

Second – Year Curriculum Syllabus for  
B.Voc. Degree Programme in  
**Automotive Servicing**

(Dr Babasaheb Ambedkar Technological University, Lonere)

**Semester-III**

Sr. No.	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credits	Total Marks		
			L	TP	ISE	MSE	ESE					
<b>Semester III- Theory</b>												
1	BVASC301	Automobile Electrical System	3	0	-	25	0	25	3	50		
2	BVASC302	Automobile Drawing & Design	3	0	-	25	0	25	3	50		
3	BVASC303	Automobile Engine Systems	3	0	-	25	0	25	3	50		
4	BVASC304	Auto Body Repair, Denting & Painting	3	0	-	25	0	25	3	50		
		<b>Total</b>							<b>12</b>	<b>200</b>		
<b>Skill Components</b>												
<b>Lab/Practical's</b>												
5	BVASL305	Automobile Workshop - I	0	0	2	25	0	25	1.5	50		
6	BVASL306	Auto Body Repair, Denting & Painting Workshop	0	0	2	25	0	25	1.5	50		
									3	100		
<b>On-Job-Training (OJT)/Qualification Packs (ANY 1)</b>									<b>Group GEM3</b>			
			Evaluation Sheet									
			IA			ESE						
7	BVASE313	Automotive Service Technician Level 6 (ASC/Q1404)	50			150			15		200	
8	BVASE314	Automation Specialist (ASC/Q6807)										
9	BVASE315	Assembly Line Machine Setter (ASC/Q3603)										
10	BVASE316	Process Design Engineer (ASC/Q6404)										
11	BVASE317	Quality Controller (ASC/Q1605)										
		<b>Total</b>							<b>18</b>	<b>300</b>		

**Semester-IV**

Sr. No.	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Marks
			L	TP	ISE	MSE	ESE			
<b>Semester IV- Theory</b>										
1	BVASC401	Automobile Engine Systems	3	0	-	25	0	25	3	50
2	BVASC402	Automotive Refrigeration and Air Conditioning	3	0	-	25	0	25	3	50
3	BVASC403	Vehicle Performance and Testing	3	0	-	25	0	25	3	50
4	BVASC404	Electrical & Hybrid Vehicles – II	3	0	-	25	0	25	3	50
		<b>Total</b>							<b>12</b>	<b>200</b>
<b>Skill Components</b>										
<b>Lab/Practical's</b>										
5	BVASL405	Automotive RAC Lab	0	0	2	25	0	25	1.5	50
6	BVASL406	Vehicle Performance and Testing Lab	0	0	2	25	0	25	1.5	50
									3	100
<b>On-Job-Training (OJT)/Qualification Packs (ANY 1)</b>									<b>Group GEM4</b>	
			Evaluation Sheet							
			IA			ESE				
7	BVASE418	One more QP to be opted from the QPs mentioned in the Level 6 first semester	50			150			15	200
		<b>Total</b>							<b>18</b>	<b>300</b>

**Semester  
III  
Syllabus**

<b>Subject Name: Automobile Electrical System</b>		
Course Code : <b>BVASC301</b>	Semester: <b>III</b>	
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>	
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>	
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>STARTING SYSTEM</b>	06
	Principle, construction and working of starter motor. Series motor and its characteristics, Compound wound motor, Engine starting circuit, Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual, solenoid, Factors affecting the starting of engines, Torque terms. Starting torque and power required, Motor efficiency, Armature reaction, Typical motor specifications	
<b>Unit – II</b>	<b>IGNITION SYSTEM OF SPARK-IGNITED ENGINES</b>	06
	Types of ignition systems- battery-and-coil, magneto ignition systems. Ignition circuit. Details of the ignition system-ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive. Firing order. Ignition timing. Ignition advance and retard, need, and factors it depends upon. Methods for obtaining advance and retard vacuum and mechanical. Optical sensor for spark timing.	
<b>Unit – III</b>	<b>SPARK PLUG</b>	06
	Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs. Glow plugs of diesel engines. Magneto-rotating armature and rotating magnet types. Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.	
<b>Unit – IV</b>	<b>LIGHTING SYSTEM</b>	06
	Requirements of automobile lighting. Head lamp - mounting and construction; Plastic headlamp Lens, sealed beam assembly. Asymmetrical head light, dipper and full beam, care of headlamp, Lens cleaners. Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs. Reflector optics. Light sources – tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp. Auxiliary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.	
<b>Unit – V</b>	<b>ACCESSORIES</b>	06
	Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, ampere meter, wind-screen wiper, electrical horn and relay, cigarette lighter, Odometer, wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly. Radio and television Interference suppressors, electrical switches. Central locking of doors, power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.	
<b>Books</b>		
Name of Authors	Title of the Book	Publisher
P L Kohli	Automotive Electrical Equipment	---
AW Judge	Modern Electrical Equipment	
WH Crouse	Automotive Electrical Equipment	

