

**CHHATTISGARH SWAMI VIVEKANANAD TECHNICAL UNIVERSITY,
BHILAI**

DIPLOMA PROGRAMME IN MECHANICAL ENGINEERING

Semester-VI

COURSE OF STUDY AND SCHEME OF EXAMINATION

S. NO.	Board of Study	Subject Code	Subject	Periods / week (In Hours)			Scheme of Examination					Credit L+ (T+P)/2	
				L	T	P	Theory			Practical			Total Marks
							ESE	CT	TA	ESE	TA		
1.	Mechanical Engineering	237611 (37)	Automobile Engineering	4	1	-	100	20	20	-	-	140	5
2.	Mechanical Engineering	237612 (37)	Refrigeration & Air conditioning	4	1	-	100	20	20	-	-	140	5
3.	Mechanical Engineering	237613 (37)	Power Plant Engineering	4	1	-	100	20	20	-	-	140	5
4.	Mechanical Engineering	237614 (37)	Estimating, & Costing	3	1	-	100	20	20	-	-	140	4
5.	Mechanical Engineering	200615 (37)	Entrepreneurship Development	4	1	-	100	20	10	-	-	130	5
6.	Mechanical Engineering	237621 (37)	Automobile Engineering Lab	-	-	3	-	-	-	50	25	75	2
7.	Mechanical Engineering	237622 (37)	Refrigeration & Air conditioning Lab	-	-	3	-	-	-	50	25	75	2
8.	Mechanical Engineering	237623 (37)	Project & Seminar	-	-	6	-	-	-	100	60	160	3
TOTAL				19	5	12	500	100	90	200	110	1000	31

L : Lecture hours, T : Tutorial hours, P : Practical hours,
ESE : End of Semester Exam, CT: Class test, TA : Teacher's Assessment

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) SEMESTER : VI
 B) COURSE TITLE : AUTOMOBILE ENGINEERING
 C) CODE : 237611 (37)
 D) BRANCH/DISCIPLINE : MECHANICAL ENGINEERING
 E) RATIONALE :

Rapid industrialization of the country has resulted in an unprecedented advancement in the technological processes and improvement in the efficiency of structures, machines and transport vehicle under various operating conditions. To cope with the advances in the automobile engineering fields, the diploma holders/engineers in the field must understand the various constructional and working details of the components used in different vehicles.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237611 (37)	4	1	-	100	20	20	-	-	140	5
237621 (37)	-	-	3	-	-	-	50	25	75	2

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Introduction (Vehicle layouts & types)	6	6
2	Automobile Engines (Power plant)	10	10
3	Fuel feed systems	10	10
4	Auto-Electric System	10	10
5	Transmission & Propeller Shaft	10	10
6	Final Drive & Rear Axle	8	10
7	Steering & Front Axle	10	10
8	Brakes	4	10
9	Suspension systems	4	10
10	Wheels and Tyres	4	6
11	Automobile Emissions and its Control	4	8
Total		80	100

H) DETAILED CONTENTS:

Chapter - 1 Introduction (Vehicle Layouts and Types)

- Introduction to an automobile,
- History of the automobile,
- Types of automobiles,
- Layout of an automobile,
- Major components of the automobile,
- Functions of the automobile components,
- Layout of chassis and frames, classification of chassis,

Chapter - 2 Automobile Engines (Power Plant)

- Types of Automobile Engines:- Petrol Engine, Diesel Engine, Gas Turbine, Rotary piston Engine Electric motor, Fuel cell (Hydro/Hydro methanol fuel cell)
- Engines locations - front, rear and transverse under floor with their advantages and disadvantages
- Engine Constructional features :- Engine block, engine heads, crank case oil pan, cylinder liners, Gasket, combustion chambers with their types, piston, piston pin, gudgeon pin, connecting rod, crank shaft, cam shaft, valve & valve mechanism. valve timing , port timing diagram, timing gears, Inlet & exhaust manifolds, Exhaust mufflers, flywheel, inlet & exhaust ports of two stroke engine, concept of firing order in multi-cylinder engine.
- Engine performance and testing – engine measurements, factors affecting engine power, engine rating and related factors, methods of determining the engine horse power, engine efficiency,

Chapter - 3 Fuel System for Petrol Engine

- Introduction & fuel system for petrol engine,
- Gravity feed system,
- Fuel pump,
- Properties of air-fuel mixture,
- Mixture control devices,
- Simple carburettor & its limitations, modern carburettor like : cartor, solex carburettor, S.U. Carburettor
- Concept of Petrol Injection & MPFI Petrol injection systems, [such as direct injection systems, port injection systems, throttle body injection etc, Mechanical and Electronic injection systems]
- Concept of supercharging & types of superchargers.

