

GUJARAT UNIVERSITY

SYLLABUS

OF

B.E. AUTOMOBILE ENGG.

[NEW COURSE]

B.E. SEMESTER	W.E.F.
V AUTOMOBILE ENGG	JULY-2006
VI AUTOMOBILE ENGG	JANUARY-2007
VII AUTOMOBILE ENGG	JULY-2007
VIII AUTOMOBILE ENGG	JANUARY-2008

GUJARAT UNIVERSITY
TEACHING & EXAMINATION SCHEME

B.E. SEM-V (AUTOMOBILE)

w.e.f. July- 2006

Subject Code	Subject Name	Teaching Scheme (Hrs)			Examination Scheme (Marks)					
		Theory	Practicals	Tutorials	Theory Hrs	Theory Marks	Practical / Oral Marks	Term Work Marks	Sessional Marks	Total Marks
A-501	Automobile Engines	4	2	--	3	100	25	25	50	200
A-502	Automobile Systems	4	2	--	3	100	25	25	50	200
A-503	Theory of Machines	4	2	--	3	100	25	25	50	200
A-504	Turbo Machines	4	2	--	3	100	25	25	50	200
A-505	Manufacturing Processes-II	4	2	--	3	100	25	25	50	200
TOTAL		20	10	--	--	500	125	125	250	1000

B.E. SEM- V (AUTOMOBILE ENGG.)

A-501

AUTOMOBILE ENGINES

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs	Theory Marks	Hrs	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
4	2	100	3	50	25	25	200

- 1 **Fundamentals**
Engine structure and its components, Actual working of 2-stroke petrol/Diesel engine & their port timing diagrams. Actual working of 4-stroke Petrol/Diesel engine and their valve timing diagrams
- 2 **Variable specific heat and cycle analysis**
Reasons for variation of specific heats of gases , change of internal energy and enthalpy during a process with variable specific heats, Heat transfer during a process with variable specific heats, change of entropy during a process with variable specific heats , isentropic law with variable specific heats, effect of variable specific heats on air standard efficiencies of Otto and Diesel cycles
- 3 **Fuel-Air cycles and their analysis**
Introduction to fuel-air cycles, factors affecting the air standard cycles, comparison of air standard and fuel air cycles, effect of operating variables on cycle analysis
- 4 **Actual cycles and their analysis**
Difference between actual cycle and fuel-air cycle, actual and fuel-air cycles for S.I. And C.I. Engines
- 5 **Fuels For I.C. Engines**
Desirable properties of I.C. Engine fuels, Liquid & Gaseous fuels, calorific value of fuels and their determination, required qualities of S.I./C.I. Engine fuels, concept about alternate fuels
- 6 **Air capacity of four stroke engines**
Ideal air capacity, volumetric efficiency . effect of various factors on volumetric efficiency inlet valve Mach Index
- 7 **Two stroke engines**
reasons for using two stroke C.I. engines for marine propulsion, reasons for the use of two stroke S.I. Engines for low horse power two wheelers , scavenging processes and parameters , scavenging systems, crankcase scavenging, scavenging pumps and blowers
- 8 **Petrol Engine Fuel Supply System**
Methods of fuel supply system- gravity system, pressure system, Vacuum system, pump system, Fuel injection system, Components of fuel supply system –Fuel tank, fuel pump (Mechanical and Electrical) Vapour return line, Air cleaner, Fuel filters, Carburetion, Functions of carburetor, simple carburetor, Limitations of simple carburetor, Types of carburetor, Special features of modern carburetor, Carter carburetor, Zenith carburetor, Solex carburetor, SU carburetor,
- 9 **Diesel Engine Fuel Supply System**
Requirements of diesel injection system, Fuel feed pump, Types of injection system, fuel injection pump, fuel injectors, Types of nozzles, Fuel filters ,Air cleaner, Phasing and calibration of fuel injection pump, Injector Testing (pressure test, leak test)
- 10 **Engine Cooling System:**
Distribution of heat supplied to engine, Necessity of engine cooling, Piston and engine Cylinder temperatures, Factors affecting piston temperature, Types of cooling system, Air cooling system, Water cooling system, Thermo-syphon cooling, Cooling with thermostatic regulator. Components of water cooling system-Radiator, Pressure Cap, Expansion Reservoir, Thermostat, Water Pump, Comparison between water cooling and air cooling, Other cooling methods- liquid cooling, steam cooling, Effects of over cooling.
- 11 **Engine Friction, Lubrication And Lubricants.**
Total engine friction, Effects of engine variables on engine friction, Lubrication- Objectives of lubrication, Lubricants used, Requirements & selection of lubricants, Viscosity rating, Multi grade oil; Additives used in lubricant, Effects of engine variables on lubricating oil, Oil consumption, Different parts of engine to be lubricated, Types of lubrication system-petrol system, Wet sump method, Dry sump method, Fully and partially pressurized lubrication system, Components of lubrication system- oil strainer, Oil filter and its types

