STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for
IV SEMESTER DIPLOMA IN MECHANICAL ENGG.
(Effective from Session 2016-17 Batch)
THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME						
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Theory of Machines & Mechanisms	1625401	03	03	10	20	70	100	28	40	03
2.	Fundamentals of Electronics	1625402	04	03	10	20	70	100	28	40	04
3.	Production Processes	1625403	03	03	10	20	70	100	28	40	03
4.	Thermal Engineering	1625404	03	03	10	20	70	100	28	40	03
5.	Fluid Mechanics and Machinery	1625405	03	03	10	20	70	100	28	40	03
		Total :- 16					350	500			

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
				Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
			Periods per Week		Internal(A)	External(B)			
6.	Thermal Engineering Lab	1625406	02	03	15	35	50	20	01
7.	Fluid Mechanics and Machinery Lab	1625407	03	03	15	35	50	20	01
8.	Computer Programming Lab	1625408	04	03	15	35	50	20	02
		Total :- 09					150		

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
9.	Theory of Machines & Mechanisms (TW)	1625409	02	07	18	25	10	01
10.	Professional Practices-IV	1625410	04	07	18	25	10	02
11.	Production Processes (TW)	1625411	02	15	35	50	20	01
		Total :- 08				100		
Total Periods per week Each of duration One Hour 33				Total Marks = 750				24

THEORY OF MACHINES & MECHANISMS (MECHANICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
1625401	No. of Periods Per Week			Full Marks	:	100	**03**
	L	**T**	**P/S**	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Chapter	Name of the Topic	Hours	Marks

Unit-1	**Fundamentals and types of Mechanisms :**
	1.1 Kinematics of Machines: - Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure.
	1.2 **Inversions of Kinematic Chain :**
	    1.2.1 Inversion of four bar chain, coupled wheels of Locomotive & Pentograph.
	    1.2.2 Inversion of Single Slider Crank chain- Rotary I.C. Engines mechanism, Whitworth quick return mechanism, Crank and Slotted lever quick return mechanism.
	    1.3.3 Ackerman's Steering gear mechanism.
	    1.3.4 Foot operated air pump mechanism.
		12	**14**

Unit-2	**Velocity and Acceleration in Mechanism :** 2.1 Concept of relative velocity and relative acceleration of a point on link, angular velocity and angular acceleration, inter- relation between linear and angular velocity and acceleration. 2.2 Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method [Excluding coriollis components of acceleration]. 2.3 Analytical method [no derivation] and Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism.	**09**	**09**
Unit-3	**Cams and Followers :** 3.1 Concept, definition and application of Cams and Followers. 3.2 Classification of Cams and Followers. 3.3 Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. 3.4 Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method).	**08**	**08**

Unit-4	**Power Transmission :** 4.1 Types of Drives – Belt, Chain, Rope, Gear drives & their comparison. 4.2 Belt Drives - flat belt, V– belt & its applications, material for flat and V-belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission(Simple numericals) 4.3 Chain Drives – Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. 4.4 Gear Drives – Spur gear terminology, types of gears and gear trains, their selection for different application, train value & Velocity ratio for compound, reverted and simple epicyclic gear train, methods of lubrication, Law of gearing. 4.5 Rope Drives – Types, applications, advantages & limitations of Steel ropes.	**14**	**16**
Unit-5	**Flywheel and Governors :** 5.1 Flywheel - Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-Stroke I.C. Engine (no Numericals). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. 5.2 Governors - Types, concept, function and application & Terminology of Governors. 5.3 Comparison between Flywheel and Governor.	**06**	**06**
Unit-6	**Brakes, Dynamometers, Clutches & Bearings :** 6.1 Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer. 6.2 Construction and working of i) shoe brake, ii) Band Brake, iii) Internal expanding shoe brake iv) Disc Brake. 6.3 Concept of Self Locking & Self energizing brakes. 6.4 Numerical problems to find braking force and braking torque for shoe & band brake. 6.5 Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. 6.6 Clutches- Uniform pressure and Uniform Wear theories. 6.7 Function of Clutch and its application, Construction and working of i) Single plate clutch, ii) Multiplate clutch, iii) Centrifugal Clutch iv)Cone clutch v) Diaphragm clutch. (Simple numericals on single and Multiplate clutch). 6.8 Bearings – i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot. Torque & power lost in friction (no derivation). Simple numericals.	**12**	**14**
Unit-7.	**Balancing & Vibrations :** 7.1 Concept of balancing. Balancing of single rotating mass. Graphical method for balancing of several masses revolving in same plane. 7.2 Concept and terminology used in vibration, causes of vibrations in machines, their harmful effects and remedies.	**03**	**03**
	Total	**64**	**70**