<b>Subject Name: Automobile Drawing &amp; Design</b>		
Course Code : <b>BVASC302</b>		Semester: <b>III</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>		Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>		Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Engine Component Drawings</b>	06
	Drafting of sectional views of the following assemblies: (a) Cylinder block and crankcase of 2-wheeler, (b) Poppet valve assembly of a 4-stroke engine, (c) Piston assembly, (d) Connecting rod assembly, (e) Spark plug, (f) Injector.	
<b>Unit – II</b>	<b>Engine Line Diagrams</b>	06
	Free hand line diagram of the following systems: (a) Fuel system of petrol engine (b) Fuel system of diesel engine (c) Cooling system of a multi-cylinder engine (d) Lubricating system of a multi-cylinder engine (e) Steering system of Maruti (f) Suspension systems of Maruti (g) Hydraulic Braking System of Maruti Zen (h) Air Hydraulic Braking System of TATA (i) Block diagram of Electronic Fuel Injection (EFI) system (j) Block diagram of Common Rail Direct Injection (CRDI) system (k) Oxygen sensor (l) Fuel injector of EFI.	
<b>Unit – III</b>	<b>Drafting of Brake Component Drawings</b>	06
	Drafting of sectional views of the following assemblies (1) Master cylinder (2) Wheel cylinder (3) Universal joint.	
<b>Unit – IV</b>	<b>Workshop Layouts</b>	06
	Sketch layouts of (a) Depot (b) F.I. pump reconditioning shop (c) Electrical Workshop.	
<b>Unit – V</b>	<b>Design of Automobile Engine Components</b>	06
	Design of the following components of an automobile engine (1) Piston assembly (2) Connecting rod assembly (3) Crank shaft (4) Flywheel	
<b>Books</b>		
Name of Authors	Title of the Book	Publisher
RB Gupta	Automobile Drawing	---