Chapter -4 Fuel System for Diesel Engine

- Mixture requirements of diesel engine,

- Fuel injection systems such as Common rail fuel injection system, Individual pump fuel injection system,
- Construction and working of Fuel feed pump, Fuel injection pump, Fuel injector, Distributor type, rotary fuel injection pump,

Chapter –5 Auto-Electric System

- Main Components of the Electrical System,
- Starter Generator, Alternator Type Generator,
- Ignition System, Distributor, Ignition Coil, Ignition Timing, Ignition Advance
- Spark Plug,
- Electronic Ignition System, Operation of Electronic Ignition System,
- Electronic Switching Systems,
- Automobile Battery, Low-maintenance and Maintenance-free Batteries

Chapter - 5 Transmission & Propeller Shaft

- Need and functions of transmission system
- Concept of various road resistances such as wind, Gradient, Resistance, Total resistance, Tractive- effort, ,
- Types of transmission,
- Types of gear boxes e.g. sliding mesh, constant mesh, synchromesh gear boxes, mathematical analysis of gear boxes, Gear shifting mechanisms. Epicyclic gear box, five speed gear box,
- Torque converter, Overdrive & automatic transmission (Elementary Treatment),
- Clutches such as Single Plate, Multiplate, Centrifugal clutches functions & types,
- Construction & functions of propeller shaft,
- Universal joints & slip joints on propeller shaft

Chapter - 6 Final Drive & Rear Axle

- Introduction, Function & need of differential,
- Types of gears used in differential,
- Differential trouble diagnosis,
- Final drive,
- Construction and details of rear axle and forces acting on rear axle,
- Types such as semi floating, fully floating, Three quarter floating, Rear axle drives such as Hotchkiss type ,torque tube type etc.

Chapter – 7 Steering & Front Axle

- Function of the steering system,
- Steering gears & Steering mechanism used in some Indian vehicles,
- Steering wheel & column,
- Front axle-Function & construction,
- Steering heads & steering geometry,
- Wheel alignment,
- Adjusting the steering angles,
- Ackerman linkage,
- Power steering,
- Under steering & over steering,
- Steering lock,
- Turning radius,
- Steering trouble shooting

Chapter – 8 Brakes

- Need & principle of braking system.,
- Brake efficiency and stopping distance,
- Types of brakes as Mechanical brakes - drum and disc brakes, Hydraulic Brakes,
- Tandem Master cylinder, wheel cylinder, braking linkages,
- Self energized brakes,
- Floating-caliper brakes,
- Power brakes,
- Air brakes,
- Air hydraulic brakes,
- Emergency & Parking Brakes,
- Brake trouble shooting.

Chapter – 9 Suspension systems

- Need for Good Suspension System,
- Stages in Suspension System,
- Elements of a Suspension System,
- Types of Suspension Systems,
- Inspection and Service of Suspension System (general),
- Trouble Shooting of Suspension Systems
- Vibration dampers

Chapter –10 Wheels and Tyres

- Types of Automobile Wheels,
- Tyres & its Types,

- Tyre Tread,
- Tyre Selection,
- Tyre Service Parameters,
- Tyre Maintenance

Chapter – 11 Automobile Emissions and its Control

- Introduction,
- Complete and Incomplete Combustion,
- Constituents of Exhaust Gases,
- Pollutant Formation,
- Effect of Air Fuel Ratio on Exhaust Emission,
- Effect of Driving Mode on Exhaust Emission,
- Sources of Pollutants in an Automobile,
- Control Approaches for Automobile Emission,
- Muffler,
- Alternative Automotive fuel-LPG, CNG etc.

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- While teaching this course more emphasis is to be given on “Practical Correlation” of concepts.
- More stress to be given on ”To disassemble/assemble directly on automobile systems and parts”,
- Frequent visits to automobile garage or workshops or service stations to be arranged.

J) SUGGESTED LEARNING RESOURCES.

Reference Books

Sr. No.	Title	Author/ Publisher
1	Automotive Engineering Vol I	Kirpalsingh, Standard publishers and distributors, New Delhi.
2.	Automotive Mechanics	Crouse & Anglin, McGraw Hills International Pub.
3.	Automobile Engineering	K.K. Jain & R. B. Asthana, TMH.
4.	Auto Mechanics- Understanding new technology	Don Knowles, Reston Publishers, New Jersey.
5.	Internal Combustion Engine	Mathur & Sharma, Dhanpat Rai & Sons, New Delhi
6.	Diesel Fuel Injection	Bosch, SAE (distributor)

Manuals

Sr. No.	Title	Author/ Publisher
1	Service manuals of various auto manufacturer	Respective manufacturer
2.	Service manuals of various original equipment manufacturer	

Codes of practices/ standards

Sr. No.	Title	Author/ Publisher
1	IS 2796- 1971	BIS, New Delhi
2	IS 1460- 1995	BIS, New Delhi

COURSE TITLE: AUTOMOBILE ENGINEERING LAB

PRACTICAL CODE : 237621 (37)

TOTAL HOURS : 48

LIST OF PRACTICALS / TUTORIALS:

- Dismantling & assembly of 4 stroke petrol engine (Jeep/Car)
- Dismantling & assembly of 4 stroke diesel engine.(Jeep/Car)
- Dismantling and assembly of 2 stroke engine like Scooter/Moped/Motorcycle engine.
- Disassembly and assembly of following carburettors with their correct tuning. (1) Solax Carburettor (2) Scooter Carburettor, (3) 4 stroke motor cycle carburettor.
- Disassembly and assembly of plunger type of fuel pump, rotary fuel pump & fuel injector with their correct tuning.
- Study of Air & water-cooling systems of a motorcycle and car engine.
- Dismantling & assembly of battery ignition system.
- Study of Alternator, dynamo and Startor Bendix drive by dismantling & assembly.
- Study of Gear box by dismantling & assembling of Sliding mesh, constant mesh & Synchromesh gear boxes.
- Dismantling & assembling of single plate clutch, Diaphragm clutch, Centrifugal Clutch.
- Dismantling assembly of steering gear of rack and pinion type of Maruti Car.
- Study hydraulic braking system of Car / truck.
- Study Air Braking system of truck.
- Study of front axle and steering system of a car
- Study independent & conventional Suspension system (Maruti/Jeep/Indica)
- To balance wheels on Dynamic wheel balancing machine.
- Conduct trial on petrol & diesel gas Analyzer & analyze results.
- Tune up petrol & diesel engine for minimum Emission level.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **VI**
 B) **COURSE TITLE** : **REFRIGERATION &
AIR CONDITIONING**
 C) **CODE** : **237612 (37)**
 D) **BRANCH/DISCIPLINE** : **MECHANICAL ENGINEERING**
 E) **RATIONALE**

Diploma engineers often come across various systems based on the refrigeration and air conditioning applications. He/she is required to often operate and regularly maintain these systems in various application areas. For performing this, it is very essential that diploma engineer should be well conversant with fundamental principles concepts, devices and systems based on the refrigeration and air-conditioning.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237612 (37)	4	1	-	100	20	20	-	-	140	5
237622 (37)	-	-	3	-	-	-	50	25	75	2

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Introduction	06	10
2	Air Refrigeration Cycles	08	10
3	Vapour Compression Cycle	10	10
4	Vapour Absorption System	08	10
5	Refrigerants	08	10
6	Vapor Compression System Components	10	10
7	Air Conditioning & Psychrometric Processes	08	10
8	Cooling Load Calculation	08	10
9	Air Distribution Systems	08	10
10	Air Conditioning Systems	06	10
Total		80	100

H) DETAILED CONTENTS:

Chapter – 1 : Introduction

- Introduction to Refrigeration.
- Methods of refrigeration as Ice refrigeration ,steam jet refrigeration,
- Concept of heat pump, Refrigerator,
- Concept of COP. Refrigerating effect ,Units of refrigeration . Reversed carnot cycle and its representation on PV & TS diagram .

Chapter – 2 : Air Refrigeration Cycles

- Bell Coleman cycle its principle, components of system, ideal/actual cycle, minimum, maximum. temperatures.(Simple numericals),
- Practical application of the cycle such as Air – craft refrigeration.

Chapter – 3 : Vapour Compression Cycle

- VCC -principle , components, representation on PV, TS,& PH digrams.
- Wet /Dry –compression-Reasons for not using Wet /Dry compression.
- Actual VCC , calculation of COP ,
- Effect of superheating & undercooling.
- Multistage vapour compression cycle, need for multistage compression system , cascade rfrigeration & its application.

Chapter – 4 : Vapour Absorption System

- Principle /components &working of Ammonia vapour absorption system,Lithium Bromide absorption system,Electrolux Refrigerators ,
- Comparison with vapour compression system

Chapter – 5 : Refrigerants

- Types of refrigerants as primary / secondary .
- Properties of the Commonly used refrigerants such as – Co₂, Ammonia So₂ , Freon 11, Freon 12 , Freon 22, Freon 500 ,503 502. & eco-friendly Refrigerants. Concept of Ozone layer and its destruction.
- Selection of refrigerants for particular application with reasons.

Chapter – 6 : Vapor Compression System Components

- Construction &working of various components .such as Open type Hermetically sealed ,Centrifugal, Screw type compressors,
- Application of the compressors.