- 12 **Exhaust and intake systems**
Air-Cleaners, silencers, manifold ,
Mufflers types : Baffle type, wave cancellation type, resonance type, absorber type, combined resonance and absorber type. Their construction and capacity to damp high and low frequency waves.
- 13 **Performance Testing of Engine**
Measurement of Indicated Power, Measurement of I.P. of Multi-Cylinder Engine (Morse Test), Measurement of brake power, measurement of speed, air consumption, fuel consumption , calculating mechanical /thermal/ volumetric efficiency, heat balance sheet, performance parameters, performance of S.I./C.I. Engines, performance maps, use of engine analyzer ,

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of experiments :

1. Measurement of air fuel ratio of I. C. engine
2. Trial on scooter engine-torque and power measurement
3. Trial on multi cylinder petrol engine (Morse test)
4. Trial on multi cylinder petrol engine (variable speed test)
5. Trial on single cylinder diesel engine(Heat balance sheet)
6. Trial on computerized single cylinder diesel engine
7. Testing of performance of petrol engine by using engine analyzer
8. Dismantling of modern carburetor used in car and reassembly
9. Study of MPFI system used for modern car
10. Study of CNG kit as a fuel supply system

Books :

1. I.C. Engine by Maleev V. L., McGraw Hill Book, Co.
2. Automobile Mechanics by W. Crouse/ Anglin, Tata McGraw Publication, Delhi
3. Fundamentals of I.C. Engine by Gill P.W., Smith J. H., Zurich E.J, Oxford & IBH
4. I. C. Engine & Air Pollution – E. F. Obert, Harper & Row Publishers, New York
5. I.C. Engines by Domkundwar & Domkundwar , Dhanpatrai & Co.
6. I.C. Engines by Mathur & Sharma, Dhanpatrai Pub.
7. I.C. Engines by V.Ganeshan, TMH Pub.
8. I.C. Engines by R.Yadav, Central Pub. House, Allahabad
9. I.C. Engines by R.K.Rajput, Laxmi Prakashan

B.E. SEM-V (AUTOMOBILE ENGG.)

A-502

AUTOMOBILE SYSTEMS

Teaching Scheme		Examination Scheme					
Theory Hrs	Practical Hrs	Theory Marks	Hrs	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