**Subject Name: Automobile Engines**

Course Code : <b>BVASC303</b>		Semester: <b>III</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>		Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>		Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Fundamentals of Thermodynamics And Thermal Engineering</b>	<b>06</b>
	(A) Fundamentals of Thermodynamics: Internal energy, Enthalpy, Mechanical Equivalent of Heat, Conservation of energy. First and Second Law of thermodynamics. P-V diagram. Reversible process. Various thermodynamic processes. Entropy, General case for change of entropy of a gas. Change of entropy during various processes. Temperature-entropy diagram. Simple numerical problem (B) Air standard cycles: Otto cycle, Diesel cycle, Air standard efficiency of Otto and Diesel cycle. Effect of compression ratio on efficiency. Simple numerical problems. Graphical representation of ideal and actual cycle. Comparison between actual and ideal cycles. Reasons for variation. Mean effective pressure. Work done during the cycle.	
<b>Unit – II</b>	<b>I.C. Engines operation</b>	<b>06</b>
	(A) I.C. Engines' operation: Working of two stroke cycle and four stroke cycle petrol and diesel engines. Valve timing diagrams. Port timing diagrams. Classification of I.C. Engines. (B) Reciprocating Engine Details: Construction, function, material and manufacturing process of: (a) Cylinder Block- 2-stroke air cooled and 4-stroke water cooled cylinder liner (wet and dry), cylinder head, and gaskets. Different cylinder arrangements. Cylinder wear. Forms of combustion chamber in petrol engine. Location of spark plug. Combustion chamber in Diesel engines. Turbulence in Combustion chambers.	
<b>Unit – III</b>	<b>Various Valve Operations</b>	<b>06</b>
	(a) Piston-plain, split skirt, auto-thermic (b) cam-ground, Anodizing and Tinning of piston, Piston clearance (c) Piston rings-different types (d) Piston pin; different methods of fitting piston pin (e) Valves: Poppet, Rotary, reed, Poppet Valve arrangement, Overhead and side valve operating mechanism. Valve clearance. Hydraulic tappet. Sodium cooled valves. Valve seat inserts (f) Connecting rod, Section of connecting rod. Bearing metal for big and small end of connecting rod (g) Crank shaft. Left hand, right hand crankshaft. Balancing of crank shaft (General idea about static and dynamic balancing, problems excluding). Main bearings. Crankshaft end play. Vibration damper. Flywheel (h) Camshaft, Camshaft drive timing gears (i) Inlet and exhaust manifold, Mufflers, Exhaust pipe (j) Variable Valve Timing (VVT).	
<b>Unit – IV</b>	<b>Rotary Engine</b>	<b>06</b>
	(A) Rotary Engine. Principle and operation. Engine cooling. Advantages and limitations. (B) Internal combustion Turbines. Principle of working, Classification, Brayton cycle. Cycle efficiency. Friction effect. Optimum compression ratio. Simple numerical problems, Deviation of practical cycles. Methods to improve efficiency, Turbine characteristics, combustion chamber, Fuel injection, Ignition Gas turbine Fuels, Materials. Turbine blades.	
<b>Unit – V</b>	<b>Supercharging and scavenging</b>	<b>06</b>
	(A) Supercharging and scavenging: - Necessity of supercharging, rotary compressors, Turbocharger requirement, Effect of supercharging on power output, mechanical losses, fuel consumption, detonation, Limitations of supercharging. Methods and classification of scavenging process. Performance of different scavenging systems. (B) Engine specifications:- specifications of engines of Indian vehicles - four wheelers, three wheelers and two wheelers.	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
A K Babu	Automotive Engines	Khanna Publishing House
Sarao, Gambhir & Aggarwal	Thermal Engineering I & II	---
Kirpal Singh	Automobile Engineering II	---
CP Nakra	Basic Automobile Engineering	---
RB Gupta	Automobile Engineering	---



<b>Subject Name: Auto Body Repair, Denting &amp; Painting</b>		
Course Code : <b>BVASC304</b>	Semester: <b>III</b>	
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>	
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>	
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Safety Precautions And First Aid-1</b>	06
	Safety precautions and first aid:-Proper- use, care and maintenance of tools and equipment's Introduction on types, function of body and panels, Procedure for inspection, removing and refitting of body components panels, doors and other body parts, Arc welding-basic electricity and welding power source. Electrodes types, description and specification.arc welding procedure Gas welding-gas welding, brazing and soldering procedures Description of gas cutting, Resistance welding-resistance welding, process-spot, seam and butt welding Details of MIG welding.	
<b>Unit – II</b>	<b>Safety Precautions And First Aid -2</b>	06
	Method of fixation of wind screen, glass Procedure for cut open, beat out, dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application & primer application at different stages of affected area(chronological order for repair of auto body) fitment of repaired part and aligning to the original shape Personal safety – three key areas of risk eyes, skin and inhalation.	
<b>Unit – III</b>	<b>Details Of Personal Protective, Equipments</b>	06
	Details of personal protective, equipment's:- RPE,PPE Details of ingredients of paint, Procedure of refinishing process, Selection of consumable for doing painting work Procedure for doing painting(in chronological order),selection of materials.	
<b>Unit – IV</b>	<b>Tools And Equipments</b>	06
	tools and equipment's:- application of body filler for surface preparation, sanding on the affected area for smooth surface preparation, primer coating on the affected area, preparing affected surfaces for base coating, applying Base coat painting, clear coat painting for metallic paints, rubbing and polishing.	
<b>Unit – V</b>	<b>Application Of Paint Production</b>	06
	Application of paint production:-s treatment/anti rust treatment Procedure for inspection of painting, work and fixing the wind screen glass Details of spray gun- types-standard air, gap design-different sizes of nozzles, Details of different types sanding - 15 equipment's Different types of sand paper-grades, Possible defects in painting, objects, causes and its cure.	