- Evaporators—their functions & types such as Extended surface, Plate coil type, Flooded, Dry Direct & Indirect expansion types Capacity of evaporator. Frosting /Defrosting of evaporators.
- Condensers – types of condensers such as Evaporative type, Air cooled [forced & natural convection) Water cooled [Double tube / Shell tube / Shell coil) .
- Construction & working of various types of expansion devices such as – capillary tube auto expansion & thermostatic expansion valves, solenoid control valves & Low side High side valves .Refrigeration system controls – LP /HP Controls, Thermostat, Overload protectors, bellow pressure controllers, Diaphragm controllers, & Relays .

Chapter – 7 : Air Conditioning & Psychrometric Processes

- Definition, Necessity of Air conditioning.
- Concept of body comfort. Properties of air as DBT, WBT, DPT, Air as mixture of different gases & water vapour
- Daltons law of partial pressures
- Concept of Humidity of air, absolute humidity, relative Humidity
- Psychrometers and their types, Enthalpy of air, Sp. Volume of air, DPT of moist air
- Psychrometric charts, & tables, Psychrometric processes such as sensible heating & cooling, latent heat of air, latent heating & cooling, heating & humidification, cooling & dehumidification, evaporative cooling, sensible heat factor, By-pass factor, apparatus dew point, [representation on psychrometric charts]

Chapter – 8 : Cooling Load Calculation

- Concept of heat load, Heat sources as out door, walls, roofs in filtration & in door sources, types of cooling loads like—glass, walls, roofs, ventilation, people, electrical equipment, motors etc.
- Calculations of total heating & cooling load estimation & determination of refrigeration capacity.

Chapter – 9 : Air Distribution Systems

- Elements of air distribution system such as types of Fans, Ducts,
- Duct system as –graduated trunk, loop perimeter, Extended Platinium, Over head trunk, over head radial duct systems
- Selection & Losses in duct systems.
- Air distribution outlets supply outlets, return outlets, sealing diffusers, grills, resistors, fixed /adjustable louvers, low /high wall outlets, floor baseboard & sealing outlets.

Chapter – 10 : Air Conditioning Systems

- Window air conditioning unit. Construction, Working, type of refrigeration system used, capacity.
- Split air conditioners construction , working ,Type of refrigeration system used , capacity Package / Summer / Winter & Year – round air Conditioner systems construction , working ,type of refrigeration system used capacity

I) SUGGESTED INSTRUCTIONAL STRATEGIES

- Lecture Method.
- Expert Lecture.
- As far as possible concepts are to be visualized by extensive use of charts, models, transparencies etc.
- More emphasis to be kept on practical/real life problem situation.
- Field visit are to be arranged to observe and to identify and analyse the practical problems
- Students are to be asked to do market survey and bring manufacturers specifications of various refrigeration and air conditioning system,

J) SUGGESTED LEARNING RESOURCES.

Reference Books :

S.No.	Title	Author and Publisher
1.	Principles of Refrigeration	Roy /J. Dosat, Wiley eastern
2.	Refrigeration & Air conditioning	P. N. Ananth ,Narayan, TMH
3	Practical Refrigeration & Air Conditioning	M.Adithon & S.C. Laroia, Wiley Eastern.
4	Principles of Air Conditioning.	V.Paull Lang, C.B.S
5.	Basic Air Conditioning Vol . I & II	Gerald Schweitzer & A.Ebling, D.B. Taraporwala
6.	Practical Air Conditioning & Refrigeration	Audel, D. B. Taraporwala
7.	Refrigeration & Air Conditioning	S.Domkundwar, Dhanpatrai & Sons
8.	Refrigeration & Air Conditioning	C.P.Aurora, TMH, R.S. Khurmi

COURSE TITLE: REFRIGERATION & AIR CONDITIONING LAB

PRACTICAL CODE : 237622 (37)

TOTAL HOURS : 48

LIST OF PRACTICALS / TUTORIALS:

- Trial on vapour compression test rig for calculation of COP ,Work done per cycle, Refrigerating effect. Representation on P-H diagram.
- Identification and location of refrigeration system and components in various application systems as Air conditioner, Household refrigerator, Water coolers Etc.
- Study & analysis of vapour absorption system in a typical application
- Study of Electrolux Refrigerator.
- Physical properties of following Refrigerants
 - Freon 12,
 - Freon22,
 - Freon 503
 - Ammonia,
 - One type of Eco friendly refrigerant.
- Dismantling & assembling of open type of compressor in view of following—
 - Identification of parts & their functions & Free hand sketching of parts.
 - Writing of specification of compressors.
 - Collection of information of compressor manufactures & their models.
- Dismantling & assembling of Hermetic type of compressor in view of the above
- Analysis & study of typical Evaporator and condensers
- Study of following controls and valves used in Refrigeration systems.
 - (i)Thermostatic switch (ii) LP & HP cut outs (iii)solenoid valve (iv)Service valves (v)Overload Protector
- Demonstration & study of various tools used in refrigeration system such as – Tube cutter , Bending tools , Flaring tool [block & yoke type] , Swaging tool , Brazing tools , Blow lamps etc
- Study of water cooler
- Study of Air ducts & Air distribution systems in typical Air conditioned space in view of (1)Layout & type of air duct system .(2)Types of outlets (3)Identification of refrigeration equipment & cycle .(4)Type of blower , fans used & capacity of the unit .
- Study various types of insulating materials used in refrigeration and air conditioning applications with their properties.
- Study of window / split & package type of air conditioner [introduction of parts ,path of refrigerant, refrigeration cycle capacity , assembling & dismantling installation
- Study of Air conditioning system of bus/car.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **VI**
 B) **COURSE TITLE** : **POWER PLANT ENGINEERING**
 C) **CODE** : **237613 (37)**
 D) **BRANCH/DISCIPLINE** : **MECHANICAL ENGINEERING**
 E) **RATIONALE** :

The power demand in the country is increasing at a very fast pace. In fact, power production is not able to keep pace with the demand. More and more steam power plants are coming up in the public sector, Nuclear power plants and gas turbine power plants are also being set up.

Industries in public and private sectors are being promoted to establish their own captive steam and diesel power plants.

This course is aimed at providing an insight into the system of power generation, and the principles of the component used therein

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237613 (37)	4	1	-	100	20	20	-	-	140	5

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Steam Power Plant	8	10
2	Steam Generators	8	10
3	Steam Prime Mover	8	10
4	Condensing Unit	6	10
5	Steam Power Station Control & Safety	8	10
6	Nuclear Power Station	10	10
7	Diesel Engine Power Plant	8	10
8	Gas Turbine Power Plants	8	10
9	Hydro Electric Plants	8	10
10	Power Plant Economics	8	10
	Total	80	100

(H) DETAILED CONTENTS

Chapter-1 Steam Power Plant

- Energy conversion in Thermal Power Station,
- Limitation and conversion of heat into work,
- Direct conversion devices,
- Types of power station such as central power station, industrial power station, captive power station – advantages, classification of power station on the basis of prime-movers.
- Elements of power plant, function of each element-generating unit,
- Prime mover, an auxiliary equipment, and turbo generator.
- Revision & improvement of thermal efficiency of Rankine cycle by lowering exhaust pressure, increasing boiler pressure and superheating of steam.
- Simple problems on Rankine efficiency.
- Reheat cycle-representation on T-S and H-S Planes, flow diagram and advantages.
- Simple regenerating cycle – flow diagram, representation on T-S and H-S plants, bleeding and feed power heating and pumping: advantages of regenerative cycle.

Chapter-2 Steam Generators:

- Classification according to working pressure.
- Accessories – superheater, economizer, preheater and draft equipment.
- Superheat control methods,
- Pulverised fuel – necessity, storing systems.
- High pressure boilers in modern steam power plants such as Velox, Benson, La-mont, Leffler .

Chapter-3 Steam Primemover

- Steam nozzle-types,
- Velocity of steam at outlet,
- Weight of discharge,
- Area of cross section at throat and outlet,
- Critical pressure ratio,
- Nozzle efficiency,
- Concept of prime mover,
- Steam turbine – working principle , method of compounding and governing, losses in steam turbines,
- Lubrication system of steam turbines.

Chapter-4 Condensing Unit

- Functions of Steam condenser and its types– jet and surface,
- Limitations and advantages of steam condenser
- Elements of condensing unit
- Cooling towers.

Chapter-5 Steam Power Station Control and Safety

- Effect of load variation on soft speed, steam admission, valve opening, steam flow rate, steam pressure and combustion control system.
- Necessity of controlling factors in load variation,
- Control system (area system, centralised control system)
- Basic elements of control system, controls and instruments located in modern control station.
- Control room,
- Records and their purpose, log sheets or log books.

