

Scheme & Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VII & VIII Semester**

**Automobile Engineering**



Rajasthan Technical University, Kota

Effective from session: 2020 – 2021



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### Teaching & Examination Scheme B.Tech. : Automobile Engineering 4<sup>th</sup> Year – VII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	7AE4-01	Internal Combustion Engines	3	0	0	3	30	120	150	3
2	OE		Open Elective-I	3	0	0	3	30	120	150	3
			<b>Sub Total</b>	<b>6</b>	<b>0</b>	<b>0</b>		<b>60</b>	<b>240</b>	<b>300</b>	<b>6</b>
PRACTICAL & SESSIONAL											
3	PCC	7AE4-21	I.C. Engines Lab	0	0	3	3	45	30	75	1.5
4		7AE4-22	Auto Transmission Lab	0	0	2	2	30	20	50	1
5		7AE4-23	Vehicle Body Engineering Lab	0	0	3	3	45	30	75	1.5
6	PSIT	7AE7-30	Industrial Training *	1	0	0		75	50	125	2.5
7		7AE7-40	Seminar *	2	0	0		60	40	100	2
8	SODE CA	7AE8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0	0	0	25	25	0.5
			<b>Sub- Total</b>	<b>3</b>	<b>0</b>	<b>8</b>		<b>255</b>	<b>195</b>	<b>450</b>	<b>9</b>
			<b>TOTAL OF VII SEMEESTER</b>	<b>9</b>	<b>0</b>	<b>8</b>		<b>315</b>	<b>435</b>	<b>750</b>	<b>15</b>

\*for the purpose of counting teaching load

**L:** Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

**ETE:** End Term Exam, **IA:** Internal Assessment

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### Teaching & Examination Scheme

### B.Tech. : Automobile Engineering

### 4<sup>th</sup> Year – VIII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	8AE4-01	Vehicle Dynamics	3	0	0	3	30	120	150	3
2	OE		Open Elective-II	3	0	0	3	30	120	150	3
			<b>Sub Total</b>	<b>6</b>	<b>0</b>	<b>0</b>		<b>60</b>	<b>240</b>	<b>300</b>	<b>6</b>
PRACTICAL & SESSIONAL											
3	PCC	8AE4-21	Advanced Automobile Engineering Lab	0	0	2	2	30	20	50	1
4		8AE4-22	Auto Maintenance & Reconditioning lab	0	0	2	2	30	20	50	1
5	PSIT	8AE7-50	Project *	3	0	0		210	140	350	7
6	SODE CA	8AE8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0		0	25	25	0.5
			<b>Sub- Total</b>	<b>3</b>	<b>0</b>	<b>4</b>		<b>270</b>	<b>205</b>	<b>475</b>	<b>9.5</b>
			<b>TOTAL OF VIII SEMEESTER</b>	<b>9</b>	<b>0</b>	<b>4</b>		<b>330</b>	<b>445</b>	<b>775</b>	<b>15.5</b>

\*for the purpose of counting teaching load

**L:** Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

**ETE:** End Term Exam, **IA:** Internal Assessment



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

### IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

<b>List of Open Electives for Automobile Engineering</b>			
<b>Subject Code</b>	<b>Title</b>	<b>Subject Code</b>	<b>Title</b>
<b>Open Elective - I</b>		<b>Open Elective - II</b>	
7AG6-60.1	Human Engineering and Safety	8AG6-60.1	Energy Management
7AG6-60.2	Environmental Engineering and Disaster Management	8AG6-60.2	Waste and By-product Utilization
7AN6-60.1	Aircraft Avionic System	8AN6-60.1	Finite Element Methods
7AN6-60.2	Non-Destructive Testing	8AN6-60.2	Factor of Human Interactions
7CH6-60.1	Optimization Techniques	8CH6-60.1	Refinery Engineering Design
7CH6-60.2	Sustainable Engineering	8CH6-60.2	Fertilizer Technology
7CR6-60.1	Introduction to Ceramic Science & Technology	8CR6-60.1	Electrical and Electronic Ceramics
7CR6-60.2	Plant, Equipment and Furnace Design	8CR6-60.2	Biomaterials
7CE6-60.1	Environmental Impact Analysis	8CE6-60.1	Composite Materials
7CE6-60.2	Disaster Management	8CE6-60.2	Fire and Safety Engineering
7CS6-60.1	Quality Management/ISO 9000	8CS6-60.1	Big Data Analytics
7CS6-60.2	Cyber Security	8CS6-60.2	IPR, Copyright and Cyber Law of India
7EE6-60.1	Electrical Machines and Drives	8EE6-60.1	Energy Audit and Demand side Management
7EE6-60.2	Power Generation Sources.	8EE6-60.2	Soft Computing
7EC6-60.1	Principle of Electronic communication	8EC6-60.1	Industrial and Biomedical applications of RF Energy
7EC6-60.2	Micro and Smart System Technology	8EC6-60.2	Robotics and control
7MI6-60.1	Rock Engineering	8MI6-60.1	Experimental Stress Analysis
7MI6-60.2	Mineral Processing	8MI6-60.2	Maintenance Management
7PE6-60.1	Pipeline Engineering	8PE6-60.1	Unconventional Hydrocarbon Resources
7PE6-60.2	Water Pollution control Engineering	8PE6-60.2	Energy Management & Policy
7TT6-60.1	Technical Textiles	8TT6-60.1	Material and Human Resource Management
7TT6-60.2	Garment Manufacturing Technology	8TT6-60.2	Disaster Management



