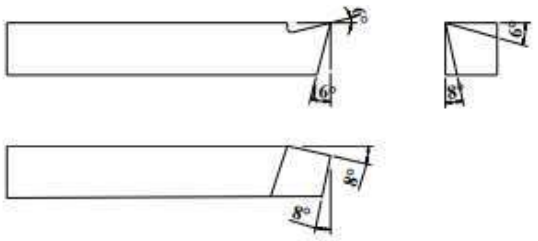
Dimensions			
Sl.No	Part Name	Actual	Obtained

8. Make Progressive type Plug gauge using Cylindrical Grinding machine



Dimensions			
Sl.No	Part Name	Actual	Obtained

9. Make a turning tool using Tool and Cutter Grinder

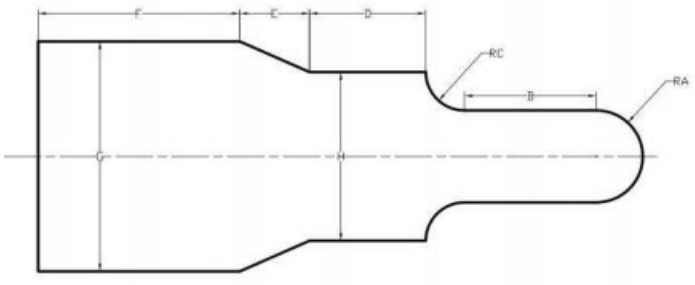


Dimensions			
Sl.No	Part Name	Actual	Obtained

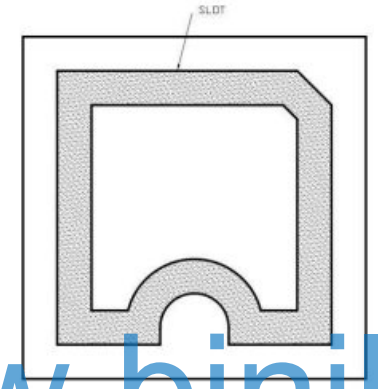
10. Make plain surfaces (four surfaces)using surface Grinder

Dimensions			
Sl.No	Part Name	Actual	Obtained

11. Make the component in the CNC Turing Centre.



12. Make the component in the CNC Milling Centre.



BOARD EXAMINATION

Note:

- All the exercises should be completed. Any one exercise will be given for examination.
- All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Description	Marks
Procedure	10
Preparation of the Specimen	15
Setting and Machining	30
Dimensions	25
Finishing	10
Viva-voce	10
Total	**100**

LIST OF EQUIPMENTS

(To accommodate a batch of 30 students in Practice / Board Examinations)

1	Vertical milling machine / Vertical attachment	-	2 Nos.
2.	Universal Milling Machine	-	2 Nos.
3.	Surface Grinding Machine	-	1 No.
4.	Cylindrical Grinding Machine	-	1 No.
5.	Tool and Cutter Grinder	-	1 No.
6.	Shaping Machine	-	2 Nos.
7.	Slotting Machine	-	1 No.
8.	CNC Turning centre	-	1 No.
9.	CNC Milling Centre	-	1 No.
10	Tools and Measuring instruments	-	Sufficient quantity.
11	Consumables	-	Sufficient quantity.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020470
Semester : IV
Subject Title : Electrical Drives and Control Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020470 Electrical Drives and Control Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Identify starters for different motors.
- Study and prepare earthing
- Test the characteristics of DC and AC machines.
- Identify and select controlling elements.
- Explore the performance of ELCB, MCB.
- Design regulated power supplies.
- Identify display devices–LED, 7 segment LED, LCD.
- Identify the drive circuit for special motors.Test the speed control circuit of the special motors.

4020470 ELECTRICAL DRIVES AND CONTROL PRACTICAL

EXPERIMENTS:

Part A:

1. Verification of Ohm's Law
2. Load test on DC shunt motor
3. Load teston single phase induction motor
4. Load test on three phase squirrel cage motor
5. Testing of relays, contactors, push buttons and limit switch
6. Connection and Testing of MCB, ELCB

Part B

1. Construction and testing of Halfwave and Fullwave rectifier.
2. Construction and testing of IC voltage regulator using IC 7805.
3. Verification of truth tables for logic gates.
4. Verification of universal gates.
5. Identification and testing of display devices - LED, 7segment LED, Laser diode.
6. Testing of Stepper motor drive.
7. Testing of Servomotor drive.

BOARD EXAMINATION

Note:

- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All the students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILLED ALLOCATION OF MARKS

Part A:		**45**
Circuit diagram	10	
Connections & Readings	20	
Calculations & Graph	15	
Part B:		**45**
Circuit diagram	10	
Connections & Readings	20	
Execution	15	
Viva Voce		**10**
Total		**100**

LISTOF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

Electrical Lab

1. DC ammeter 0-5A - 1 no
2. DC ammeter 0-25A - 1 no
3. DC voltmeter 0-30V - 1 no
4. DC voltmeter 0-300V - 1 no
5. Rheostat 10.8 ,8.5A - 1 no
6. AC ammeter 0-5A - 1 no
7. AC ammeter 0-10A - 2 nos.
8. AC voltmeter 0-50V - 3 nos
9. ACwattmeter 5A-10A - 3 nos
   (0-750W,0-600V)
10. Loading rheostat 5A,230V - 1 no
11. Tachometer 0-1000rpm - 1 no
    (Analog type)
12. Variac 20A,250V - 2 nos
    (Auto transformer)
13. Over load relay1 to 2.5A - 1 no
14. Air breakcontactors 20A,220V - 4 nos

15. Push button 2A ,220V - 2 nos
16. Limit switch 20A,220V - 1 no
17. MCB 20A single pole - 1 no
18. MCB 20A double pole - 1 no
19. ELCB 2pole 20A,100mA - 1 no
20. ELCB 4POLE 20A,100mA - 1 no

Electronics Lab

1. Transformer 230 / 9-0-9V, 1A - 4 nos.
2. Resistor 1 Kδ/ ½W - 3 nos.
3. Capacitor 1000 μF/25V - 4 nos.
4. IC 7805 - 1 no.
5. Logic Gates IC
   7400, 7408, 7432, 7404,7402, 7486- 1 each
6. Stepper Motor Drive kit - 1no.
7. Servo Motor Drive Kit - 1no
8. Digital Multimeter - 1no.
9. LED, 7 Segment LED, Laser Diode - 1 each