**Subject Name: Automobile Workshop –I**

Course Code : <b>BVASL305</b>	Semester: <b>III</b>
Weekly Practicals: PR: <b>01</b> Tut: <b>00</b>	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
Credit: <b>1.5</b>	

<b>Content</b>		<b>Hours</b>
<b>I</b>	<b>Engine Tuning</b>	06
	Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Service data of Maruti: Alto, WagonR, Swift (Petrol & Diesel); Hyundai, Santro, Ford: Figo; Volkswagen: Polo; Chevrolet, Spark. Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking.	
<b>II</b>	<b>Wheel Balance And Alignment</b>	06
	Wheel Balance: Reasons of wheel imbalance, Effect of wheel imbalance on stability of vehicle. Static and dynamic balancing, Wheel balancing by the application of weights, Wheel Alignment: Meaning of wheel alignment, Various angles-camber, caster, KPI & toe - and their effect on steering stability, General values of popular Indian vehicles, Wheel alignment on computerised wheel aligner	
<b>III</b>	<b>Exhaust Gas Analysis</b>	06
	Measurement of Exhaust Pollution by various analysers such as Four Gas Analyser, Smoke meter, Nox analyser.	
<b>IV</b>	<b>Use of aligner And oscilloscope</b>	06
	Use of Headlight aligner, Wheel aligner, automotive oscilloscope	
<b>V</b>	<b>Automobile Servicing</b>	06
	Servicing: Meaning and scope of servicing, Items attended to in servicing of a vehicle. Servicing a vehicle, Focussing and alignment of head lights	

**Books**

<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
Gary Lewis	Engine Service	---
---	Various Car's Manuals	---

<b>Subject Name: Auto Body Repair, Denting &amp; Painting Workshop</b>		
Course Code : <b>BVASL306</b>		Semester: <b>III</b>
Weekly Practicals: PR: <b>01</b> Tut: <b>00</b>		Scheme of Marking TH: --
TH Exam Duration: --		Scheme of Marking PR: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
Credit: <b>1.5</b>		
<b>Content</b>		<b>Hours</b>
<b>I</b>	<b>Auto Body Repair</b>	06
	Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipment's, Consumables clothing safety Simple basic practices on computer reading, service manuals, collision repair manuals and colour matching guide, Identification of different types of body, chassis and drive lines, Identification of location of parts and panels, Practice on operating the air compressor.	
<b>II</b>	<b>Periodical Maintenance</b>	06
	Practice on periodical maintenance of air compressor Inspect and decide whether it can be repaired or replaced Remove and refit body panels, doors, floors, wheel boxes and fenders Practice on removing and refitting wind shield glasses, Practice on arc welding on vehicle body Practice on gas welding, gas brazing, gas soldering and gas cutting on vehicle body Practice on resistance, spot, seam and butt welding on vehicle body Practice on MIG welding Safety precautions and first aid.	
<b>III</b>	<b>Various Tools and Equipments -1</b>	06
	Proper use, care and maintenance of tools and equipment's, Introduction on types, function of body and panels Procedure for inspection, removing and refitting of body components panels, doors and other body parts Arc welding-basic electricity and welding power source. Electrodes types, description and specification, Arc welding procedure Gas welding- gas welding, brazing and soldering procedures.	
<b>IV</b>	<b>Various Tools and Equipments -2</b>	06
	Description of gas cutting Resistance welding-resistance welding process-spot, seam and butt welding. Details of MIG welding Method of fixation of wind screen glass Procedure for cut open, beat out dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application & primer application at different stages of affected area(chronological order for repair of auto body) fitment of repaired part and aligning to the original shape, Practice on plasma welding, Practice on minor repair of auto body cut open, beat out, strip out old paint, make smooth surface by using different grades of sanders, apply putty on affected area and applying primer(repair damaged body which is ready for final paint) Apply base coat painting, Fit check the repaired components for alignment.	
<b>V</b>	<b>Auto Body Painting</b>	06
	Practice health & safety-familiarize, select, proper use, maintain and store – tools, equipments, Consumables clothing safety, Practice on removing paint from the damaged area Practice on mixing and applying body filler Practice on sanding(block) Practice on mixing and applying putty Practice on applying primer Practice on feather edge sanding and masking Base coat application Surface cleaning and degreasing Second and third coat application Preheating the vehicle and cooling Cutting, scuffing, rubbing and polishing.	