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 7AE4-01: Internal Combustion Engines

Credit: 3

Max. Marks: 150(IA:30, ETE:120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Fuels:</b> Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.	4
3	<b>Engine types and their operations:</b> Engine classification, engine operating cycles, engine components, SI engine operation, CI engine Operation, Stratified engine	4
4	<b>Combustion in SI and CI Engines:</b> Stages of combustion in SI engines, abnormal combustion and knocking in SI engines, factors affecting knocking, effects of knocking, control of knocking, combustion chambers for SI engines, Stages of combustion in CI engines, detonation in C.I. engines, factors affecting detonation, controlling detonation, combustion chamber for SI and CI engine.	8
5	<b>Fuels supply system for SI and CI engine:</b> Simple carburetor and its working, types of carburetors, MPFI, types of injection systems in CI engine, fuel pumps and injectors, types of nozzles, spray formation.	4
6	<b>Engine Cooling and Lubrication:</b> Lubrication of engine components, Lubrication system – wet sump and dry sump, crankcase ventilation, Types of cooling systems – liquid and air cooled, comparison of liquid and air cooled systems.	4
7	<b>SI and Diesel Engine Emissions:</b> Nature and extent of problem Nitrogen oxides Carbon monoxide Hydrocarbons Particulates Emissions control strategies.	4
8	<b>Measurement and Testing of IC engines:</b> Measurement of indicated power, brake power, fuel consumption and emission, Measurement of friction power by Willan's Line Method* and Morse Test*, calculation of brake thermal efficiency, brake power and brake specific fuel consumption of IC Engines, variable compression ratio engines, heat balance sheet of IC Engines.	4
9	<b>IC Engines:</b> The Future Engine development prospects Stratified charge, direct injection systems Homogeneous charge, compression ignition Low temperature diesel combustion Advanced electronic-controlled engines Hybrids and fuel cells.	7
	<b>Total</b>	<b>40</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

### IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

#### Books/References

SN	Name of Authors /Books /Publisher
1	Internal Combustion Engine Fundamentals, John B Heywood.
2	Fundamentals of Internal Combustion Engine, Gill, Smith, Ziurs
3	Fundamentals of Internal Combustion Engines, H.N. Gupta
4	A Course in International Combustion Engines, Mathur & Sharma
5	Internal Combustion Engines, V Ganesan.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 7AE4-21: I.C. Engines Lab

**Credit: 1.5**

**Max. Marks: 75(IA:45, ETE:30)**

**OL+OT+3P**

**End Term Exam: 3 Hours**

SN	List of Experiments
1	To perform the load test on variable compression ratio engine to determine the following: engine brake power (KW), engine brake torque (N-m), Brake specific fuel consumption (kg/kWh), and brake mean effective pressure (kPa).
2	To perform the Morse test on three/four cylinder petrol engine to determine the IP of the engine.
3	To study and perform computerized engine control systems including sensor testing, onboard diagnosis, scan tool use and fuel injector testing, cleaning and preventive maintenance.
4	Study of electronic fuel injection system.
5	Study of Common rail direct injections engine
6	To perform laboratory course covering the basics of automotive electric and electronic.
7	Study of various sensor and electronic control module used in automobile
8	Study of Electronic fuel pump.
9	Study of circuit construction emphasizing meter usage, including analog, digital and oscilloscopes
10	Study of alternative fuels for I.C. Engines

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 7AE4-22: Auto Transmission Lab

**Credit: 1**

**Max. Marks: 50(IA:30, ETE:20)**

**OL+OT+2P**

**End Term Exam: 2 Hours**

SN	List of Experiments
1	To dismantle and assemble of clutch assembly
2	To dismantle and assemble of gearbox.
3	To dismantle and assemble of propeller shaft.
4	To dismantle and assemble of steering system.
5	To inspect for wear and tear, crack breakdown, servicing and cleaning and necessary adjustment in the transmission components
6	Technical specification of two and four wheeled vehicle and troubleshooting chart of all the transmission components.
7	Study of a layout of transmission system for a front wheel drive, rear wheel drive and a four-wheel drive arrangement
8	Study of an electric drive in an Electric vehicle

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 7AE4-23: Vehicle Body Engineering Lab

