



RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

CREDIT BASED GRADING SYSTEM

PROGRAMME NAME : AIRCRAFT MAINTENANCE

Name of Scheme OCBC 2020

Implemented from Session

Scheme of Studies and Examinations for : **THIRD SEMESTER**

Exam Code:

COURSE CODE	COURSE TITLE	PAP ER CODE	THEORY COMPONENT								PRACTICAL COMPONENT						TOTAL CREDIT	GRAND TOTALOF MARKS
			LECTUR ES							THEORY CREDIT	PRACTICAL Hrs. Per Week	CONTI NUOUS EVALU ATION	END OF THE TERM/ SEMESTER EVALUATION			PRACTICAL CREDIT		
				Hrs. Per Week	TERM WORK QUIZ, ASSIG NMENT	MID TERM TEST (TWO)		THEORY PAPER					PRACTICAL Hrs. Per Week	LAB. WORK QUIZ, ASSIG NMENT	PRACTICAL / ORAL EXAMINATION (VIVA)			
I	II	NO.	MARKS			DURATION (Hrs)	NO.	MARKS	DURATION (Hrs.)									
301	STRENGHT OF MATERIALS	6934	04	10	10	10	01	70	3	04	04	20	01	30	3	02	06	150
303	INTRODUCTION TO AERONAUTICS	7300	04	10	10	10	01	70	3	04							04	100
304	BASIC ELECTRICAL AND ELECTRONICS	6933	04	10	10	10	01	70	3	04	04	20	01	30	3	02	06	150
302	THERMAL ENGINEERING	6931	04	10	10	10	01	70	3	04	04	20	01	30	3	02	06	150
305	PROFESSIONAL ACTIVITY										02	GRADES TO BE GIVEN						
	TOTAL		16	40	40	40	04	280		16	14	60		90		6	22	550

Theory Credits : 16
 Practical Credits : 06
Total Credits : 22

Theory Marks : 280
 Practical Marks : 90
 Quiz, Mid Term, Lab. Work : 180
Total : 550

Minimum Pass Grade in Theory & Practical 'D'

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 1/3	
Branch	MECHANICAL ENGINEERING			Semester		III	
Course Code			Course Name			BASIC ELECTRICAL AND ELECTRONICS	
Course Outcome 1		Calculate electrical quantity for given electrical circuit				Teach Hrs	Marks
Learning Outcome 1		Define various terms used in electrical engineering. (Cognitive domain)				4	5
Contents		● Concept of electric current, potential and potential difference. ● Classification of D.C. and A.C. sources. ● Overview of AC voltage generation, transmission and distribution. ● Electrical Power, energy and their units.					
Method of Assessment		Internal : Mid semester Test-1 (Pen paper test)					
Learning Outcome 2		Explain fundamentals of D.C. circuit and calculate electrical quantity. (Cognitive domain)				10	12
Contents		● Ohm’s Law, Concept of resistance, conductance, resistivity, conductivity and their units. Effect of temperature on resistance, Temperature coefficient of resistance. ● Series, Parallel connections of resistance and their combinations, Simple Numerical. ● Kirchhoff's Voltage Law, Kirchhoff's Current Law, Simple Numerical					
Method of Assessment		External : End semester theory examination (Pen paper test)					
Learning Outcome 3		Explain fundamentals of A.C. circuit and determine electrical quantity of single phase AC circuit. (Cognitive domain)				10	12
Contents		● Concept of Cycle, Frequency, time period, amplitude, phase and phase difference. ● Define Instantaneous value, average value, RMS value and peak value of sinusoidal electrical quantities, form factor and peak factor. ● Concept of reactance, impedance and power factor in AC circuit. ● Concept of current, voltage, power in purely resistive, inductive, capacitive, RL, RC and RLC Series circuit ● Active power, reactive power and apparent power. ● Three phase AC supply: three phase three wire and three phase four wire system, Relationship between line voltage, phase voltage, line current and phase current in star and delta connection .					

Method of Assessment	External : End semester theory examination (Pen paper test)		
Learning Outcome 4	Verify Kirchhoff's laws and determine the electrical quantities for a given electrical circuit. (Psychomotor domain)	10	12
Contents	• Verification of Kirchhoff's current Law and Kirchhoff's voltage Law • Calculate Impedance, power and power factor by measuring voltage across each element and current for a given RLC series circuit.		
Method of Assessment	External: End semester practical exam- Performance of task and viva voce		
Course Outcome 2	Select an appropriate electrical machine for particular application.	Teach Hrs	Marks
Learning Outcome 5	Describe various parts of the DC machines, explain the working principle and applications of DC generator (Cognitive domain)	8	10
Contents	• Concepts of Electromagnetism, Faraday's Law, Lenz's Law, Fleming's Left Hand and Right Hand Rule. • D.C. Machines: Construction, its main parts & their functions and classification. • D.C. Generator: Working principle, emf equation • Types and applications of DC Generators.		
Method of Assessment	Internal : Mid semester-I theory examination (Pen paper test)		
Learning Outcome 6	Explain the working principle and choose a DC motor for particular application. (Cognitive domain)	4	6
Contents	• D.C. Motor: Working principle • Significance of back emf, torque equation • Types and applications of DC motors • Need of starter		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome 7	Describe various parts of the AC machine, explain its working principle and select the AC machine for particular application.(Cognitive domain)	12	12
Contents	• Single Phase Transformer: Construction, working principle, emf equation, transformation ratio, simple numerical. • Step up and step down transformers and their application. • Three-phase Induction motor: Construction, types, principle of operation, concept of Slip and applications. • Single-phase Induction motor: types of single phase induction motor- capacitor start, capacitor run, shaded pole and their applications.		

Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome 8	Apply field & armature control methods to vary speed of DC shunt motor and perform open circuit & short circuit test on single phase transformer to determine losses and efficiency (Psychomotor domain)	10	13
Contents	- Field and armature control methods of DC shunt motor. - Open circuit & short circuit test of single phase transformer.		
Method of Assessment	External: End semester practical exam- Performance of task and viva voce		
Course Outcome 3	Use electrical measuring instruments and justify the need of the transducers. (Cognitive domain)	Teach Hrs	Marks
Learning Outcome 9	Select an appropriate instrument for measurement of electrical quantities (Cognitive domain)	10	12
Contents	- Classification of Measuring Instruments: Absolute and secondary instruments. Indicating, Integrating and Recording instruments with examples. - Working principle and construction of moving iron & moving coil type ammeter and voltmeter, electrodynamic type wattmeter, induction type and electronic energy meter.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome 10	Classify different types of transducer. (Cognitive domain)	8	10
Contents	- Transducer: Definition, primary and secondary transducers, active and passive transducers, analog and digital transducers. - Principle and application of Strain gauge, LVDT, Thermocouple, Piezoelectric and Photoelectric Transducers.		
Method of Assessment	Internal : Mid semester-II theory examination (Pen paper test)		
Learning Outcome 11	Measure various electrical quantities by using suitable measuring instruments. (Psychomotor and affective domain)	12	15
Contents	- Measurement of insulation resistance by megger. - Measurement of earth resistance by earth tester. - Measurement of linear displacement by LVDT.		
Method of Assessment	Internal: Performance of task, observation and viva voce		
Course Outcome 4	Analyze various electronic devices and circuits.	Teach Hrs	Marks
Learning Outcome 12	Explain concepts of various semiconductor devices and circuits.(Cognitive domain)	8	10

Contents	● Semiconductor PN Junction Diode, Zener diode, PNP and NPN transistor ● Forward and reverse bias of semiconductor diode. ● Applications of semiconductor diode, zener diode and transistor ● Single phase half wave and full wave rectifier: Circuit diagram, working and input-output waveforms.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome 13	Plot the V-I characteristics of semiconductor diode and measure output voltage of single phase rectifiers. (psychomotor domain)	8	10
Contents	● V-I characteristics of semiconductor diodes. ● Measurement of output voltage in single phase half wave and full wave rectifier.		
Method of Assessment	External : Performance of task and viva voce		
Course Outcome 5	Select electrical wiring material and apply electrical safety measures.	Teach Hrs	Marks
Learning Outcome 14	Choose electrical wiring materials. (Cognitive domain)	4	5
Contents	● Types of Wiring and their Applications. ● Size of conductor, Standard Wire Gauge. ● Electrical Fixtures: switches, fuses, holders, sockets and MCB's.		
Method of Assessment	Internal : Mid semester test II (Pen paper test)		
Learning Outcome 15	Identify electrical safety measures in various working conditions. (Cognitive domain)	4	6
Contents	● Electric shock, its prevention, effect of electrical current on the human body and shock treatment. ● Earthing: Need and types of earthing.		
Method of Assessment	External: End semester theory examination (Pen paper test)		

Reference books

1	Basic Electrical Engineering, McGraw Hill Education, Noida, ISBN: 978-00-705-9357-2	Mittle, V.N. and Mittle, Arvind
2	Electrical Circuits (Hindi), Satya Prakashan New Delhi	Suresh Kumar Soni and Umesh Kumar Soni
3	A Text Book of Electrical Technology Vol-I, Vol-II and Vol-IV, S. Chand & Co. Ram-nagar, New Delhi,	Theraja, B. L. and Theraja, A. K.,
4	Electrical Machines, Vol-I, II, Khanna Book Publishing House, New Delhi 2 (ISBN: 978-9386173-447, 978-93-86173-607)	Bimbhra, P.S.
5	Electrical Measurements and Measuring Instruments, S. K. Kataria and sons, Delhi, ISBN: 9788188458264	Gupta J. B.
6	Electrical Installation Estimating & Costing, S. K. Kataria and sons, Delhi	Gupta J. B.
7	Principles of Electronics, S. Chand Publications, Delhi	V K Mehta and Rohit Mehta

AIRCRAFT MAINTENANCE

INTRODUCTION TO AERONAUTICS

This course forms the first exposure to the discipline of Aircraft Maintenance Engineering. It starts with familiarization of airplanes and helicopters. The subject is built up slowly and steadily by introducing the terminology and basis of flight mechanics, airplane structures, power plant, systems etc. At the end of the subject, the student will be fully acquainted with the basics of Aeronautical engineering.

DETAILED CONTENTS

1. Introduction

Mankind's desire to fly, various efforts in Pre-Wright Brothers era, brief historical sketch, Wright flyer, earlier types of flying machines, development of aeronautics, progress in Aircraft design and applications, different types of heavier than air vehicles along with prominent features. Airplane, Helicopter, Hovercraft, V/STOL machines, modern developments

2. Airplane Aerodynamics

Nomenclature used in Aerodynamics, different parts of airplane, Wing as lifting surface, Types of wing plan forms, Aerodynamic features like Aerofoil pressure distribution, Aerodynamic forces and moments, Lift and Drag. Drag polar, L/D ratio, high lift devices, Airplane performance like Thrust/Power available, climb and glide, maximum range and endurance, take off and landings, Illustrations through sketches/plots.