### Group GAS3 of Qualifier Packs

<b>Subject Name: Automotive Service Technician Level 6 (ASC/Q 1403)</b>	
Course Code : <b>BVASE307</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.asdc.org.in/uploads/1052830856120719052300.pdf">https://www.asdc.org.in/uploads/1052830856120719052300.pdf</a>	

<b>Subject Name: Automation Specialist (ASC/Q6807)</b>	
Course Code : <b>BVASE308</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP-Automation%20Specialist.pdf">https://www.nqr.gov.in/sites/default/files/QP-Automation%20Specialist.pdf</a>	

<b>Subject Name: Assembly Line Machine Setter (ASC/Q3603)</b>	
Course Code : <b>BVASE309</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP-Assembly%20line%20machine%20setter.pdf">https://www.nqr.gov.in/sites/default/files/QP-Assembly%20line%20machine%20setter.pdf</a>	

<b>Subject Name: Process Design Engineer (ASC/Q6404)</b>	
Course Code : <b>BVASE310</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP%20-%20Process%20Design%20Engineer.pdf">https://www.nqr.gov.in/sites/default/files/QP%20-%20Process%20Design%20Engineer.pdf</a>	

<b>Subject Name: Quality Controller (ASC/Q1605)</b>	
Course Code : <b>BVASE311</b>	Semester: <b>III</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP%20-%20Quality%20Controller.pdf">https://www.nqr.gov.in/sites/default/files/QP%20-%20Quality%20Controller.pdf</a>	

**\*Skill Practical assessment will be done rules/ procedure of respective Skill Sector Council of India.**

**Semester  
IV  
Syllabus**

**Subject Name: Automobile Engine Systems**

Course Code : <b>BVASC401</b>		Semester: <b>IV</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>		Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>		Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Starting And Lubrication System</b>	06
	STARTING SYSTEM: Idea of engine starting-system circuit. Kick-starting system of 2 wheelers. Starting of mopeds. IGNITION SYSTEM: Idea of Battery-and-coil ignition circuit and it's working. Compression ignition of diesel engines. LUBRICATION SYSTEM: Lubrication in 2 stroke engines - petrol and oil-injection. Lubrication in 4 stroke multi-cylinder petrol/diesel engines. Dry and wet sump lubrication. Full pressure and semi-pressure lubrication. Oil pump types. Oil pump drive, relief valve; pressure gauge. Oil filters. Full-flow and by-pass type filtering systems. Crankcase dilution, crankcase ventilation. Positive Crankcase Ventilation. Properties and functions of good lubricating oil. Additives. Gradation of lubricating oil due to viscosity. SAE numbers. Service rating. 2T and Super 2T oils for use in 2-s engines.	
<b>Unit – II</b>	<b>Cooling System And Fuels</b>	06
	COOLING SYSTEM: Necessity of cooling of I.C. engines. Methods of cooling-air cooling, water cooling, liquid cooling. Shape of cooling fins. Field of application of air cooling. Water cooling system - Thermo siphon system, pump system, thermostat system of cooling. Thermostat - types. Radiators-different types, their construction and function. Pressurized cooling system; radiator pressure-cap, surge tank. Cooling water temperature gauge. Antifreeze and anti-corrosive additives. Coolants. Flushing of cooling system. AUTOMOBILE ENGINE FUELS: Types of fuels. Influence of structure. Calorific value. Requirements in fuels for I.C. engines. Properties. Fuel rating. Additives for S.I. and C.I. engine fuels. Specifications of petrol and diesel. Leaded and un-leaded petrol, Low Sulphur diesel. Enhancing Power output- Nitrox injection. Non-conventional fuels - LPG, CNG ethanol-mixed petrol. Properties, method of manufacture and their performance as I.C. engine fuels. Engine Modifications required. Dual mode engine. Idea of Electric Vehicles and Hybrid Vehicles.	
<b>Unit – III</b>	<b>Fuel System Of Diesel Engines</b>	06
	Fuel supply system. Filters (primary and secondary); positioning of filters. Feed pump. Solid and air injection system. Fuel injection pump, different types- plunger, distributor pump, their construction and working. Injectors. Governors. Types of governing. Combustion process in diesel engine. Diesel knock. Electronically Controlled Diesel Injection Pump. Common Rail Direct Injection. Piezoelectric effect and its use in CRDI.	
<b>Unit – IV</b>	<b>Fuel System Of Petrol Engines</b>	06
	Gravity feed system used in 2-wheelers. Fuel supply circuit of 4-wheelers. Mechanical and electrical fuel pump. Electric fuel gauge. Petrol fuel filter. Air/fuel ratio. Variation of air/fuel ratio with speed. Air cleaners (wet & dry). Cyclone filter. CARBURETOR - Function and principle of working of simple carburettor. Carburettor controls-throttle, choke. Types of Carburettors- fixed jet carburettor (Solex type) and constant vacuum carburettors used in YAMAHA motorcycle. Twin-barrel carburettors. Classification of carburettors. Disadvantages of carburettors. Phenomenon of combustion and detonation. Pre- ignition.	

<b>Unit – V</b>	<b>Fuel Injection Systems (Petrol Engine) And Engine Performance</b>	06
	TBI, MPI; the Electronic Module. Advantages of Electronic Fuel Injection (EFI). Block diagram of the EFI. The Air Intake System and the Idle Air Control System. Fuel Delivery System. Various sensors used with the ECM, their location and purpose. Fuel Injector. Idea of Gasoline Direct Injection ENGINE PERFORMANCE AND TESTING: Various losses in an engine. Heat balance, Morse method of finding IHP, Calculation of Various quantities like IHP, BHP, mechanical efficiency, thermal efficiency, relative efficiency, overall efficiency, and specific fuel consumption. Performance curves.	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
A K Babu	Automotive Engines	Khanna Publishing House



<b>Subject Name: Automotive Refrigeration &amp; Air-conditioning</b>		
Course Code : <b>BVASC402</b>	Semester: <b>IV</b>	
Weekly Teaching Hours: <b>TH: 03 Tut: 00</b>	Scheme of Marking <b>TH: 25, IA: 25, Total: 50</b>	
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking <b>PR: --</b>	
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Refrigeration Fundamentals</b>	06
	Introduction to refrigeration and vapour compression system, cycle diagram (Carnot cycle, Reverse Carnot cycle, Simple vapour compression cycle, bell Coleman cycle), effects of various operating parameters on performance of A/C System, Vapour absorption refrigeration system (No numerical), Applications of refrigeration and air Conditioning.	
<b>Unit – II</b>	<b>Refrigerants and Air Conditioning Components</b>	06
	Environmental concerns/Legislation for automotive A/C systems, types and properties of refrigerants, refrigerant oils, refrigerant piping. Future refrigerants, Air conditioning components: Compressors, Condensers, flow control devices, evaporators – Design guidelines, types, sizing and their installation. Accumulators, receiver driers and desiccants, Refrigerant charge capacity determination.	
<b>Unit – III</b>	<b>Air distribution system</b>	06
	Comfort conditions, Air management and heater systems, air distribution modes (Fresh/Recirculation, Face, Foot, Defrost, and Demist), A/C ducts and air filters. Blower fans, Temperature control systems (manual/semiautomatic, automatic). Vehicle operation modes and Cool-down performance Psychometric: Psychometric properties, tables, charts, Psychometric processes, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor.	
<b>Unit – IV</b>	<b>Load analysis and control devices</b>	06
	Load Analysis, Outside and inside design consideration, Factors forming the load on refrigeration and air conditioning systems, Cooling and heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine performance, Air conditioning electrical and electronic control, pressure switching devices, sensors and Actuators.	
<b>Unit – V</b>	<b>Diagnostics, Trouble Shooting, Service and Repair</b>	06
	Initial vehicle inspection, temperature measurements, pressure gauge reading and cycle testing, leak detection and detectors, Sight glass. Refrigerant safety/handling, refrigerant recovery; recycle and charging, system oil, system flushing, odour removal, retrofitting. Removing and replacing components, Compressor service.	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
Sadhu Sing	Refrigeration And Air Conditioning	Khanna Publishing House