- 1 **Vehicle Layouts:** Introduction, Classification of automobile, Types of chassis layout with reference to power plant locations and drive, vehicle frames, Various types of frames. Requirements of transmission
- 2 **Clutches:** Location, functions, general requirements, operating principle, types of clutches, cone clutch, single-plate clutch, diaphragm spring clutch, multi-plate clutch, centrifugal clutch, electro magnetic clutch, lining materials, over-running clutch, Clutch control systems. Applications of clutch for two wheeler
- 3 **Gear Box:** Necessity of gear box, resistance to motion of vehicle, requirements of gear box, functions of gear box, different types, sliding mesh, constant mesh, synchromesh. Principle, construction, and working of synchronizing unit, requirements & applications of helical gears, effects of engagement & disengagement, need of double-declutching, gear selector mechanism, Two wheeler gear box., overdrive gears- performance characteristics.
- 4 **Drive Lines:** Effect of driving thrust and torque reaction, propeller shaft-universal joints, hooks and constant velocity U.J., Drive line arrangements– Hotchkiss drive & torque tube drive, rear wheel drive & front wheel drive layouts, tandem - axle drives for heavy duty vehicles
- 5 **Final Drive & Rear Axle:** Purpose of final drive, Different types of final drives, need of differential, differential principle, constructional details of differential unit, non-slip differential, differential lock, need of backlash & setting between crown and bevel pinion, differential housing, function of rear axle, construction, types of loads acting on rear axle, types - semi floating, full floating, three quarter. Final drive lubrication, Gear axle ratio
- 6 **Transmission with Fluid Flywheel & Torque converter:** Operating principle, advantages of fluid coupling, Advantages & limitations of fluid coupling, construction details with operation of fluid coupling. Basic operating principle, performance characteristics, advantages, comparison with conventional gear box, basic construction and operation of torque converter
- 7 **Epicyclic Gear Boxes:** Basic Epicyclic gearing, advantages, basic construction and operation, Types of Epicyclic gear set, Wilson Epicyclic gear train - construction - operation, overdrive gears -purpose, need, advantages, Overdrive ratios and engine speeds - performance characteristics.
- 8 **Automatic Transmission:** Semi-automatic transmission for cars and heavy vehicles with layout and operation, Automatic transmission - advantages, basic construction and operation, automatic transmission for passenger cars, hydraulic control system with function and operation, continuous variable transmission (CVT) - operating principle, basic layout and operation with advantages and disadvantages
- 9 **Vehicle Transmission Performance :** Characteristics & features of friction clutches, mechanical gear transmission & Epicyclic gear boxes, fluid coupling & torque converters .

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of experiments :

1. Sketching of different vehicle layouts and comparison
2. To open the single plate clutch, observe the arrangement, sketch the components & system
3. To open the centrifugal clutch of moped / two wheeler, observe the arrangement, sketch the system
4. To open the multi-plate clutch of two wheeler, observe the arrangement, sketch the system
5. To open the diaphragm clutch of light duty vehicle, observe the arrangement, sketch the system
6. To open the two wheeler gear box, observe the arrangement, sketch the system
7. To open the synchromesh gear box of light heavy duty vehicle, observe the arrangement, sketch the system
8. To open the Continuous variable transmission unit (CVT) of Kinetic Honda, observe the arrangement, sketch the system

B.E. SEM-V (AUTOMOBILE ENGG.)

A-502

AUTOMOBILE SYSTEMS

Teaching Scheme		Examination Scheme					
Theory Hrs	Practical Hrs	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

- 1 **Vehicle Layouts:** Introduction, Classification of automobile, Types of chassis layout with reference to power plant locations and drive, vehicle frames, Various types of frames. Requirements of transmission
- 2 **Clutches:** Location, functions, general requirements, operating principle, types of clutches, cone clutch, single-plate clutch, diaphragm spring clutch, multi-plate clutch, centrifugal clutch, electro magnetic clutch, lining materials, over-running clutch, Clutch control systems. Applications of clutch for two wheeler
- 3 **Gear Box:** Necessity of gear box, resistance to motion of vehicle, requirements of gear box, functions of gear box, different types, sliding mesh, constant mesh, synchromesh. Principle, construction, and working of synchronizing unit, requirements & applications of helical gears, effects of engagement & disengagement, need of double-declutching, gear selector mechanism, Two wheeler gear box., overdrive gears- performance characteristics.
- 4 **Drive Lines:** Effect of driving thrust and torque reaction, propeller shaft-universal joints, hooks and constant velocity U.J., Drive line arrangements- Hotchkiss drive & torque tube drive, rear wheel drive & front wheel drive layouts, tandem - axle drives for heavy duty vehicles
- 5 **Final Drive & Rear Axle:** Purpose of final drive, Different types of final drives, need of differential, differential principle, constructional details of differential unit, non-slip differential, differential lock, need of backlash & setting between crown and bevel pinion, differential housing, function of rear axle, construction, types of loads acting on rear axle, types - semi floating, full floating, three quarter. Final drive lubrication, Gear axle ratio
- 6 **Transmission with Fluid Flywheel & Torque converter:** Operating principle, advantages of fluid coupling, Advantages & limitations of fluid coupling, construction details with operation of fluid coupling. Basic operating principle, performance characteristics, advantages, comparison with conventional gear box, basic construction and operation of torque converter
- 7 **Epicyclic Gear Boxes:** Basic Epicyclic gearing, advantages, basic construction and operation, Types of Epicyclic gear set, Wilson Epicyclic gear train - construction - operation, overdrive gears -purpose, need, advantages, Overdrive ratios and engine speeds - performance characteristics.
- 8 **Automatic Transmission:** Semi-automatic transmission for cars and heavy vehicles with layout and operation, Automatic transmission - advantages, basic construction and operation, automatic transmission for passenger cars, hydraulic control system with function and operation, continuous variable transmission (CVT) - operating principle, basic layout and operation with advantages and disadvantages
- 9 **Vehicle Transmission Performance :** Characteristics & features of friction clutches, mechanical gear transmission & Epicyclic gear boxes, fluid coupling & torque converters ,