3. Airplane Stability and Control

Airplane axis system, forces and moments about longitudinal, lateral and vertical axes, equilibrium of forces developed on wing and horizontal tail, centre of gravity, its importance in stability and control. Control surfaces, elevators, ailerons, and rudder

4. Airplane Propulsion

Requirement of power, various means of producing power, Brief description of thermodynamics of engines, Piston engines, Jet engines. Engine airframe combinations of various types, their performance, detailed functioning of components of a Piston-Prop engine, use of propellers as means of producing forward thrust, functioning of Jet engine, turbo-prop, turbo-fan, turbo-shaft, Prop-fan, possible locations of power plant on airplane

5. Airplane Structure, Materials and Production

Structural arrangement of earlier airplane, developments leading to all metal aircraft, Strength to weight ratio - choice of aircraft materials for different parts, detailed description of wing, tail and fuselage joints, stress-strain diagrams, plane and space, trusses, loads on airplane components, mechanical properties of materials.

6. Aircraft Instruments

Flight instruments, air speed indicators, altimeters, rate of climb/descent meter, gyro based instruments, engine performance measuring instruments, basic instruments in avionics.

7. Aircraft Systems

Elementary ideas about hydraulic and pneumatic systems, pressurization, temperature control and oxygen system, system integration, accessories, aircraft electrical system: generation and distribution of electricity on board the airplane, flight control system temperature / environment, aircraft fuel system, fire protection, ice and rain protection system.

8. Airplane Design, Types of Certification and Airworthiness

Basic steps in airplane design, airplane specification, part/component wise specification, design and testing for certification, airworthiness requirements, air safety requirements and standards.

RECOMMENDED BOOKS

1. Fundamentals of Flight by Y R S Shevell; Prentice Hall, Delhi
2. Aircraft Instruments by E H J Pallet; Himalayan Books, Delhi
3. Introduction to Flight by John Anderson Jr.; McGraw Hill, Delhi
4. Aircraft Electrical Systems by E H J Pallet; Himalayan Books, Delhi
5. Jet Engine Manual by E W Somerset Maugham,, BIP Publications, Delhi
6. Fundamentals of Flight by Dr. O. P. Sharma and Lalit Gupta, Himalayan Books, Delhi

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE			FORMAT-3		Sheet No. 1/3	
Branch	Mechanical Engineering				Semester		IV	
Course Code		401	Course Name		STRENGTH OF MATERIALS			
Course Outcome 1		Calculate stresses, strain and strain energy.				Teach Hrs	Marks	
Learning Outcome 1		Draw stress strain diagram for a given material.				04	05	
Contents		Simple stresses and strains viz. tensile, compressive, Shear, Crushing, Thermal, fatigue stresses and strains, Hook's Law, Stress- Strain curve for ductile material and brittle material.						
Method of Assessment		Paper pen test						
Learning Outcome 2		Calculate stresses, strains, elastic constants, principal stresses and strains for a given condition.				06	10	
Contents		Factor of Safety, Elastic Constants, Lateral Strain, Poisson's ratio, Bulk Modulus, Shear Modulus, Volumetric Strain. Relation between elastic constants—Problems on Direct Stresses and Linear Strains, Hook's Law elastic constants. Principal stresses and strains. Mohr's Circle.						
Method of Assessment		Theory exam						
Learning Outcome 3		Calculate strain energy under given loading for a given object.				06	05	
Contents		Strain Energy: Strain energy or resilience, proof resilience and modulus of resilience; formulae of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/shock load; numerical problems based on strain energy.						
Method of Assessment		Paper pen test						
Course Outcome 2		Perform mechanical testing of materials.						
Learning Outcome 1		Describe an appropriate test method for a mechanical property of a given material.				09	20	
Contents		Mechanical properties of materials brittleness, creep, ductility, elasticity, hardness, malleability, plasticity, strength, stiffness, toughness, endurance limit, Destructive testing , tensile test, compression test, shear test bending test, hardness test, torsion test, impact test fatigue test, Non- destructive testing methods, visual testing, ultrasonic testing, radiography testing, electromagnetic testing, magnetic particle testing, acoustic emission testing, liquid penetrate testing, leak testing methods						
Method of Assessment		Laboratory test by observation						
Learning Outcome 2		Perform a given destructive/ non-destructive test for a given material.				36	30	

Contents	Destructive testing , tensile test, compression test, shear test bending test, hardness test, torsion test, impact test fatigue test, Non- destructive testing methods, visual testing, ultrasonic testing, radiography testing, electromagnetic testing, magnetic particle testing, acoustic emission testing, liquid penetrate testing, leak testing methods		
Method of Assessment	Laboratory test by observation		
Course Outcome 3	Draw SFD and BMD for a given beam under loading.	Teach Hrs	Marks
Learning Outcome 1	Describe types of load, shear force, bending moment acting on beams.	04	05
Contents	Definition-Shear Force and Bending Moment, types of beams cantilever, simply supported, overhanging and fixed beams, types of load acting on beams- point load, uniformly distributed load, uniformly varying load,		
Method of Assessment	Theory exam		
Learning Outcome 2	Draw shear force, bending moment diagram for a beam under a given loading condition.	10	15
Contents	Bending Moment and its importance -sign convention to draw shear force diagram and bending moment diagram- Concept of Maximum bending moment, Point of Contra-flexure and its importance-Drawing shear force and bending moment diagram for Cantilever, Simply Supported Beams subjected to Point Load and U.D.L		
Method of Assessment	Theory exam		
Course Outcome 4	Calculate bending stresses for a given beam.	Teach Hrs	Marks
Learning Outcome 1	Explain bending stresses, modulus of section and bending equation.	04	06
Contents	Position of neutral axis in beams, moment of resistance, Bending equation (without proof), Modulus of section for rectangular, hollow rectangular, circular and hollow circular sections, Beams of uniform strength,		
Method of Assessment	Theory exam		
Learning Outcome 2	Express relation between bending stress and radius of curvature.	04	05
Contents	Introduction, assumptions in theory of simple bending, bending stress, relation between bending stress and radius of curvature (formula only).		
Method of Assessment	Assignment		
Learning Outcome 3	Calculate slope, deflection, flexural strength of a given beam.	08	10
Contents	Calculation of slope, deflection, flexural strength of cantilever and simply supported beams for point load and UDL.		
Method of Assessment	Paper pen test		