<b>Subject Name: Vehicle Performance &amp; Testing</b>		
Course Code : <b>BVASC403</b>		Semester: <b>IV</b>
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>		Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
TH Exam Duration: <b>01 Hours</b>		Scheme of Marking PR: <b>--</b>
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Vehicle Performance Parameters</b>	06
	Vehicle Performance parameters: Fuel economy, acceleration, deceleration, grad ability, top speed, handling, comfort, life durability, EGR systems, Impact of vehicular systems on performance: Suspension system, Steering system, Brakes, Tyres, carriage unit. Catalytic converters function and construction, Lambda close loop control system for gasoline vehicles.	
<b>Unit – II</b>	<b>Drive train and Component testing</b>	06
	Vehicular transmission performance: comparison of automotive clutches, Epicyclic transmission, torque converter, final drive and differential, testing of vehicle components: clutch, gear box (for noise and shifting force), brake testing, wheels and tyre testing – tyre wear pattern identification and causes.	
<b>Unit – III</b>	<b>Vehicle testing</b>	06
	Vehicle Testing - Road test, free acceleration test, coast down test, passer by noise test, road load data acquisition for vehicle. Test tracks: Proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water Laboratory testing: Testing on chassis dynamometer, transition testing (Euro III onwards), accelerated testing, virtual testing, evaporative emission testing, oil consumption testing, endurance test, high speed performance test. Collisions and Crash Testing: Crash testing: Human testing, dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, braking distance test.	
<b>Unit – IV</b>	<b>Comfort, Convenience and Safety</b>	06
	Seats: types of seats, driving controls accessibility, and driver seat anthropometry. Steering: steering column angle, collapsible steering, and power steering. Adaptive cruise control, navigation system, adaptive noise control, driver information system, Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety.	
<b>Unit – V</b>	<b>Noise Vibration and EMI</b>	06
	Noise and vibration: Mechanism of noise generation, engine noise and vibration, causes and remedies on road shocks, wind noise and measurement. Automobile testing instrumentation: Sensors types and selection, instrumentation for functional tests, model test and full scale testing.	

<b>Subject Name: Electrical &amp; Hybrid Vehicles – II</b>		
Course Code : <b>BVASC404</b>	Semester: <b>IV</b>	
Weekly Teaching Hours: TH: <b>03</b> Tut: <b>00</b>	Scheme of Marking TH: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>	
TH Exam Duration: <b>01 Hours</b>	Scheme of Marking PR: <b>--</b>	
Credit: <b>3</b>		
<b>Content</b>		<b>Hours</b>
<b>Unit – I</b>	<b>Hybrid Architecture and Power Plant Specifications</b>	06
	Series configuration locomotive drives- series parallel switching- load tracking architecture. Pre transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- Continuously Variable transmission (CVT)- wheel motors. Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications.	
<b>Unit – II</b>	<b>Sizing the Drive System and Energy Storage Technology</b>	08
	Matching electric drive and ICE; sizing the propulsion motor; sizing power electronics. Battery basics; lead acid battery; different types of batteries; battery parameters	
<b>Unit – III</b>	<b>Fuel Cells</b>	06
	Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- hydrogen storage systems- reformers- fuel cell EV- super and ultra-capacitors- PEM fuel cell vehicles.	
<b>Unit – IV</b>	<b>Energy Storage</b>	06
	Battery based energy storage: Battery basics, Lead acid (Pb-Acid) battery, Nickel Cadmium (NiCd) battery, Nickel-Metal-Hydride (NiMH) battery, Lithium-ion (Li-ion) battery, Lithium-polymer (Li-poly) battery, Ultra capacitors.	
<b>Unit – V</b>	<b>Nonelectric Hybrid Systems</b>	06
	Short term storage systems flywheel accumulators. Continuously variable transmissions hydraulic accumulator's hydraulic pumps/motors- pneumatic hybrid engine systems operation modes.	