Chapter-6 Nuclear Power Station

- Nuclear reactions – fission, fusion, mass defect, binding energy, chain reaction,
- Types of nuclear materials – fissile materials, fertile materials, process of conversion of fertile materials, breeding, moderation.
- Nuclear reactor – function, elements of nuclear reactor, reactor core, moderator, thermal shielding, reflector, reactor vessel, fuel, coolant flow, control rods, biological shielding, coolant (gaseous, non-boiling liquid, boiling liquid).
- Liquids – Helium, CO₂, CO₂ under pressure, pressurized water (ordinary, heavy), liquid metals (Li, Si, Pv, Na) and their alloy, boiling water.
- Generation – fast reactors, thermal reactor, breeding reactor.
- Nuclear fuel – Heterogeneous, Homogeneous.
- Moderator – water moderator, heavy water moderator graphite moderator and beryllium moderator.
- Hazards in nuclear power station – units of radiations, safe and dangerous doses of radiations, safety precautions in nuclear power station
- Effects of nuclear materials , nuclear radiation and Nuclear waste disposal

Chapter-7 Diesel Engine Power Plants

- Diesel power plant layout
- Functions & components of diesel power plant
- Diesel power plant systems such as -Cooling and lubrication system, fuel injection system – basic requirements, solid injection system – common rail system, individual pump system, distribution system, data recording, performance.

Chapter-8 Gas Turbine Power Plants

- Advantages of gas turbines ,
- Brayton or Joule Cycle,
- Open and close cycle, representation of cycle on P.V. and T.S. diagram.
- Thermal efficiency in terms of terminal temperature and pressure, effect of pressure ratio on thermal efficiency,
- Advantages and disadvantages of open and close cycle gas turbines,
- Important components of gas turbine power plant,
- Methods of improving thermal efficiency,
- Essential auxiliaries and controls of a gas turbine power plants,
- Fuels for gas turbines.

Chapter-9 Hydro Electric Plants

- Types of Hydro Electric Plants
- Comparison of low, medium and high head plants,
- Elements of hydro power plants,
- Governing of turbine,
- Performance of water turbines,
- Site selection.

Chapter-10 Power Plant Economics

- Concept of occurrence of fluctuating loads,
- Load curve and its significance,
- Definition and terminology of connected load, maximum demand, demand factor, average load, load factor, diversity factor, plant capacity factor, plant use factor, effect of variable load and remedies, energy auditing.

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- Arrange expert Lecture sessions.
- Site visit to following places-
 - Tidal and Geothermal power plant.
 - Gobar gas plants/ Bio gas plant.
- Use of Audio- Visual cassettes.
- Assignment on various topics.

J) SUGGESTED LEARNING RESOURCES.

Reference Books :

S.No.	Title	Author/Publisher
1.	A Course in Power Plant Engineering	S.Domkundwar
2.	A Course in Power Plant Engineering	T.Morse
3.	A Course in Power Plant Engineering	Nagpal
4.	A Course in Power Plant Engineering	Agrawal.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **VI**
 B) **SUBJECT TITLE** : **ESTIMATING & COSTING**
 C) **CODE** : **237614 (37)**
 D) **BRANCH/DISCIPLINE** : **MECHANICAL ENGINEERING**
 E) **RATIONALE** :

Estimating and costing is an important subject of study to any engineer. For Mechanical engineering technicians, a sound knowledge of the various methods and techniques of costing is of paramount importance. This will equip with the necessary know-how for undertaking any manufacturing operation in a workshop or an industry.

F) TEACHING AND EXAMINATION SCHEME:

Course Code	Teaching Scheme (Hrs./week)				Scheme of Examination					Credit L+(T+P)/2	
	L	T	P	Total Hours	Theory			Practical			Total Marks
					ESE	CT	TTA	ESE	PTA		
237614 (37)	3	1	-		100	20	20	-	-	140	4

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Elements of Costing	06	10
2.	Fundamentals of Estimating	06	10
3.	Estimation of Material Cost	08	10
4.	Profit & Budget	06	10
5.	Machine shop Estimation	08	10
6.	Estimation in Welding shop	06	10
7.	Estimation in forging shop	06	10
8.	Estimation in Foundry shop	06	10
9.	Estimation in Sheet metal shop	06	10
10	Estimation of fabrication cost	06	10
TOTAL		64	100

H) DETAILED COURSE CONTENTS:

Chapter- 1: Elements of Costing

- Definition
- Objectives
- Elements of Cost
- Components of Cost, Overhead Allocation
- Depreciation and Obsolescence
- Method of Calculation of Depreciation

Chapter- 2: Fundamentals of Estimating

- Definition, importance and function of estimating
- Estimating procedure
- Principle factors in estimating
- Miscellaneous allowances

Chapter- 3: Estimation of Material Cost

- Estimation of volume and weight of material
- Provision for scrap
- Simple Problems

Chapter- 4: Profit and Budget

- Methods of Increasing Profit,
- Effects of the Methods on production, make and sales.
- Definition of Budget
- Departmental Budget
- Purpose of Budgetary Control
- Advantages of Budgetary Control
- Limitation of Budget

Chapter- 5: Machine Shop Estimation

- Terminology used in Machine Shop Estimation
- Use of Standard Table to determine Time Elements for various machining process
- Use of formula to calculate actual machining time for different operation of machine tools
- Calculation of production operation time per production cycle
- Batch production time

Chapter- 6: Estimation in Welding Shop :

- Estimation of Welding Cost
- Gas Cutting Cost
- Arc Welding Cost
- Simple Problems

Chapter-7: Estimation in Forging Shop :

- Hand forging, machine forging, forging operation
- Estimation procedure
- Estimation of Losses

Chapter-8: Estimation in Foundry Shop :

- Definition of Pattern
- Pattern Allowances
- Estimation of Pattern Cost
- Estimation of Foundry Cost

Chapter- 9: Estimation in Sheet Metal Shop :

- Introduction, Blank Layouts
- Sheet Metal Operation
- Capacity for Power Process
- Simple Problems

Chapter- 10: Estimation of Fabrication Cost :

- Definition
- Elements of Cost of Fabrication
- Joining Methods

D) SUGGESTED INSTRUCTIONAL STRATEGIES:

- **Lecture Method:**
 - Teaching through chalk board
 - H.P, LCD Projector.
 - Interaction with students through seminar.
 - As far as possible concepts are to visualized by extensive use of charts & wooden models of different machine components.
 - Production Drawings from Industries.
- **Industrial Visits:**

- Arrange visits to demonstrate the ergonomically aspects of design.
- **Expert Lectures:**
 - Expert lecturer as to be arranged on above subject through guest faculty.
- **Demonstration:**

Use wooden cut models of different components to show the resisting area in different type of failures.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books

S.No.	Title	Author/Publisher
1.	Mechanical Estimating & Costing	Banga & Sharma
2.	Mechanical Estimating & Costing	Shrimali & Jain
3.	Mechanical Estimating & Costing	N.R. Agrawal

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **VI**
 B) **COURSE TITLE** : **ENTREPRENEURSHIP DEVELOPMENT**
 C) **CODE** : **200615 (37)**
 D) **BRANCH/DISCIPLINE** : **MECHANICAL ENGINEERING**
 E) **RATIONALE**

It has been experienced in most parts of the world that entrepreneurship development is a means of rapid economic development vis-à-vis creation of gainful employment of masses. The myth that entrepreneurs are born and not made, no longer holds good. Experiences of last few decades in India show that it is possible to develop entrepreneurs through planned efforts. These designed efforts are more essentially required in polytechnics where increasing unemployment has necessitated promoting self-employment/entrepreneurship as career option thereby creating more job providers than job seekers. This course focuses on inputs required for students to undertake entrepreneurial activities as career option.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
200615 (37)	4	1	-	100	20	10	-	-	130	5

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1.	Entrepreneurship Development	10	12
2.	Forms of business organization	8	10
3.	Institutional support for SSI	8	10
4.	Planning a small scale industry	10	18
5.	Management of small business firms	8	12
6.	Project selection, formulation and appraisal	12	12
7.	Problems of small industries	12	14
8.	Entrepreneurial motivation training	12	12
	Total	80	100

H) DETAILED CONTENTS

Chapter- 1 Entrepreneurial Development

- Definition of entrepreneurship,
- Characteristics of entrepreneurs,
- Factors influencing entrepreneurship,
- Need for promotion of entrepreneurship and small business
- Entrepreneurial Environment
- Environmental analysis.
- Government policies for setting up new small enterprises
- Opportunities in service industries.

Chapter - 2 Forms of Business Organization

- Forms of ownership
- Sole Proprietorship
- Partnership
- Cooperative society
- Joint – stock company
- Private Limited Companies
- Public Limited Companies

Chapter – 3 Institutional support to SSI

- Institutional set up
- Industries centers,
- Industrial estates
- Institutional support at National level
- Institutional support at State level
- Commercial banks and financial institutions

Chapter – 4 Planning a SSI

- What is planning?
- Types of planning
- Importance of planning
- Steps in planning
- Steps in planning a SSI
- Technical dimensions for setting up an enterprise

Chapter - 5 Management of Small Business Firm

- Functional areas of small business firm
- Fundamentals of Management
- Managerial effectiveness
- Essential data for effective control of small business
- Resource management
- Office management
- Employees Welfare & safety
- Factory rules and Labour Laws related to SSIs
- Sales Tax and Income Tax laws related to SSIs

Chapter - 6 Project selection, Formulation & Appraisal

- Project selection & formulation
- Scope of project report
- Content & Format of Project report
- Need of Project Appraisal
- Steps of Project Appraisal

Chapter -7 Problems of Small industries

- Power shortages
- Project planning
- Finance
- Raw material
- Production constraints
- Marketing
- Personal constraints
- Regulations