**Credit: 1.5**

**OL+OT+3P**

**Max. Marks: 75(IA:45, ETE:30)**

**End Term Exam: 3 Hours**

SN	List of Experiments
1	Perform the visibility test on the vehicle
2	Study of different types of tool used in body shop
3	Perform the various joining processes (welding, riveting) in the body material
4	Assembling and dismantling of various body mechanisms like door lock mechanism, window winding machine mechanism, passenger seat mechanism
5	Perform the dent beating process on the metal sheet.
6	Study and perform the various painting process on the car.
7	Make the different scale model like Bus body model, mini truck model and car models
8	To study and perform the wind tunnel test on the models like aerofoil, sphere and cylinder
9	To Study the different vehicle crash analysis process
10	To prepare the analysis of the vehicle body weight and the weight distribution indifferent conditions and its effect on steering performance.

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 8AE4-01: Vehicle Dynamics

Credit: 3

3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>Introduction to vehicle dynamics:</b> lumped mass, vehicle fixed coordinate system, motion variables, earth fixed coordinate system, Euler angles, force system acting on a rigid vehicle, Newton's second law application in dynamics, Dynamics axle loads: static loads on level ground, low speed acceleration, loads on grades, rigid body translation and rotational dynamics.	8
3	<b>Tires:</b> construction, size and load rating, terminology and load rating, mechanism of force generation, tractive properties, cornering properties, camber thrust, aligning moment, combined braking and cornering, conicity and ply steer, durability forces, performance of tires on wet surfaces.	8
4	<b>Suspension geometry:</b> degree of freedom and motion path, instant centre, solid axles, anti squat and anti pitch geometry, anti dive suspension geometry, roll centre geometry, active suspension, castor theory	8
5	<b>Steering geometry:</b> steady state handling, characteristics of a two axle vehicle, steady state response, directional stability <b>Stability of vehicle:</b> introduction, stability and dynamics of an elementary automobile model, Stability analysis using inertial coordinates, dynamics stability in a steady turn, Stability of vehicle at banked roads and curved path	8
6	<b>Two wheeler stability:</b> basic geometry considerations, body force components of a two wheeler, two wheel rigid vehicle dynamics, steering control of banking vehicles, steering control of lean angles, Counter steering or reverse action	7
	<b>Total</b>	<b>40</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

### IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

#### BOOKS/REFERENCES

SN	Name of Authors /Books /Publisher
1	Fundamentals of vehicle dynamics: Thomas D Gillespe, SAE International publication
2	Vehicle dynamics theory and applications: Raza N Nazar
3	Vehicle stability: Dean Karnhoop
4	Race car dynamics: William F. Milliken, SAE international publication
5	Theory of ground vehicles: J Y Wong, John Willey & sons Inc.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 8AE4-21: Advanced Automobile Engineering Lab

**Credit: 1**

**Max. Marks: 50(IA:30, ETE:20)**

**OL+OT+2P**

**End Term Exam: 2 Hours**

SN	List of Experiments
1	To find out the performance characteristics of variable compression ratio engine.
2	To study the performance characteristics and emission of single cylinder S.I. engine blend with any alternative fuel in the four-stroke engine.
3	To study the use of waste exhaust gases to drive the auxiliary units like alternator/compressor.
4	To study the compressed air engine technology
5	To study the various ECM controlled mechanisms like Quattro systems, Traction control, Drive by wire technology and automatic gear boxes etc.
6	To study the role of ergonomics in the automobiles.
7	To study the fleet management in the workshop
8	Braking distance test
9	Understand the necessity of transfer case mechanism for all wheel drive and differentiate gear box and transfer case
10	Study of different alternative fuel vehicles i.e. Electric vehicle, hybrid vehicle, solar vehicle etc.

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Automobile Engineering)

### 8AE4-22: Auto Maintenance and Reconditioning Lab

Credit: 1

OL+OT+2P

Max. Marks: 50(IA:30, ETE:20)

End Term Exam: 2 Hours

SN	List of Experiments
<b>Section A : Power Unit Including Electrical System</b>	
1	Cylinder reboring – checking the cylinder bore, Setting the tool and reboring.
2	Valve grinding, valve lapping - Setting the valve angle, grinding and lapping and checking for valve leakage
3	Study of silencer Decarbonising process
4	Fuel Injection Pump Calibration
5	Fuel Nozzle reconditioning
6	To study and practice of engine analyser
7	Trouble shooting in cooling system of an automotive vehicle
<b>Section B :Transmission unit &amp; power train</b>	
8	Demonstration of garage, garage equipment's & tools, preparation of different garage layouts
9	Engine oil change & periodic maintenance of vehicle
10	To study and practice of wheel alignment (Mechanical and computerized) and wheel balancing
11	Hand on practice of the air bleeding from brakes and tightening and adjustment of wheel bearing.
12	Automobile Electrical & lighting circuit.
13	Assembling and dismantling of differential and adjusting the backlash
14	Perform head light focusing test and visibility test.

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota