

TWO AND THREE WHEELER TECHNOLOGIES**Course Code : 314344**

Programme Name/s : Automobile Engineering.
Programme Code : AE
Semester : Fourth
Course Title : TWO AND THREE WHEELER TECHNOLOGIES
Course Code : 314344

I. RATIONALE

The increasing numbers of two and three-wheeler vehicles on Indian roads, particularly as primary transportation for individuals and small businesses in rural and urban areas, highlight the need to equip students with essential knowledge and skills. Recognizing the growth and job prospects in this sector, it is necessary to inculcate students with fundamental features like frames, engine upgradation, electrical systems, brakes, steering, and suspension systems of these vehicles.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Maintain two and three-wheeler automobile systems

III. COURSE LEVEL LEARNING OUTCOMES (COS)

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Identify proper frame and chassis types and material for both two and three wheelers vehicles.
- CO2 - Diagnose various problems in two and three-wheeler engine, fuel and lubrication system
- CO3 - Perform repairs on transmission, steering, suspension and braking system
- CO4 - Maintain the electrical systems such as ignition, starting, charging and lightning system of a given vehicle
- CO5 - Identify the significance of aerodynamics, aesthetics, ergonomics and safety aspects on vehicle performance

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week			SLH	NLH	Paper Duration		Theory				Based on LL & TL				Based on SL				
				CL	TL	LL					Practical				Based on SL								
											FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA				
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314344	TWO AND THREE WHEELER TECHNOLOGIES	TTW	DSC	3	-	2	1	6	3	3	30	70	100	40	25	10	25#	10	25	10	175		

Total IKS Hrs for Sem. : 2 Hrs

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. * Self learning hours shall not be reflected in the Time Table.
7. * Self learning includes micro project / assignment / other activities.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain the given vehicle frame with sketch. TLO 1.2 Compare the given two/ three wheeler chassis and frames on the basis of construction and application. TLO 1.3 Describe with suitable sketch the layout of two and three wheeler. TLO 1.4 Select relevant frame material for given vehicle application with justification. TLO 1.5 Select frame/ chassis for given application with justification.	Unit - I Frame and Chassis 1.1 Frames: Single cradle frame, Double cradle frame, Tabular frame and its types, Engine based frame and Twin spar frame. 1.2 Chassis: Conventional chassis and monocoque or integral construction. 1.3 Layout of Two wheeler and Three wheeler vehicle. 1.4 Frame material and its properties: Alloy steel, aluminium alloy, carbon fiber.	Lecture Using Chalk-Board Presentations Model Demonstration Video Demonstrations

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Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Describe engine technology upgradation from BS IV to BS VI. TLO 2.2 Select an engine for the given vehicle with justification. TLO 2.3 Describe valve clearance adjustment procedure of 4-stroke engine. TLO 2.4 Select an air filter for given vehicle with justification. TLO 2.5 Select an engine exhaust system components for given vehicle with justification. TLO 2.6 Describe fuel supply system with sketch. TLO 2.7 Explain lubrication system for the given two or three wheeler engine with sketch.	Unit - II Engine, Fuel and Lubrication System 2.1 Basics of two and three wheeler engine, Engine technology upgradation (From BS IV to BS VI), Engine selection criteria, Valve operating mechanism. 2.2 Induction System: Air filter/Air cleaner: Function, types, construction and working. 2.3 Exhaust System: Function, Construction. Basic Parts- Heat Diffuser, Header pipe, Muffler. 2.4 Fuel supply system: Block diagram, Construction & working of Carburetor System, Electronic fuel injection system as per BSVI Norms. 2.5 Lubrication system: Lubrication in four stroke engines of two wheeler and three wheeler.	Lecture Using Chalk-Board Presentations Model Demonstration Video Demonstrations