Learning Outcome 4	Calculate stresses using bending equation on a given beam.	08	14
Contents	Numerical problems on calculation of stresses using bending equation		
Method of Assessment	Theory exam		
Course Outcome 5	Calculate design parameters of circular shafts and springs	Teach Hrs	Marks
Learning Outcome 1	Calculate design parameters of a given shaft.	08	10
Contents	Definition and function of shaft: Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Derivation of the equation $T/J = f_s/R = G\theta/L$; Numerical Problems on design of shaft based on strength and rigidity		
Method of Assessment	Theory exam		
Learning Outcome 2	Explain springs, its classification and stiffness of a spring.	05	05
Contents	Classification of springs: Nomenclature of closed coil helical spring; Deflection formula for closed coil helical spring (without derivation); stiffness of spring.		
Method of Assessment	Quiz		
Learning Outcome 3	Calculate design parameters of a given spring.	08	10
Contents	Numerical Problems related to comparison of strength and weight of solid and hollow shafts. Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.		
Method of Assessment	Theory exam		

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	1	1	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate stresses, strain and strain energy.										
LO Description		Draw stress strain diagram for a given material.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Simple stresses and strains viz. tensile, compressive, Shear, Crushing, Thermal, fatigue stresses and strains, Hook’s Law, Stress- Strain curve for ductile material and brittle material.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	4	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Paper pen test	Student will be asked to draw stress strain diagram for a given material.		05	Test paper + Rating scale				Internal			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of progressive I												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	1	2	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate stresses, strain and strain energy.										
LO Description		Calculate stresses, strains, elastic constants, principal stresses and strains for a given condition.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Factor of Safety, Elastic Constants, Lateral Strain, Poisson’s ratio, Bulk Modulus, Shear Modulus, Volumetric Strain. Relation between elastic constants— Problems on Direct Stresses and Linear Strains, Hook’s Law elastic constants. Principal stresses and strains. Mohr’s Circle.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	6	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Theory exam	Student will be asked to calculate given properties for a given condition.		10	Question paper + rating scale				External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
NIL												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	1	3	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate stresses, strain and strain energy.										
LO Description		Calculate strain energy under given loading for a given object.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Strain Energy: Strain energy or resilience, proof resilience and modulus of resilience; formulae of strain energy for the following cases: i) Gradually applied load, ii) Suddenly applied load, iii) Impact/shock load; numerical problems based on strain energy.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	6	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required				External / Internal				
1	Paper pen test	Student will be asked to calculate strain energy under given loading for a given object.	05	Test paper + Rating scale				Internal				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of progressive I												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	2	1	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Perform mechanical testing of materials.										
LO Description		Describe an appropriate test method for a mechanical property of a given material.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Mechanical properties of materials brittleness, creep, ductility, elasticity, hardness, malleability, plasticity, strength, stiffness, toughness, endurance limit, Destructive testing , tensile test, compression test, shear test bending test, hardness test, torsion test, impact test fatigue test, Non- destructive testing methods, visual testing, ultrasonic testing, radiography testing, electromagnetic testing, magnetic particle testing, acoustic emission testing, liquid penetrate testing, leak testing methods	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	NIL	09	Handouts, chalk board, PPT, text book, charts, video film, lab manual.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required				External / Internal				
1	Laboratory test by observation	Student will be asked to select an appropriate test method for a mechanical property of a given materials.	20	Observation schedule/check-list /rating scales /rubrics				Internal				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of Lab Work												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	2	2	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Perform mechanical testing of materials.										
LO Description		Perform a given destructive/ non-destructive test for a given material.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Destructive testing , tensile test, compression test, shear test bending test, hardness test, torsion test, impact test fatigue test, Non- destructive testing methods, visual testing, ultrasonic testing, radiography testing, electromagnetic testing, magnetic particle testing, acoustic emission testing, liquid penetrate testing, leak testing methods	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	NIL	36	Handouts, chalk board, PPT, text book, charts, video film, lab manual.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Laboratory test by observation	Student will be asked to perform a destructive test for a given material.		30	Observation schedule/check-list /rating scales /rubrics				External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of end practical exam												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	3	1	
COURSE NAME	STRENGTH OF MATERIALS											
CO Description	Draw SFD and BMD for a given beam under loading.											
LO Description	Describe types of load, shear force, bending moment acting on beams.											
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Definition-Shear Force and Bending Moment, types of beams cantilever, simply supported, overhanging and fixed beams, types of load acting on beams- point load, uniformly distributed load, uniformly varying load,	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	4	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Theory exam	Student will be asked to describe shear force, bending moment, types of load acting on a given beam.		5	Question paper + rating scale				External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
NIL												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	4	1	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate bending stresses for a given beam.										
LO Description		Explain bending stresses, modulus of section and bending equation.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Position of neutral axis in beams, moment of resistance, Bending equation (without proof), Modulus of section for rectangular, hollow rectangular, circular and hollow circular sections, Beams of uniform strength,	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	4	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Theory exam	Student will be asked describe bending stresses, modulus of section for given sections and bending equation.		6	Test paper + Rating scale				External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
NIL												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	4	2	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate bending stresses for a given beam.										
LO Description		Express relation between bending stress and radius of curvature.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Introduction, assumptions in theory of simple bending, bending stress, relation between bending stress and radius of curvature (formula only).	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	4	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required				External / Internal				
1	Assignment	Student will be asked theory of simple bending to express relation between bending stress and radius of curvature.	05	Rubrics/rating scales				Internal				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Term work												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	4	3	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate bending stresses for a given beam.										
LO Description		Calculate slope, deflection, flexural strength of a given beam.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Calculation of slope, deflection, flexural strength of cantilever and simply supported beams for point load and UDL.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	8	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Paper pen test	Student will be asked to calculate slope, deflection, flexural strength of a given beam under given loading.		10	Test paper + Rating scale				Internal			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of progressive II												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	4	4	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate bending stresses for a given beam.										
LO Description		Calculate stresses using bending equation on a given beam.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Numerical problems on calculation of stresses using bending equation	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	8	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required				External / Internal			
1	Theory exam	Student will be asked to calculate stresses using bending equation on a given beam.		14	Test paper + Rating scale				External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
NIL												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	5	1	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate design parameters of circular shafts and springs										
LO Description		Calculate design parameters of a given shaft.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Definition and function of shaft: Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Derivation of the equation $T/J=f_s/R=G\theta/L$; Numerical Problems on design of shaft based on strength and rigidity	Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	8	0	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks		Resources Required			External / Internal			
1	Theory exam	Student will be asked to calculate design parameters a given shaft.		10		Test paper + Rating scale			External			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
NIL												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	5	2	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate design parameters of circular shafts and springs										
LO Description		Explain springs, its classification and stiffness of a spring.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Classification of springs: Nomenclature of closed coil helical spring; Deflection formula for closed coil helical spring (without derivation); stiffness of spring.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	5	NIL	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
1	Quiz	Student will be asked to explain springs, its classification and stiffness of a spring.	05	Rubrics/rating scales			Internal					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Term work												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	4	0	1	5	3	
COURSE NAME		STRENGTH OF MATERIALS										
CO Description		Calculate design parameters of circular shafts and springs										
LO Description		Calculate design parameters of a given spring.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required			Remarks			
1	Numerical Problems related to comparison of strength and weight of solid and hollow shafts. Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils.	Interactive classroom teaching, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct assignments/ quiz/tutorial to make students practice their knowledge.	8	0	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks		Resources Required				External / Internal		
1	Theory exam	Student will be asked to calculate design parameters a given spring.		10		Test paper + Rating scale				External		
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
NIL												

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3	Sheet No. 1	
Branch	MECHANICAL ENGINEERING			Semester	III	
Course Code	302	Course Name	THERMAL ENGINEERING			
Course Outcome 1	Explain renewable sources of energy				Teah. Hrs	Marks
Learning Outcome 1	Classify renewable and non-renewable energy sources.				2	3
Contents	Definition and Classification of energy sources- Renewable and Non-Renewable, Examples of renewable and non renewable sources.					
Method of Assessment	Paper-Pen Test (Part of Prg 1)					
Learning Outcome 2	Sketch the schematic diagram of solar, bio-gas, tidal, geothermal power generation.				8	10
Contents	Flat plate and concentrating solar collectors, their application. Photovoltaic Cell, Solar Distillation system, solar cooker. Wind energy horizontal and vertical wind mill, site selection for wind energy power plants, introduction to Tidal energy, Geothermal energy, Biogas energy, Bio-gas plant.					
Method of Assessment	Theory Exam					
Learning Outcome 3	Identify components of Solar systems				9	8
Contents	Demonstration of components of Flat plate and concentrating solar collectors. Photovoltaic Cell, Solar Distillation system, solar cooker.					
Method of Assessment	Laboratory Test by Observation (Part of LW)					

Course Outcome 2	Solve simple problems based on basic concepts of thermodynamics, and its laws.	Teach Hrs	Marks
Learning Outcome 1	Explain thermodynamic systems, properties, processes, cycles, gas equation and modes of heat transfer.	6	7
Contents	Concept of thermodynamic System– definition, classification and applications, State, processes, cycles, Properties- Intensive and Extensive with examples, Point and Path function, Concept of Work and Heat, Definitions: Enthalpy, Internal energy, Entropy, Specific heat at constant pressure (C_p), specific heat at constant volume (C_v), relation between C_p & C_v , characteristic gas equation, Universal gas constant, Definition of quasi-static process, flow work, Modes of Heat transfer - definition and types.		
Method of Assessment	Paper-Pen Test (Part of Prg 1)		
Learning Outcome 2	Solve given problems based on thermodynamic systems, properties and gas equation.	4	10
Contents	Numerical problems based on Thermodynamic System, Properties, gas equation.		
Method of Assessment	Theory Exam		
Learning Outcome 3	Solve given problems based on the laws of thermodynamics.	8	10
Contents	Laws of thermodynamics- Zeroth law, concept of work and heat, statement of first law- internal energy, enthalpy, relationship between heat transfer, work transfer and change in internal energy, Concept of conservation of mass and control volume, Steady and steady flow energy equation (without proof). Limitation of first law. Second law – Clausius and Kelvin-Planck Statements, concept of heat pump, refrigerator, heat engine, thermal efficiency, COP, reversible process, factors which make a process irreversible, Carnot cycle, its efficiency and limitation, Clausius inequality, entropy		
Method of Assessment	Theory Exam		

Course Outcome 3	Solve numerical problems based on thermodynamic processes, air standard cycles.	Teach.Hrs	Marks
Learning Outcome 1	Compare thermodynamic processes, air standard cycle using P-V and T-S diagram.	8	10
Contents	Thermodynamic processes- Definition, classification and representation on P-V and T-S diagram for Constant pressure, Constant volume, Constant Temperature, Adiabatic, Polytropic, throttling processes. Thermodynamic cycle – definition, classification- reversible and irreversible cycles, Air Standard Cycles: Carnot cycle, Otto Cycle, Diesel Cycle, Dual Cycle, their representation on P-V and T-S diagrams		
Method of Assessment	Paper-Pen Test (TW)		
Learning Outcome 2	Calculate mean effective pressure, work done, efficiency for a given Air Standard cycle.	7	10
Contents	Problems on calculation of work done, change in internal energy, heat transfer, change in entropy for thermodynamic processes. Problems on calculation of Mean Effective Pressure, work done, air standard efficiency for Air Standard cycle.		
Method of Assessment	Theory Exam		
Course Outcome 4	Explain steam generation processes, steam generators.	Teach. Hrs	Marks
Learning Outcome 1	Solve given problems based on thermodynamic properties of steam.	9	10
Contents	Two Phase System: Pure substance, steam as a two phase system, its representation on P-V, T-S plane for isobaric, isochoric, isothermal, isentropic, polytrophic, throttling process, dryness fraction of steam, methods of determination of dryness fraction separating and throttling calorimeter. Steam tables, Mollier's diagram and its uses for calculation of changes in properties of steam such as enthalpy, internal energy, entropy; heat, work in various processes.		

Method of Assessment	Paper-Pen Test (Part of Prg 2)		
Learning Outcome 2	Determine dryness fraction using throttling, separating calorimeters.	6	12
Contents	Experimental determination of dryness fraction using separating, throttling calorimeter.		
Method of Assessment	Laboratory Test by Observation (Part of LW)		
Learning Outcome 3	Explain construction, working of a given steam generator.	9	10
Contents	Steam Generator- Definition, classification, construction, working, mountings and accessories of (a) low pressure boilers- Babcock and Wilcox boiler, Lancashire boiler (b) high pressure boilers - La-Mont, Velox boiler.		
Method of Assessment	Theory Exam		
Learning Outcome 4	Identify components, mountings, accessories of a given steam generator.	24	18
Contents	Demonstration of steam generator components, mountings and accessories.		
Method of Assessment	Laboratory Test by Observation (Part of Practical Exam)		
Course Outcome 5	Explain steam nozzles, steam turbines, steam condensers.	Teach.Hrs	Marks

Learning Outcome 1	Explain construction, working of steam nozzle, steam turbine, steam condenser.	10	10
Contents	Steam nozzle- construction, working Flow of steam through convergent-divergent nozzle Steam turbine –classification, construction, working principle with line diagram of a Impulse turbine-De Laval turbine, reaction turbine-Parsons turbine, velocity diagram of impulse, reaction turbine. Compounding of turbines. Pressure compounding, velocity compounding, pressure-velocity compounding Steam condenser- classification construction and working.		
Method of Assessment	Theory Exam		
Learning Outcome 2	Solve given problems based on discharge and area of nozzle.	4	10
Contents	Flow of steam through convergent-divergent nozzle, Friction in a nozzle, Discharge of steam through nozzles, Critical pressure ratio (no derivation), Calculation of cross sectional areas at throat and exit for maximum discharge.(simple problems)		
Method of Assessment	Theory Exam		
Learning Outcome 3	Identify components of D- Laval and Parsons Turbine.	6	12
Contents	Demonstration of the components of De-Laval and Parsons steam turbine.		
Method of Assessment	Laboratory Test by Observation (Part of Practical Exam)		

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	1	2	
COURSE NAME		Thermal Engineering										
CO Description		Explain renewable sources of energy										
LO Description		Sketch the schematic diagram of solar, bio-gas, tidal, geothermal power generation.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Flat plate and concentrating solar collectors, their application. Photovoltaic cell, solar distillation system, solar cooker. Wind energy horizontal and vertical wind mill, site selection for wind energy power plants, introduction to tidal energy, geothermal energy, biogas energy, bio-gas plant.	Interactive classroom teachings, demonstration, quiz.	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz to make students practice their knowledge.	8	0	Handouts, chalk board, PPT, text book, charts, video film.	NIL					
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment				Maximum Marks	Resources Required	External / Internal				
1	Theory exam	Student will be asked to describe and sketch schematic representation of any one of tidal energy, solar energy, geothermal energy, bio-gas plant.				10	Question paper + Rating scale	External				
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	1	3	
COURSE NAME		Thermal Engineering										
CO Description		Explain renewable sources of energy										
LO Description		Identify components of solar systems										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Demonstration of components of flat plate and concentrating solar collectors. Photovoltaic cell, solar distillation system, solar cooker.	Lab demonstration, hands on practice, lab assignments.	Teacher will explain the contents and provide handout to students. Teacher will demonstrate the components in lab. Students will learn through practice.	0	9	Handouts, chalk board, PPT, manual, charts, video film, models, virtual lab	NIL					
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal							
1	Laboratory test by observation	Student will be asked to identify components of solar systems.	8	Observation schedule/check-list /rating scales /rubrics	Internal							
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of Lab Work												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	2	1	
COURSE NAME		Thermal Engineering										
CO Description		Solve simple numerical problems based on basic concepts of thermodynamics and its laws.										
LO Description		Explain thermodynamic systems, properties, processes, cycles, gas equation and modes of heat transfer.										
SCHEME OF STUDY												
S. No	Learning Content					Teaching – Learning Method	Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Concept of thermodynamic system– definition, classification and applications, state, processes, cycles, properties- intensive and extensive properties with examples, point and path function, concept of work and heat, definitions: enthalpy, internal energy, entropy, specific heat at constant pressure (c_p), specific heat at constant volume (c_v), relation between c_p and c_v , characteristic gas equation, universal gas constant, definition of quasi-static process, flow work, modes of heat transfer - definition and types.					Interactive classroom teachings, demonstration, quiz.	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz to make students practice their knowledge		6	0	Handouts, chalk board, PPT, text book, charts, video film.	
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment						Maximum Marks		Resources Required	External / Internal	
1	Paper-pen test	Student will be asked to explain basic concepts of thermodynamics from the learning content.						7		Test paper + Rating scale	Internal	
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of Progressive – 1												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	2	2	
COURSE NAME		Thermal Engineering										
CO Description		Solve simple numerical problems based on basic concepts of thermodynamics and its laws.										
LO Description		Solve a numerical problem based on thermodynamic systems, properties and gas equation.										
SCHEME OF STUDY												
S.No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark					
1	Numerical problems based on thermodynamic system, properties, gas equation.	Interactive classroom teaching, demonstration, quiz, assignments.	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz and give assignments to make students practice their knowledge.	4	0	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment			Maximum Marks	Resources Required	External / Internal					
1	Theory exam	Students will be asked to solve two numerical problems based on thermodynamic systems, properties and gas equation.			10	Question paper + Rating scale	External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	3	1	
COURSE NAME		Thermal Engineering										
CO Description		Solve numerical problems based on thermodynamic processes, air standard cycles.										
LO Description		Describe thermodynamic processes, air standard cycle using P-V and T-S diagram.										
SCHEME OF STUDY												
S. No.	Learning Content				Teaching – Learning Method	Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark	
1	Thermodynamic processes- definition, classification and representation on P-V and T-S diagram for constant pressure, constant volume, constant temperature, adiabatic, polytropic, throttling processes. Thermodynamic cycle – definition, classification- reversible and irreversible cycles, Air standard cycles: Carnot cycle, Otto cycle, Diesel cycle, Dual cycle, their representation on P-V and T-S diagrams.				Interactive classroom teaching, demonstration, quiz, assignment.	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz and give assignments to make students practice their knowledge		8	0	Handouts, chalk board, PPT, text book, charts, video film.		
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment						Maximum Marks		Resources Required	External / Internal	
	Paper-pen Test	Student will be asked to describe two thermodynamic processes and one air standard cycle using P-V and T-S diagram.						10		Test paper + Rating scale	Internal	
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Term Work												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	3	2	
COURSE NAME		Thermal Engineering										
CO Description		Solve numerical problems based on thermodynamic processes, air standard cycles.										
LO Description		Calculate mean effective pressure, work done, efficiency for a given air standard cycle.										
SCHEME OF STUDY												
S. No	Learning Content				Teaching – Learning Method		Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
1	Numerical problems on calculation of work done, change in internal energy, heat transfer, change in entropy for thermodynamic processes. Problems on calculation of mean effective pressure, work done, air standard efficiency for air standard cycle.				Interactive classroom teachings, demonstration, quiz.		Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz to make students practice their knowledge.		7	0	Handouts, chalk board, PPT, text book, charts, video film.	
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment						Maximum Marks	Resources Required		External / Internal	
1	Theory exam	Student will be asked to solve one numerical problem to calculate mean effective pressure, work done, efficiency of any air standard cycle.						10	Question paper + Rating scale		External	
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	4	1	
COURSE NAME		Thermal Engineering										
CO Description		Explain steam generation processes, steam generators.										
LO Description		Solve a given numerical problem based on thermodynamic properties of steam.										
SCHEME OF STUDY												
S. No.	Learning Content					T-L Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark	
	Two Phase System: Pure substance, steam as a two phase system, its representation on P-V, T-S plane for isobaric, isochoric, isothermal, isentropic, polytrophic, throttling process, dryness fraction of steam, methods of determination of dryness fraction separating and throttling calorimeter. Steam tables, Mollier diagram and its uses for calculation of changes in properties of steam such as enthalpy, internal energy, entropy; heat, work in various processes.					Interactive classroom teaching, demonstration, quiz, assignment	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz and give assignments to make students practice their knowledge.	9	0	Handouts, chalk board, PPT, text book, charts, video film.		
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment						Maximum Marks	Resources Required	External / Internal		
	Paper-pen test	Student will be asked to solve a given numerical problem based on properties of steam.						10	Test paper + Rating scale	Internal		
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of Progressive – 2												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	4	2	
COURSE NAME		Thermal Engineering										
CO Description		Explain steam generation processes, steam generators.										
LO Description		Determine dryness fraction using throttling, separating calorimeters.										
SCHEME OF STUDY												
S. No.	Learning Content		T-L Method	Description of T-L Process			Teach Hrs.	Pract. /Tut Hrs.	LRs Required		Remark	
1	Experimental determination of dryness fraction using separating, throttling calorimeter.		Lab demonstration, hands on practice	Teacher will explain the contents and provide handout to students. Teacher will demonstrate the procedure of lab experiments. The students will learn through practice.			0	6	Handouts, chalk board, PPT, charts, video film, apparatus.			
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment				Maximum Marks	Resources Required			External / Internal		
1	Laboratory test by observation	Student will be asked to find out dryness fraction of steam using any method.				12	Observation schedule/check-list /rating scales /rubrics			Internal		
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Part of Lab Work												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				<i>M</i>	<i>0</i>	<i>2</i>	<i>3</i>	<i>0</i>	<i>2</i>	<i>4</i>	<i>3</i>	
COURSE NAME		Thermal Engineering										
CO Description		Explain steam generation processes, steam generators.										
LO Description		Explain construction, working of a steam generator.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark					
1	Steam generator- definition, classification, construction, working, mountings and accessories of (a) low pressure boilers- Babcock and Wilcox boiler, Lancashire boiler (b) high pressure boilers - La-Mont, Velox boiler.	Interactive classroom teachings, demonstration, quiz.	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz to make students practice their knowledge.	9	0	Handouts, chalk board, PPT, text book, charts, video film.						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment			Maximum Marks	Resources Required	External / Internal					
1	Theory exam	Student will be asked to classify boilers, explain construction, working of one boiler.			10	Question paper + Rating scale	External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		M	0	2	3	0	2	4	4	
COURSE NAME	Thermal Engineering									
CO Description	Explain steam generation processes, steam generators.									
LO Description	Identify components, mountings, accessories of a given steam generator.									
SCHEME OF STUDY										
S. No.	Learning Content	T-L Method	Description of T-L Process			Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark	
1.	Demonstration of steam generator components, mountings and accessories.	Lab demonstration, hands on practice	Teacher will explain the contents and provide handout to students. Teacher will demonstrate the components in lab. The students will learn through practice.			0	24	Handouts, chalk board, PPT, text book, charts, video film, virtual lab, models.		
SCHEME OF ASSESSMENT										
S. No.	Method of Assessment	Description of Assessment				Maximum Marks	Resources Required		External / Internal	
1.	Laboratory test by observation	Student will be asked to identify components, mountings and accessories of a given boiler.				18	Observation schedule/check-list /rating scales /rubrics		External	
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)										
Nil										

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
			M	0	2	3	0	2	5	1	
COURSE NAME	Thermal Engineering										
CO Description	Explain steam nozzles, steam turbines, steam condensers.										
LO Description	Explain construction, working of steam nozzle, steam turbine and steam condenser.										
SCHEME OF STUDY											
S. No.	Learning Content			Teaching – Learning Method		Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark
	Steam nozzle- construction, working Flow of steam through convergent-divergent nozzle Steam turbine –classification, construction, working principle with line diagram of a Impulse turbine-De Laval turbine, reaction turbine-Parsons turbine, velocity diagram of impulse, reaction turbine. Compounding of turbines. Pressure compounding, velocity compounding, pressure-velocity compounding Steam condenser- classification construction and working.			Interactive Classroom teaching, demonstration, quiz		Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz to make students practice their knowledge		10	0	Handouts, chalk board, PPT, text book, charts, video film.	
SCHEME OF ASSESSMENT											
S. No.	Method of Assessment	Description of Assessment					Maximum Marks	Resources Required	External / Internal		
	Theory exam	Student will be asked to explain construction, working of a steam nozzle or turbine or condenser.					10	Question paper + Rating scale	External		
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)											
Suitably mix the content in assessment to justify maximum marks 10											

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	5	2	
COURSE NAME		Thermal Engineering										
CO Description		Explain steam nozzles, steam turbines, steam condensers.										
LO Description		Solve a given numerical problem based on discharge and area of nozzle.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remark					
1	Flow of steam through convergent-divergent nozzle, friction in a nozzle, discharge of steam through nozzles, critical pressure ratio (no derivation), calculation of cross sectional areas at throat and exit for maximum discharge.(simple problems).	Interactive classroom teachings, demonstration, quiz.	Teacher will explain the contents and provide handouts to students. Teacher will conduct a quiz to make students practice their knowledge.	4	0	Text book, charts, chalk board, PPT						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment		Maximum Marks	Resources Required	External / Internal						
1	Theory exam	Student will be asked to calculate discharge, cross sectional area and critical pressure ratio for flow through a given convergent-divergent nozzle.		10	Question paper + Rating scale	External						
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				M	0	2	3	0	2	5	3	
COURSE NAME		Thermal Engineering										
CO Description		Explain steam nozzles, steam turbines, steam condensers.										
LO Description		Identify components of D- Laval and Parsons Turbine.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process				Teach Hrs.	Pract. /Tut Hrs.	LRs Required		Remark	
1	Demonstration of the components of De-Laval and Parsons steam turbine.	Lab demonstration, hands on practice.	Teacher will explain the contents and provide handouts to students. Teacher will demonstrate the components in lab. The students will learn through practice.				0	6	Handouts, chalk board, PPT, charts, video film, manual, virtual lab, models.			
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment				Maximum Marks		Resources Required			External / Internal	
1	Laboratory test by observation	Student will be asked to identify components of De-Laval and Parsons Turbine				12		Observation schedule/check-list /rating scales /rubrics			External	
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

LIST OF EXPERIMENTS OF THERMAL ENGINEERING

S.No.	Name of Experiment	Duration
1	Identify components of solar systems.	3
2	Write a Report on visit to solar power/wind mill / biogas plant / hydraulic power plant to document the specifications of components and power generation capacity, draw schematic arrangement.	6
3	Determine dryness fraction of steam using Throttling calorimeter.	3
4	Determine dryness fraction of steam using separating calorimeter.	3
5	Identify components of Babcock and Wilcox, Lancashire boiler	6
6	Identify components of La-Mont and Velox Boilers	6
7	Draw the flue gas path and water steam circuit with the help of boiler model and write a report	3
8	Identify mountings and accessories in Boiler.	3
9	Write a Report on visit to Dairy / thermal power plant to document specifications of boiler, list mountings and accessories.	6
10	Identify components of Impulse turbine (De-Leval)	3
11	Identify components of Reaction Turbine (Parson's Turbine)	3