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of experiments :

1. Sketching of different vehicle layouts and comparison
2. To open the single plate clutch, observe the arrangement, sketch the components & system
3. To open the centrifugal clutch of moped / two wheeler, observe the arrangement, sketch the system
4. To open the multi-plate clutch of two wheeler, observe the arrangement, sketch the system
5. To open the diaphragm clutch of light duty vehicle, observe the arrangement, sketch the system
6. To open the two wheeler gear box, observe the arrangement, sketch the system
7. To open the synchromesh gear box of light heavy duty vehicle, observe the arrangement, sketch the system
8. To open the Continuous variable transmission unit (CVT) of Kinetic Honda, observe the arrangement, sketch the system

9. To open the differential, sketch the unit with bearing locations and assemble
- 10 Study of fluid flywheel & torque converters
11. Study of automatic transmission

Books :

1. Automobile Mechanics by W. Crouse/ Anglin, Tata McGraw Publication, Delhi
2. Motor Vehicles by Newton Steed , Butterworths London
3. Automatic Transmission by Chek Chart, A Harper & Row Publications
4. Automobile Engg Vol- I & II by Kirpal singh, Standard Pub.
5. Automobile Engg Vol- I & II by K.M.Gupta, Umesh Pub.
6. Automobile Engg Vol- I & II by A.Chhikara , Satya Prakashan
7. Automobile Engg ., by R.B.Gupta , Satya Prakashan.
8. Automobile Technology, Dr. N.K.Giri, Khanna Pub.

**B.E. SEM-V (AUTOMOBILE ENGG.)
THEORY OF MACHINES**

A-503

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
4	2	100	3	50	25	25	200

- 1 **Toothed Gearing :**
Geometry of motion, Gear geometry, Types of gear profile- involute & cycloidal, Theory of Spur, Helical & Spiral gears, Interference in involute tooth gears and methods for its prevention, Contact ratio, Path of contact, Efficiency and center distance of spiral gears
- 2 **Kinetic Analysis of Mechanisms :**
Inertia Force and Torque, D'Alembert's Principle, Dynamically equivalent system, force analysis of reciprocating engine mechanism, Function of flywheel and study of turning moment diagrams.
- 3 **Gyroscope :**
Gyroscopic couple, Spinning and Precessional motion, Gyroscopic couple and its effect on i) Aero plane ii) Ship iii) Four-Wheeler iv) Two - Wheeler
- 4 **Balancing :**
Static and Dynamic balancing of rotary and reciprocating masses, Primary and Secondary forces and couples, Direct and Reverse cranks. Balancing of Single cylinder, Multi cylinder- In-line and V-Engines.
- 5 **Vibrations :**
Basic concepts and definitions, vibration measuring parameters- Displacement, Velocity and acceleration, Free and forced vibrations. Types of damping, Equivalent Springs
- 6 **Single Degree of Freedom Systems :**
Free vibrations with and without damping (Rectilinear, Torsional & Transverse), degree of damping. Logarithmic decrement, equivalent viscous damping, Coulomb damping.
- 7 **Forced vibrations with viscous damping, magnification factor, frequency response curves, vibration isolation and transmissibility, Whirling of Shafts and Critical speeds**

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Suggested list of experiments