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Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Sketch the layouts of Transmission system of the given two-wheeler or three-wheeler. TLO 3.2 Explain multiplate and centrifugal clutch with neat sketch. TLO 3.3 Describe construction and working of Continuous variable transmission with neat sketch. TLO 3.4 Explain constant mesh gearbox with neat sketch. TLO 3.5 Describe effect of steering geometry relevant parameters for the given vehicles with sketch. TLO 3.6 Select the suspension system for the given application with justification. TLO 3.7 Compare the braking system of the given vehicles on basis of the given parameters.	Unit - III Transmission, steering, suspension and braking systems 3.1 Transmission system : Layout of transmission system in two and three wheeler, Construction and working of - Cable actuated wet multi- disc clutch, Centrifugal clutch, Chain drive, Continuous variable transmission (CVT), Gearbox- working of constant mesh gearbox, Gear shifting mechanism- hand and foot operated shifting mechanism. 3.2 Steering system: Steering geometry and effects-Caster angle & Trail, Steering fork, Handlebar arrangement. 3.3 Suspension System: Two wheeler suspension system- Spring and damper- swing arm and telescopic type. Monoshock suspension. Swing Arm type rear suspension of passenger Auto rickshaw. 3.4 Braking system: Drum brake and disc brake - Construction & Working. Brake control system- hand and foot operated brake, Braking system of Auto rickshaw.	Lecture Using Chalk-Board Presentations Model Demonstration Video Demonstrations
4	TLO 4.1 Describe working of the given ignition system with sketch. TLO 4.2 Compare the engine starting systems and their aggregates on the basis of the given parameters. TLO 4.3 Describe working of the given charging system with sketch. TLO 4.4 Describe specification and features of the given Dash board /lighting system aggregates.	Unit - IV Electrical systems 4.1 Ignition system: Ignition system upgradation from BS IV to BS VI Block diagram, construction and working of - Magneto Ignition system, Capacitive discharge Ignition system, Microprocessor controlled Ignition system, Concept of twin spark ignition system. 4.2 Starting system: Kick start and button start arrangement with components their functions. 4.3 Charging system: Circuit diagram, components and working of charging system. 4.4 Lightening system and accessories: Specification and application of- Head lamp, tail and number plate lamp, purpose of using LED lights in tail lamp, turn signal lamp, side stand indicator lamp, speedometer lamp, horn, mobile charger point, head lamp and tail lamp reflectors used in two wheelers. Dash units- Use of speedometer, trip meter. Use of engine speed indicator/ Tachometer.	Lecture Using Chalk-Board Presentations Model Demonstration Video Demonstrations

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Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Describe aerodynamic aspects for relevant aggregates of the given vehicle with sketch. TLO 5.2 Describe Ergonomic aspect relevant to the given vehicle handling/ seating arrangement with sketch. TLO 5.3 Explain significance of aesthetic aspect for relevant aggregates of the given vehicle with justification. TLO 5.4 Describe safety aspects of given two wheeler relevant to rider.	Unit - V Aerodynamics, Aesthetics, Ergonomics and Safety Aspects of vehicles 5.1 Aerodynamics Aspects: Head lamp shape (Sealed beam and conventional), Tail lamp and indicator light arrangements- body enclosed and separate, Shape of fuel tank in motorcycles. 5.2 Ergonomics Aspects: Seat arrangement for rider and pillion rider, Handle bar position, Floor/Foot rest for driver and pillion rider. 5.3 Aesthetics Aspects: Headlamp fairing of motorcycles, Side panels for scooter/scooterate and motorcycle, Ground clearance. 5.4 Safety Aspects: Crash bar, saree guard, Driving habits.	Lecture Using Chalk-Board Presentations Model Demonstration Video Demonstrations