	Text/Reference Books:	
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Theory of machines	Khurmi Gupta	Eurasia publishing House Pvt. Ltd. 2006 edition
Theory of Machine	S.S.Rattan	McGraw Hill companies II Edition
Theory of machines	P.L.Ballaney	Khanna Publication
Theory of machines	Timo Shenko	Wiley Eastern
Theory of machines	Jagdishlal	Bombay Metro – Politan book ltd.
Theory of machines	Ghosh - Mallik	Affilated East west press
Theory of machines	Beven T.	CBS Publication
Theory of machines	J.E.Shigley	Mc Graw Hill
Theory of Machines & Mehanisms	D.P. Mukherjee	Foundation Publishing

FUNDAMENTALS OF ELECTRONICS (MECHANICAL ENGINEERING GROUP)

Subject Code 1625402	Theory						Credits
	No. of Periods Per Week			Full Marks	:	100	
	L	T	P/S	ESE	:	70	04
	04	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	**Electronic Devices :** Introduction to electronic devices, their symbols, principle of working and testing procedure – Diode, Zener diode, Power diode, Varactor diode, Bipolar Junction Transistor (BJT), Field Effect Transistor(FET) - JFET & MOSFET, Uni-junction Transistor(UJT), power devices – DIAC,TRIAC, SCR, Photo devices-, LDR, Photo diode, Photo transistor, LED & LED display (7 segment), Liquid crystal display(LCD), opto –coupler, thermister-NTC,PTC Power supply.	10	16
Unit-02	**Circuit diagram and operation :** Half wave, full wave & bridge rectifier. Filters – L, C, L-C, π filter Concept of unregulated power supply, regulated power supply- line regulation & load regulation. Principle of operation, block diagram and application of shunt regulated power supply, series regulated power supply, switch mode power supply (SMPS), 3 pin IC regulated, IC 723 adjustable power supply. Block diagram of UPS, Concept of online and off line UPS. Concept of constant current limiting and fold back current limiting, concept of constant voltage source, constant current source.	09	15
Unit-03	**Transistor :** Transistor as a switch and amplifier, single stage transistor amplifier CB, CE and CC configuration and their applications, RC coupled and direct coupled amplifier, their frequency response and application. Power amplifier- class A, class B, class C, class AB, their comparison on operating point, conduction cycle, efficiency, application.(No circuits expected) **Oscillator**: Requirement of oscillator circuit, Barkhauson's criteria of oscillator, circuit diagram and its application-. Phase shift oscillator, Hartley oscillator, Colpitts oscillator, Crystal oscillator.	09	15
Unit-04	**OP Amp :** Block diagram, configurations and use of op amp as - Inverting, Non-inverting, Summing, Voltage to current converter, current to voltage converter, differentiator, Comparator, Wien bridge oscillator, Schmitt's trigger, Instrument amplifier	05	10
Unit-05	**Digital Electronics :** **Number system-** Decimal, Binary, Hexadecimal, BCD, Decimal to binary conversion, , Decimal – Hexadecimal conversion. Study of logic gates, Symbol, truth table and IC numbers - NOT, AND, OR, NAND, NOR, XOR, XNOR and NAND as universal gate. **Flip Flops** – Block diagram of flip flop, RS flip flop, D flip flop ,Toggle , JK flip flop, Master Slave JK flip flop, Clocked flip flop – level triggered and edge triggered , Application of flip flop – Frequency divider, Ring counter, Shift register. Seven segment driving circuit, Encoder, Decoder, Multiplexer, De	09	14