Chapter - 8 Entrepreneurial Motivation Training

- Achievement Motivation
- Creative thinking
- Risk taking abilities

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- Lecture Method.
- Industrial visits.
- Simulation
- Role play
- Interaction with successful entrepreneurs
- Demonstration.
- Games

J) SUGGESTED LEARNING RESOURCES:

Reference Books :

Sl. No.	Title	Author, Publisher
1.	Starting your own Business, A step-by-step Blue print for the First-time Entrepreneur	Stephen C. Harper, Mc Craw-Hill
2.	Harward Business Review on Entrepreneurship	Harvard Business School Press
3.	Entrepreneurship Development in small scale proceedings of National Seminar, DCSSI, New Delhi	Patel V.G.
4.	Entrepreneurship : Strategies & Resources	Abrams Grant Pass, Oregon: Oasis Press
5.	The Business Planning Guide	David H. Bangs Upstart Publishing Company, In Chicago
6.	Entrepreneurship development in India	Dr. C.B. Gupta Dr. N.P. Srinivasan Sultan Chand & Sons

LIST OF TEAM WORK

Team Work will consist of collecting following information by the students:

1. Collect State industrial policy
2. Report of interaction with successful entrepreneurs/industrial visits
3. Prepare list of opportunities for business, service and industrial ventures
4. Whom to approach for What?
5. Facilities and incentives available from various support agencies

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

- A) **SEMESTER** : **VI**
 B) **COURSE TITLE** : **PROJECT & SEMINAR**
 C) **CODE** : **237623 (37)**
 D) **BRANCH/DISCIPLINE** : **MECHANICAL ENGINEERING**
 E) **RATIONALE** :

Every diploma engineer should work on project which will be useful for him for actual industrial applications. This course helps the student to study various applications of mechanical engineering such as compressors, pumps, blowers, torque wrenches, generators. Also the students are exposed to the repairs and maintenance of various types of machines and equipment encountered in practice..

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
237623 (37)	-	-	6	-	-	-	100	60	160	3

DETAILED CONTENTS

The student will undertake one project which will consist of problem related to design and fabrication, repair and maintenance, fault finding of actual situations and there by plan organize and execute the project actually.

BASICS OF PROJECT

The project shall be executed in the following basic steps

- Project idea generation
- Literature survey for project.
- Design & Fabrication.
- Working & result analysis.

The student should use following LISTED AREAS as the guidelines for basic project idea generation

- Study & maintenance of different equipment which work on compressed air such as Pneumatic Impact wrenches, Air motors, Air blowers, Air spray gun, grease gun etc

- Study & Maintenance of various conveyors such as roller conveyors belt conveyors, over head hanger conveyors used for material handling.
- Study & maintenance of compressed air pipe lines, gas pipe lines and water pipe lines.
- Study and maintenance of fork lifts used for material handling.

Sample list of projects that can be taken by the group of 4 to 5 students

- Repair and maintenance of machines such as lathe milling m/c, drilling m/c, shaper, planer, grinder etc
- To fabricate work benches for two wheeler maintenance
- To manufacture some attachments for existing machines such as spherical turning attachment, taper turning attachment to lathe, lapping attachment to lathe etc
- To design and manufacture small material handling equipment required in the institute such as hydraulic trolleys, wheeled pallets etc
- Design & manufacturing of jigs and fixtures
- Design & manufacturing of attachment to machines
- Manufacturing of dies
- Simple automation in existing machines using hydraulic & pneumatic systems
- Quality study in the industry
- To develop simple computer programmes for various industrial applications.
- To study and manufacture innovative simple mechanisms from popular mechanics magazine or Invention intelligence magazine.
- Any research work.

Suggested Implementation Strategy

- The student should review various literature and various industrial situations and applications before starting the project in order to generate the ideas.
- Following modus operandi is to be used for execution of project.
 - In the first two weeks the students are given the idea about the project work that they will do along with the observations of other things mentioned in the syllabus.
 - The students will be going to such industries where they will get exposure to almost all contents in the syllabus. He will work simultaneously on his project selected by him. The student and institute should try to get permission/ sponsorship to enable students to work in the industry.
 - For one month i.e. 4 weeks he will spend in industry and in the remaining weeks, he will work on his selected project work may be in industry or in the institute work shop.

SUGGESTED LEARNING RESOURCES:

Reference Books

Sl. No.	Title
1.	HMT Handbook
2.	Manuals of compressors, Impact wrenches, Fork lifts, Various Machine Tools
3.	Popular Mechanics Magazine, Machine Design Magazine
4.	Invention Intelligence Magazine
5.	Internet sites