1. Experiment on Gyroscope
2. Generation of involute gear tooth profile
3. Determination of M.I. by Bi-filar suspension, Trifilar suspension or Compound pendulum
4. Balancing of rotary masses (Static and Dynamic)
5. Determination of logarithmic decrement (Free Damped Vibrations)
6. Forced vibration characteristics (Undamped and Damped vibrations)

Books

1. Theory of Machines by Rattan S.S., Tata McGraw Hill Pub. Co. Ltd., New Delhi
2. Theory of Machines by Thomas Bevan, C.B.S. Publishers & Distributors
3. Theory of Machines & Mechanisms by Shigley J.E., McGraw Hill International Book Ltd.
4. Mechanism and Machine Theory by Rao J.S. , Dukkipati R. V., New Age International Pub
5. Theory of Machines by Dr. V.P.Singh, Dhanpatrai & Co., Delhi
6. Mechanical Vibrations by Grover G. K., Nemchand & Bros., Roorkee.
7. Theory of Machines by Ballaney P. L., Khanna Publishers, Delhi
8. Theory of Machines by Jagdishlal, Metropolitan Book Co. Pvt. Ltd., New Delhi
9. Theory of Machines by R.S.Khurma & J.K. Gupta, S.Chand & Co.
10. Dynamics of Machinery by F.Haideri, Nirali Prakashan, Pune

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B.E. SEM- V (AUTOMOBILE ENGG.)

A-504

TURBO-MACHINES

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs.	Sessional Marks	Practical/ Oral Marks	TermWork Marks	Total Marks
4	2	100	3	50	25	25	200

1 Centrifugal Pumps:

Working principles, Construction, types ,various heads, multistage pumps, velocity triangles, minimum starting speed, cavitation , MPSH and NPSH. Methods of priming calculations of efficiencies, discharge, blade angles, head, power required, impeller dimensions etc., Similarity Principles of centrifugal pumps, Performance characteristic.

2 Positive Displacement Pumps :

Reciprocating Pumps :

Principle, construction, working, , Air vessels, Performance characteristics.

Rotary Pumps :

Principle, Construction & Working of gear pumps&: vane pumps, types, applications

3 Positive Displacement Air Compressors :

Application of compressed air, classification of compressor, reciprocating compressors, construction, work input, necessity of cooling, isothermal efficiency, heat rejected, effect of clearance volume, volumetric efficiency, necessity of multi staging , construction, optimum intermediate pressure for minimum work required, after cooler, free air delivered, air flow measurement, capacity control. Roots blower and vane blower (descriptive treatment)

4 Roto-dynamic Air Compressors :

Centrifugal compressor :

velocity diagram. Theory of operation, losses, Adiabatic efficiency, effect of compressibility, diffuser, pre-whirl, pressure coefficient, slip factor, performance.

Axial flow compressors:

velocity diagram, degree of reaction, polytropic efficiency, surging, choking, stalling, performance, comparison with centrifugal.

5 Gas Turbines :

Introduction, classification, simple open cycle gas turbine, closed cycle gas turbine, Actual Brayton cycle, optimum pressure ratio for maximum thermal efficiency, work ratio, air rate, means of improving the efficiency and specific output of simple cycle, open cycle gas turbine with regeneration, reheating inter cooling, , effect of various modification, effect of operating variables on air rate, actual cycle gas turbine with inter-cooling, reheat and regeneration. Effect of operating variables on work ratio, water injection, closed cycle gas turbine, Combustion chambers, applications of gas turbines, turbine blade cooling, materials, protective coating, performance of gas turbines starting and ignition systems, lubricating systems.

6 Jet Propulsions :

Types, construction, working principle, applications, Ram jet, Turbo jet, Thrust power, propulsive efficiency, thermal efficiency, merits and demerits of jet propulsion, turboprop.

Term Work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

Books :

1. Hydraulic Machines by V.P. Vasantani, Kharana Publishers
2. Turbines, Fans & Compressors by S.M. Yahya , Tata Mc-Graw Hill Pub.
3. Fluid Mechanics & Fluid power Engineering by D.S. Kumar, S.K.Kataria & Sons
4. Steam & Gas Turbines by R. Yadav, Central Pub.
5. Gas Turbines by V. Ganeshan, Tata Mc-Graw Hill Pub.
6. Thermal Engg. By P.L. Ballaney, Khanna Publishers
7. Gas turbines by Cohen & Rogers , Pearson Ed.
8. Thermodynamics & Heat Engines – Vol-II by R. Yadav , Central Pub.
9. Thermal Engineering by R.K.Rajput, Laxmi Prakashan
10. Fluid Mechanics & Hydraulic Machines by R.K.Rajput, S.Chand & Co.
11. Fluid Mechanics & Hydraulic Machines by R.K.Bansal, Laxmi Prakashan
12. Thermal Engineering by Mathur & Mehta, Jain Brothers

B.E. SEM-V (AUTOMOBILE ENGG.)

A-505

MANUFACTURING PROCESSES- II

Teaching Scheme		Examination Scheme					
Theory Hrs.	Practical Hrs.	Theory Marks	Hrs	Sessional Marks	Practical/ Oral Marks	Term Work Marks	Total Marks
4	2	100	3	50	25	25	200

- 1 **Automobile Manufacturing Industry:**
Automotive Component manufacturing & vehicle Manufacturing , automotive manufacturing plant layout.
- 2 **Forging of Automotive Components :**
Different components & methods of forging – gudgeon pin, Crankshaft, connecting rod, cam shaft, rocker arm, gears, shaft & axles, material suitability for above components, forging equipments, forging defects.
- 3 **Sheet Metal Working of Automotive Components:**
Different components & methods of manufacturing sheet metal components – body components, wheel disc, different covers, fuel tanks, chassis frame components, Selection of sheet metal.
Cold forming (Sheet metal working) :
Drawing, deep drawing, squeezing, bending, blanking, piercing, notching etc., high energy rate forming. Spinning operations and applications.
Press Work :
Types of press, drive mechanisms for presses, feed mechanisms, press tools and sets, die classification, elements of die and punch design.
- 4 **Plastic, Rubber & Glass Component Manufacturing:**
Different components & methods of manufacturing plastic, rubber, reinforced plastic, glass. Plastic – dashboard, handles & knobs, door panels, semi-transparent components, bumpers, fan, grills. Rubber – Seals, door trims, bushes, packing, hoses, tubes & tyres , mountings. Glass – Windshield, door glasses, lamps.
- 5 **Joining Processes :**
Joining techniques like welding, riveting, brazing, soldering used for sheet metal components, chassis frame components.
Welding processes like spot , tungsten inert gas welding, metal inert gas welding, submerged arc welding , friction and electro-slag welding , electro beam welding, laser welding ,ultrasonic welding, inspection of weldments , Automated joining processes, Gas & Plasma arc cutting.
- 6 **Surface Treatment :**
Anti corrosive treatment - body components, chassis frame, Surface hardening – gears, crankshaft, cam shaft, piston rings, piston pin, valves.
- 7 **Theory of Metal Cutting :**
Mechanism of cutting, chip formation and types , tool materials , tool geometry , cutting forces, cutting fluids , tool wear and life , machinability
- 8 **Machining Operations for Major Components :**
Automotive components like piston, crankshaft cylinder block, head, connecting rod, gears, axles , shafts
- 9 **Advanced Manufacturing Processes :**
Use of EDM, ECM, ECG,USM,PAM.,LBM for manufacturing automobile components.
- 10 **Jigs and Fixtures :**
Definition, its usefulness in mass production, design principles, locators and clamps with their types, jig bushes, type of jigs and fixtures for various machining operations, economics of jigs and fixtures.

Term work: The term work shall be based on the topics mentioned above.

Practical / Oral: The candidate shall be examined on the basis of term-work.

- Books :**
- 1 Production Technology by R.K.Jain, Khanna Publishers
 - 2 Production Engineering by P.C. Sharma, S.Chand & Co.
 - 3 Production Technology by P. C. Sharma, S.Chand & Co.
 - 4 Production Technology Vol- I & II by O.P. Khanna & M.Lal, Dhanpatrai Pub.
 - 5 Automobile Engineering Vol-V , A.Chhikara , Satya Prakashan