<b>Books</b>		
<b>Name of Authors</b>	<b>Title of the Book</b>	<b>Publisher</b>
A.K. Babu	Electric & Hybrid Vehicles	Khanna Publishing House

**Subject Name: Automotive RAC Lab.**

Course Code : <b>BVASL405</b>	Semester: <b>IV</b>
Weekly Practical: PR: <b>01</b> Tut: <b>00</b>	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
Credit: <b>1.5</b>	

**Content**

1. Test on vapor compression test rig.
2. Test on air conditioning test rig.
3. Study of various methods of transport refrigeration systems.
4. Study and demonstration on car and bus air conditioning system.
5. Study of latest trends in automotive refrigeration systems.
6. Study and demonstration of controls in refrigeration.
7. Study of different components with the help of cut sections/models/charts- Compressor, Condenser, Evaporators, Expansion device, Blower fans, Hating systems etc.
8. Study of installation/operations/maintenance practices for refrigeration systems.
9. Study of leak testing and leak detection methods. 10. Visit to maintenance shop of automotive Air conditioning and writing report on it.

**Subject Name: Vehicle Performance & Testing Lab**

Course Code : <b>BVASL406</b>	Semester: <b>IV</b>
Weekly Practical: PR: <b>01</b> Tut: <b>00</b>	Scheme of Marking TH: --
TH Exam Duration: --	Scheme of Marking PR: <b>25</b> , IA: <b>25</b> , Total: <b>50</b>
Credit: <b>1.5</b>	

**Content**

1. Estimation of power requirement for vehicle propulsion by taking actual vehicle example.
2. Perform coast down test to find vehicle inertia.
3. On road fuel consumption test at different speeds.
4. Brake efficiency measurement.
5. Pass- by noise test.
6. Free acceleration test.
7. Vibration measurement in passenger compartment.
8. Laboratory testing of vehicle on chassis dynamometer for performance.
9. Laboratory testing of vehicle on chassis dynamometer for emission.
10. Report based on visit to vehicle testing and research organization.
11. On road emission testing of petrol and diesel vehicles for PUC/RTO.

### Group GAS4 of Qualifier Packs

<b>Subject Name: Automotive Service Technician Level 6 (ASC/Q 1403)</b>	
Course Code : <b>BVASE407</b>	Semester: <b>IV</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.asdc.org.in/uploads/1052830856120719052300.pdf">https://www.asdc.org.in/uploads/1052830856120719052300.pdf</a>	

<b>Subject Name: Automation Specialist (ASC/Q6807)</b>	
Course Code : <b>BVASE408</b>	Semester: <b>IV</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP-Automation%20Specialist.pdf">https://www.nqr.gov.in/sites/default/files/QP-Automation%20Specialist.pdf</a>	

<b>Subject Name: Assembly Line Machine Setter (ASC/Q3603)</b>	
Course Code : <b>BVASE409</b>	Semester: <b>IV</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP-Assembly%20line%20machine%20setter.pdf">https://www.nqr.gov.in/sites/default/files/QP-Assembly%20line%20machine%20setter.pdf</a>	

<b>Subject Name: Process Design Engineer (ASC/Q6404)</b>	
Course Code : <b>BVASE410</b>	Semester: <b>IV</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP%20-%20Process%20Design%20Engineer.pdf">https://www.nqr.gov.in/sites/default/files/QP%20-%20Process%20Design%20Engineer.pdf</a>	

<b>Subject Name: Quality Controller (ASC/Q1605)</b>	
Course Code : <b>BVASE411</b>	Semester: <b>IV</b>
Weekly Skilling Hours: PR: <b>24</b> Tut: <b>00</b>	Scheme of Marking TH: <b>00</b> , IA: <b>00</b> , Total: <b>00</b>
PR Exam Duration: <b>06 Hours</b>	Scheme of Marking PR: <b>150</b> , IA: <b>50</b> , Total: <b>200</b>
Credit: <b>15</b>	<b>Choose any one from specified Group GAS1 of Qualification Packs</b>
<b>Syllabus for this qualifier Pack is available on</b> <a href="https://www.nqr.gov.in/sites/default/files/QP%20-%20Quality%20Controller.pdf">https://www.nqr.gov.in/sites/default/files/QP%20-%20Quality%20Controller.pdf</a>	

**\*Skill Practical assessment will be done rules/ procedure of respective Skill Sector Council of India.**