Unit-06	**IC 555 :** Block diagram, Multi vibrator circuit diagram and working for Mono stable, Bi stable and Astable Multivibrator, Analog to Digital Converters , Digital to Analog converter . Block diagram and working of – Welding control circuits –sequential timer Temperature control circuits using SCR,FWR Speed control circuits Level control circuit using variable capacitor and potentiometer.	06	10
	Total	**48**	**80**

Text /Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Principles of Electronics	V.K. Mehta	S. Chand & Company Ltd. New Delhi
Electronic Principles	Paul Malvino	Tata McGraw Hill Publishers
Electronic Devices & Components'	A. Mottershead	Prentice Hall of India
Modern Digital Electronics	R.P. Jain	Tata McGraw Hill Publishers
Basic Electronics	Grob Bernard	Tata McGraw Hill Publishers
Basic Electronics - a Text Lab Manual	Paul B. ZBar, Albert p.Malvino,Michael	Tata McGraw Hill Publishers
	A. Miller	
Industrial Electronics - a Text Lab Manual	Paul B. ZBar	Tata McGraw Hill Publishers
Fundamentals of Electronics	Ashish K Majumdar	Foundation Publishing

PRODUCTION PROCESSES (MECHANICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
1625403	**No. of Periods Per Week**			**Full Marks**	**:**	**100**	**03**
	L	**T**	**P/S**	**ESE**	**:**	**70**	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	**Turning :** **1.1 Lathe** : Angle calculations for taper turning. Cutting tool nomenclature and tool signature. Cutting parameters and machining time calculation.	03	08
	1.2 CNC Lathe : Introduction, classification, advantages, positioning system, constructional features. Part programming : programming format, word, statement, block. Preparatory and miscellaneous code, Fixed cycles in programming – canned cycle, do-loop, subroutine.	10	22
Unit-02	**Drilling :** Twist drill nomenclature. Cutting parameters , machining time calculation, Deep hole drilling.	02	06
Unit-03	*Milling and gear cutting* **3.1 Milling :** Cutting parameters, machining time calculation, Milling operations – plain milling, side and face milling, form milling, gang milling, end milling, face milling, T- slot milling, slitting.	03	06
	3.2 Gear cutting : Gear cutting on milling machine –Dividing head and Indexing methods Gear hobbing, Principle of operation, Advantages And limitations. Hobbing techniques – climb and conventional, Gear shaping - Principle of operation, advantages, disadvantages, Gear finishing processes - Gear shaving , Gear grinding, Gear burnishing, gear lapping .	06	12
Unit-04	**Grinding :** Classification of machines , Grinding wheel composition, types and shapes, Designation. Types of Grinding operations.	02	05
Unit-05	**Super Finishing Processes** 6.1 Honing, 6.2 Lapping, 6.3 Burnishing, 6.4 Buffing and polishing.	02	05
Unit-06	**Plastic Moulding** Types of plastic, Compression molding, Transfer moulding, Injection moulding, blow molding, vacuum forming, extrusion, calendaring, rotational moulding.	04	06
	Total	**32**	**70**

Text/Referernce Books:

Titles of the Book	Name of Authors	Name of the Publisher
Elements of workshop Technology-Volume I & II	S. K. Hajra Chaudary, Bose, Roy	Media Promoters and Publishers Limited.
Production Technology Volume- I & II	O. P. Khanna & Lal	Dhanpat Rai Publications.
Workshop Technology- Volume –I,II & III	W. A. J. Chapman, S. J. Martin	Viva Books (p) Ltd.
A text book of Foundry Tech.	O.P. Khanna	Dhanpat Rai Publications.
Production Technology	R.B. Gupta	Satya Prakashan New Delhi
Workshop Technology Volume-I& II	H.S.Bawa	Tata McGraw-Hill
Introduction to Manufacturing Processes	John A. Schey	McGraw-Hill
Manufacturing Technology	M. Adithan A. B. Gupta	New age International
CNC machines	Pabla B. S. M. Adithan	New age international limited.
Fundamental of metal cutting and machine tools	B. L. Juneja	New age international limited.
Technology of Machine Tools.	Steve Krar, Albert Check	McGraw-Hill International.
CAD/CAM Principals and Applications	P. N. Rao	Tata McGraw-Hill
Manufacruting Technology Metal Cutting & Machne tools	P. N. Rao	Tata McGraw-Hill
Production Processes	R.N. Pandey, S.P. Sharma	Foundation Publishing

THERMAL ENGINEERING (MECHANICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
1625404	No. of Periods Per Week			Full Marks	:	100	**03**
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENTS : THEORY

Chapter	Name of the Topic	Hours	Marks

Unit-1.	**Sources of energy**
	1.1 Brief description of energy sources
	  - Classification of energy sources
	  - Renewable, Non-Renewable
	1.2 Fossil fuels, including CNG, LPG.
	1.3 Solar
	  - Flat plate and concentrating collectors & its application.
	  - Solar Water Heater
	  - Photovoltaic Cell, Solar Distillation.
	1.4 Wind, Tidal, Geothermal
	1.5 Biogas, Biomass, Bio-diesel
	1.6 Hydraulic, Nuclear
	1.7 Fuel cell – list of fuel cells
		08	**06**

Unit-2.	**Fundamentals of Thermodynamics :**
	2.1 Concepts of pure substance, types of systems , properties of systems , Extensive and Intensive properties with units and conversion like P, V, ρ And temperature. Point function and path function.
	2.2 Work and Energy
	  - Thermodynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work, concepts of enthalpy, entropy.
	2.3 Laws of Thermodynamic
	  - Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Clausius statements and their equivalence, Concept of perpetual motion machine 1 and 2.
	2.4 Application of Thermodynamic laws
	  - Steady Flow Energy equation and its application to open system like boiler, engine, nozzle, turbine, compressor & condenser.
	2.5 Application of Second law to Heat Engine, Heat Pump and Refrigerator.
		12	**14**

Unit-3.	**Ideal Gases :** 3.1 Concept of Ideal gas, Charle's law, Boyle's law, Avogadro's law, equation of state, Characteristic gas constant and universal gas constant. 3.2 Ideal gas processes: - - Isobaric, Isochoric, Isothermal, Adiabatic,Polytropic, Isentropic with representation of the processes on P-V and T-S diagram (only simple numericals)	**08**	**14**

Unit-4.	**Steam and Steam Boiler :**
	4.1 Generation of steam at constant pressure with representation on various charts such as T-H, T-S, H-S, P-H. Properties of steam and use of steam table, Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical).
	4.2 Vapour process : -
	    - constant pressure, constant volume, constant enthalpy, constant entropy (numericals using steam table and Mollier chart), Rankine Cycle.
	4.3 Steam Boilers: -
	    - Classification of boilers.
	    - Construction and working of Cochran, Babcock and Wilcox, La- mont and Loeffler boiler. Boiler draught natural and Mechanical.
	4.4 Boiler mounting and accessories [to be covered in practical].
		14	**14**

Unit-5.	**Steam Turbines and Condensers :**
	5.1 Steam nozzle: -
	    - Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles.
	5.2 Steam turbine: -
	    - Classification of turbines, Construction and working of Impulse and Reaction turbine.
	5.3 Compounding of turbines, Regenerative feed heating, bleeding of steam, nozzle control governing (no velocity diagrams and numerical).
	5.4 Steam condenser: -
	    - Dalton's law of partial pressure, function and classification of condensers, construction and working of surface condensers.
	5.5 Sources of air leakage, concept of condenser efficiency, vacuum efficiency (no numerical).
	5.6 Cooling Towers.
	    - Force draught, natural draught and induced draught.
		12	**14**

Unit-6.	**Heat Transfer :**
	6.1 Modes of heat transfer: -
	    - Conduction, convection and radiation.
	6.2 Conduction by heat transfer
	    - Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical).
	6.3 Heat transfer by Radiation: -
	    - Thermal Radiation, Absorptivity, Transmissivity, Reflectivity, Emissivity, black and gray bodies, Stefan-Boltzman law.
	6.4 Heat Exchangers: -
	    - Shell and tube, plate type, multiphase heat exchangers. Materials Used and applications of heat exchangers.
		10	**08**

	Total	**64**	**70**

Text /Referemce Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
A Course in Thermal Engineering	Domkundwar V. M.	Dhanpat Rai & Co.
A Course in Thermal Engineering	P. L. Ballaney	Khanna Publishers
A text book of Thermal Engineering.	R. S. Khurmi	S. Chand & co. Ltd.
A Course in Thermal Engineering	R. K. Rajput	Laxmi Publication, Delhi
Heat Engine Vol. - I & II	Patel and Karmchandani	Acharya Publication
Engineering Thermodynamics	P. K. Nag	Tata McGraw Hill
Thermal Engineering	B. K. Sarkar	Tata McGraw Hill
Thermal Engineering	Rajiv Kr Singh, P.K. Gupta	Foundation Publishing

FLUID MECHANICS & MACHINERY (MECHANICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
1625405	No. of Periods Per Week			Full Marks	:	100	
	L	**T**	**P/S**	ESE	:	70	03
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CONTENT : THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	**Properties of fluid :** 1.1 Density, Specific gravity, Specific Weight, Specific Volume 1.2 Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity 1.3 Vapour Pressure, Compressibility	**04**	**04**
Unit -02	**Fluid Pressure & Pressure Measurement :** 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, center of pressure. **Note:** Numericals on Manometers, Total Pressure & Centre of pressure	**09**	**12**
Unit-03	**Fluid Flow :** 3.1 Types of fluid flows 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 **Note :-** Numericals on Venturimeter, orifice meter, pitot tube	**09**	**12**
Unit-04	**Flow Through Pipes :** 5.1 Laws of fluid friction (Laminar and turbulent) 5.2 Darcy's equation and Chezy's equation for frictional losses. 5.3 Minor losses in pipes 5.4 Hydraulic gradient and total gradient line. 5.5 Hydraulic power transmission through pipe **Note:** Numericals to estimate major and minor losses	**05**	**06**
Unit-05	**Impact of jet :** 4.1 Impact of jet on fixed vertical, moving vertical flat plates. 4.2 Impact of jet on curved vanes with special reference to turbines & pumps **Note -** Simple Numericals on work done and efficiency	**09**	**08**
Unit-06	**Hydraulic Turbines :** 6.1 Layout of hydroelectric power plant. 6.2 Features of Hydroelectric power plant. 6.3 Classification of hydraulic turbines. 6.4 Selection of turbine on the basis of head and discharge available 6.5 Construction and working principle of Pelton wheel, Francis and Kaplan turbine. 6.6 Draft tubes – types and construction, Concept of cavitation in turbines 6.7 Calculation of Work done, Power, efficiency of turbine.	**10**	**10**

Unit-07	**A] Centrifugal Pumps :** 7.1 Construction , principle of working and applications 7.2 Types of casings and impellers. 7.3 Concept of multistage 7.4 Priming and its methods, Cavitation 7.5 Manometric head, Work done, Manometric efficiency, Overall efficiency, NPSH 7.6 Performance Characteristics of Centrifugal pumps 7.7 Trouble Shooting 7.8 Construction, working and applications of submersible, jet pump Note :- Numericals on calculations of overall efficiency and power required to drive pumps.	10	10
	B] Reciprocating Pump : 7.9 Construction ,working principle and applications of single and double acting reciprocating pumps. 7.10 Concept of Slip, Negative slip, Cavitation and separation 7.11 Use of Air Vessel. 7.11 Indicator diagram with effect of acceleration head & frictional head. Note:- No Derivations and Numericals on reciprocating pumps.	08	06
	Total	64	70

Text/Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Hydraulic, fluid mechanics & fluid machines	Ramamrutham S.	Dhanpat Rai and Sons New Delhi
Hydraulics and fluid mechanics including Hydraulic machines	Modi P. N. and Seth S. M.	Standard Book House. New Delhi
Fluid Mechanics	Streeter Victor, Bedford K.W., Wylie E.B	McGraw Hill Int.
One Thousand Solved Problems in Fluid Mechanics	K. Subramanya	Tata McGraw Hill
Fluid Mechanics and Machinery	Bishwajet Ranjan, Anand Sharma	Foundation Publishing

Pump manufactures' catalogs such as Kirloskar Brothers, KSB, Kishor pumps etc.

THERMAL ENGINEERING LAB (MECH. ENGG. GROUP)

Subject Code	Practical						Credits
1625406	**No. of Periods Per Week**			**Full Marks**	**:**	**50**	**01**
	L	**T**	**P/S**	**ESE**	**:**	**50**	
	—	—	**02**	**Internal**	**:**	**15**	
	—	—	—	**External**	**:**	**35**	

CONTENTS : PRACTICAL

Practical: **Skills to be developed**:

Intellectual Skill :

1. Understand different sources of energy and their applications.

2. Understand various concepts and fundamentals of thermodynamics.

3. Understand concepts and laws of ideal gasses.

4. Understand vapour processes, steam boilers and different mountings and accessories.

5. Understand modes of heat transfer and concept of heat exchanges.

6. Interpret steam tables, mollier chart and relationship between different thermodynamic properties.

Motor Skills :

1. Collect and write technical specifications of photovoltaic cells and identify different components on panels of photovoltaic cells.

2. Conduct trial on the setup for calculation of thermal conductivity of metal rod

3. Trace path of flue gases and water steam circuit in a boiler.

4. Conduct trial on solar water heating system.

List of practical:

1. Collection of technical data and specification of photovoltaic cell by referring to manufacturers' catalogues.

2. Study and Trial on solar water heating system.

3. Report on visit to wind power generation plant / biogas plant / hydraulic power plant.

4. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.

5. Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories.

6. Calculation of thermal conductivity of a solid metallic rod.

7. Verification of Stefan-Boltzman's law

8. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.

   Numericals on vapour processes and ideal gas processes (minimum two problems on each)

FLUID MECHANICS AND MACHINERY LAB (MECH. ENGG. GROUP)

Subject Code	Practical						Credits
1625407	**No. of Periods Per Week**			Full Marks	:	50	
	L	T	P/S	ESE	:	50	01
	—	—	03	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS : PRACTICAL

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 and turbines.

Motor Skills:

1) Use flow measuring device.

2) Use pressure measuring device.

3) Operate pumps and turbines.

List of Practical:

1. Calibration of Bourden pressure gauge with the help of Dead Weight Pressure gauge.

2. Verification of Bernoulli's Theorem.

3. Determination of Coefficient of Discharge of Venturimeter.

4. Determination of Coefficient of Discharge, coefficient of contraction and coefficient of velocity of orifice meter.

5. Determination of coefficient of friction of flow through pipes.

6. Trial on Pelton wheel to determine overall efficiency.

7. Trial on centrifugal pump to determine overall efficiency.

8. Trial on reciprocating pump to determine overall efficiency.

COMPUTER PROGRAMMING LAB (MECH. ENGG. GROUP)

Subject Code	Practical							Credits
1625408	**No. of Periods Per Week**			Full Marks	:	50		
	L	T	P/S	ESE	:	50		02
	—	—	04	Internal	:	15		
	—	—	—	External	:	35		

CONTENTS : PRACTICAL			Hrs/week
Chapter	**Name of the Topic**		**Hours**
1.	**Introduction -** 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		02
2.	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( )		03
3.	Use of Control Statements:- if-else, while loop, do – while loop, for loop, switch, break and continue. Writing, Compiling, Executing and debugging programs		05
4.	Introduction to Subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and writing		03
5.	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		03
		Total	**16**

List of Practical:

To write simple program having engineering application involving following statements

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

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Introduction to 'C' programming	Byron Gotfried	Tata McGraw Hill
Let us 'C'	Yashwant Kanitkar	BPB publications
Introduction to 'C' programming	Denis Ritchie and Kerninghan	Prantice Hall Publications
Programming in 'C'	Balguruswamy	Tata Mc- Graw Hill
Computer Programming	S.N. Sudhakar	Foundation Publishing

THEORY OF MACHINES & MECHANISMS (TW) (MECH. ENGG. GROUP)

Subject Code	Practical						Credits
1625409	No. of Periods Per Week			Full Marks	:	25	**01**
	L	T	P/S	ESE	:	25	
	—	—	02	Internal	:	07	
	—	—	—	External	:	18	

CONTENTS : TERM WORK

Perform any four

1) Draw the profile of radial cam for the given motion of follower. (At least four problems)

2) Determine the radius of rotation of flyball for different speed of governor and draw a graph between radius of rotation versus speed.

3) Dismantling and assembly of mechanically operated braking mechanism for two wheelers.

4) Determi nation of power transmitted by any belt drive using any one dynamometer.

5) Dismantling and assembly of multiplate clutch of two-wheeler.

6) Determine graphically balancing of several masses rotating in a single plane.

PROFESSIONAL PRACTICES-IV (MECH. ENGG. GROUP)

Subject Code	Term Work						Credits
1625410	No. of Periods Per Week			Full Marks	:	25	
	L	T	P/S	Internal	:	07	02
	—	—	04	External	:	18	

Contents : Term Work		Hrs/week
Sr. No.	**Activities**	**Practical Hours**

Unit-1	**Industrial Visits**
	Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.
	The industrial visits may be arranged in the following areas / industries :
	Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant .
	   vi) Machine shop having CNC machines.
	   vii) ST workshop / Auto service station
	   viii) City water supply pumping station
	   ix) Manufacturing unit to observe finishing and super finishing processes.
		14

Unit-2	**Lectures by Professional / Industrial Expert lectures to be organized from any two of the following areas:** Interview Techniques. Modern Boilers – Provisions in IBR Applications of Sensors and Transducers Alternate fuels – CNG / LPG , Biodiesel, Ethanol, hydrogen Piping technology	**06**

Unit-3	**Information Search :**
	Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report **any one** topic. Following topics are suggested :
	   v) Engine lubricants & additives
	   vi) Automotive gaskets and sealants
	   vii) Engine coolants and additives
	   viii) Two and Four wheeler carburetor.
	   ix) Power steering
	   x) Filters
	   xi) Different drives/Transmission systems in two wheelers.
	   xii) Types of bearings – applications and suppliers.
	   xiii) Heat Exchangers
	   xiv) Maintenance procedure for solar equipment.
	Tools holder on general purpose machines and drilling machines.
		08

Unit-4	**Seminar :** Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)	**08**

Unit-5	Mini Project / Activities : (any one)
	   a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as : i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers v) Geneva mechanism
	   b) Dismantling of assembly (e.g. jig / fixtures , tool post , valves etc.) Take measurement and prepare drawings / sketches of different parts.
	   c) Make a small decorative water fountain unit.
	   d) Toy making with simple operating mechanisms.
		12

	Total	**48**

Text / Reference Books:		
Titles of the Book	**Name of Authors**	**Name of the Publisher**
Professional Practices-IV	Sudha Ranjan	Foundation Publishing

PRODUCTION PROCESSES (TW) (MECH. ENGG. GROUP)

Subject Code	Term Work						Credits
1625411	**No. of Periods Per Week**			Full Marks	:	50	**01**
	L	**T**	**P/S**	Internal	:	15	
	—	—	**02**	External	:	35	

CONTENTS : TERM WORK

Note: One hour of the Term Work per week is to be utilized for instructions by subject teacher to explain & demonstrate the accessories, tool holding & work holding devises as mentioned in Term Work contents. The student will write assignments based on these sessions..

List of Term Work :

1) One assignment on cutting tool nomenclature and tool signature of single point cutting tool.

2) Industrial visit to observe plastic processing shop and report on the visit.

3) One job on lathe containing the operations like plain turning, threading, boring, taper turning.

4) One job on CNC lathe containing the operations like plain turning, taper turning and curvature. (Group of two students , each group must use different program for different job dimensions)

5) One job containing drilling, milling, reaming, gear cutting (spur gear) per job max. two students.

6) One job containing surface grinding / cylindrical grinding for tolerances

   ± 30 micron,(For the job already made on milling machine /lathe).

7) One assignment on accessories & attachment – chucks, mandrels, carrier and catch plates rests, face plate and angle plate, grinding attachment used on lathe.

8) One assignment on accessories & attachment, work holding & tool holding devises used on milling machine.

9) One assignment each on shaper, planer, boring machine, broaching machine.

10) One assignment each on tool nomenclature & geometry of boring tool, broaching tool, milling cutters.

   One assignment on types of grinding wheels.