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify types of vehicle frame/ chassis. LLO 1.2 Analyze vehicle frame data according to different manufactures. LLO 1.3 Prepare report as per the prescribed format.	1	*Identification of two/ three-wheeler frame/ chassis (Use the two & three-wheeler available in the college premises).	2	CO1
LLO 2.1 Identify different components in the given dismantled engine. LLO 2.2 Compare specification of different types of Engines.	2	*Comparative study of different types of two/ three wheeler engine.	2	CO2
LLO 3.1 Inspect Valve Clearance using feeler gauge. LLO 3.2 Adjust valve clearance as per service manual.	3	Valve clearance setting of the given engine two/ three wheeler engine.	2	CO2
LLO 4.1 Select suitable tools for Spark Plug & Air filter opening. LLO 4.2 Dismantle Spark Plug & Air filter of given vehicle. LLO 4.3 Cleaning of air filter. LLO 4.4 Cleaning and adjustment of spark plug.	4	Spark Plug & Air filter Cleaning of available vehicle.	2	CO2
LLO 5.1 Use suitable tools for carburetor dismantling. LLO 5.2 Prepare check list. LLO 5.3 Follow standard servicing procedure as per service manual.	5	*Servicing of carburetor.	2	CO2

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Check the condition of engine oil. LLO 6.2 Maintain the level of engine oil with correct grade oil. LLO 6.3 Identify the faults in lubricating pump. LLO 6.4 Follow standard servicing procedure as per service manual for repair/replace of the pump.	6	Servicing of lubricating system.	2	CO2
LLO 7.1 Use suitable tools for clutch dismantling. LLO 7.2 Check the condition of clutch plates. LLO 7.3 Follow standard servicing procedure as per service manual for repair/replace of the clutch.	7	Servicing of clutch assembly.	2	CO3
LLO 8.1 Use suitable tools for gearbox dismantling. LLO 8.2 Check the condition of gearbox. LLO 8.3 Follow standard servicing procedure as per service manual for repair/replace of the gearbox.	8	Servicing of gearbox.	2	CO3
LLO 9.1 Check chain & brake condition. LLO 9.2 Use suitable tool to adjust the chain and brake. LLO 9.3 Repair the loose/ replace of chain & brake.	9	*Chain and brake adjustment.	2	CO3
LLO 10.1 Use suitable tools for dismantling brake assembly. LLO 10.2 Check the condition of brake shoe. LLO 10.3 Follow standard servicing procedure as per service manual Check the condition of brake assembly.	10	*Servicing of brake assembly.	2	CO3
LLO 11.1 Use suitable tools for dismantling suspension system. LLO 11.2 check the condition of oil seals, bushings, spring. LLO 11.3 Follow standard servicing procedure as per service manual.	11	Servicing of suspension system.	2	CO3
LLO 12.1 Check the working of different components of ignition system. LLO 12.2 Repair/replace the faulty components.	12	*Servicing of ignition system the given two/three wheeler.	2	CO4

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 13.1 Check self start system. LLO 13.2 Servicing the self start system components.	13	Servicing of self start system of the given two/three wheeler.	2	CO4
LLO 14.1 Check wiring harness of the given two/three wheeler. LLO 14.2 Repair wiring harness of the given two/three wheeler.	14	Troubleshooting of Wiring harness of the given two/three wheeler.	2	CO4
LLO 15.1 Observe aerodynamics, ergonomics, aesthetics and safety aspects of the given two/three wheeler. LLO 15.2 Interpret aerodynamics, ergonomics, aesthetics and safety aspects of the given two/three wheeler.	15	*Observe the aerodynamics, ergonomics, aesthetics and safety aspects of the given two/three wheeler.	2	CO5
LLO 16.1 Collect data about technology used in ancient Indian vehicles and modern vehicles. LLO 16.2 Compare technological development. LLO 16.3 Prepare a report on the same.	16	*Comparison of modern two/ three wheeler vehicles with ancient Indian vehicles on the basis of technological development (IKS).	2	CO1 CO2 CO3 CO5

Note : Out of above suggestive LLOs -

- '*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)**Micro project**

- Prepare table mounted model of brake assembly of two or three wheeler.
- Prepare table mounted model of Shock up assembly of two or three wheeler.
- Prepare table mounted model of wiring harness of two or three wheeler.
- Compare old & new two or three wheelers on the basis of Aerodynamics, Aesthetic & Ergonomics aspects.
- Collect data of Indian two or three wheeler manufacturers and their products and prepare a report based on product range, market share, product innovation, emission control technology and economy.
- Explore innovative and latest technology/features provided in two and three wheeler vehicle. Prepare a report containing relevant aspects of the technology /features.
- Apply aerodynamic, ergonomics, aesthetic and safety aspect and draw conceptual sketch of two/three-wheeler.
- Visit to nearest garage/ showroom and collect and compare data for different vehicles of same capacity.

Assignment

- Observe & prepare report on different types of frames used in modern two or three-wheeler.
- Collect the data of any two or three wheeler of same category and compare them on the basis of various parameters.
- Collect the data of different engine oil available in market for two or three wheeler engines & prepare report of the same.
- Write step wise procedure for dismantling/assembling two/three wheeler engine along with tools required.

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- List different lightening accessories used in two/three wheeler with their specification & functions.

Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Two wheeler vehicle- frames (single and double cradle frame)	1
2	Three wheeler vehicle- frame and body (Auto rickshaw – 4 Stroke)	1
3	Universal clutch holder	7
4	Working model of Two wheeler transmission systems (4-Speed transmission)	7,8
5	Working model of Three wheeler transmission systems (4-forward and 1-Reverse transmission)	7,8
6	Two Wheeler vehicle /Three wheeler vehicle (4-stroke,single cylinder engine)	All
7	General purpose tools (Spanners, ring spanner and socket set,- 6mm to 32 mm)	All
8	Torque wrench range- 10 Nm to 200Nm.	All
9	Allen key Set – star & hex	All
10	Screw driver set, plier set, T headed spanner set	All
11	Feeler gauge set	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Frame and Chassis	CO1	6	4	2	4	10
2	II	Engine, Fuel and Lubrication System	CO2	11	2	8	6	16
3	III	Transmission, steering, suspension and braking systems	CO3	12	2	8	6	16
4	IV	Electrical systems	CO4	9	4	6	4	14
5	V	Aerodynamics, Aesthetics, Ergonomics and Safety Aspects of vehicles	CO5	7	2	8	4	14
Grand Total				45	14	32	24	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

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- Class Test, Term work and Self learning

Summative Assessment (Assessment of Learning)

- End semester examination theory, End semester examination practical (external)

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	-	-	-	-	3	2			
CO2	3	2	2	3	2	3	3			
CO3	3	2	2	3	2	3	3			
CO4	3	-	2	2	2	3	3			
CO5	3	-	-	-	-	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Panchal, Dhruv, U.	Two and Three Wheeler Technology	PHI Learning Private Limited, Delhi, 2015, third edition ISBN-978-81-203-5143-1
2	Ramalingam, K.K.	Two Wheeler and Three Wheeler	SCITECH Publication, Chennai. Second edition. ISBN-978-93-85983-30-6
3	Dr. Kripal, Singh	Automobile Engineering Vol-1	Standard Publishes-Distributors-Delhi; 13th Edition (2012), ISBN-13: 978-8180141966
4	William, Crouse; Donald, Anglin	Automotive Mechanics	McGraw Hill Education; 10 edition (1 July 2017), ISBN-13: 978-0070634350

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=Jk6V1Kdeons	Bajaj RE Auto Rickshaw Manufacturing
2	https://www.youtube.com/watch?v=oAircVPnvSs	Royal Enfield Factory in India
3	https://www.youtube.com/watch?v=m3osMG_ppIs	Bajaj Motorcycles production - Two wheeler manufacturing in India
4	https://www.youtube.com/watch?v=8qakw7NaFn4&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MIJau4F&index=7	Operation of Four Stroke Engines (NPTEL)

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Sr.No	Link / Portal	Description
5	https://www.youtube.com/watch?v=AAJyUk4wHfI&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F&index=34	Transmission System (NPTEL)
6	https://www.youtube.com/watch?v=NJkU8wbjgjs&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F&index=44	Components of a Brake System and Drum Brake (NPTEL)
7	https://www.youtube.com/watch?v=54GyDX_pzvw&list=PLyqSpQzTE6M9G2SNxKfsVEjcM9MlJau4F&index=46	Disc Brake and Introduction to Hydraulic Brake (NPTEL)
8	https://www.youtube.com/watch?v=9cKbzUgFdS0	Working of scooter transmission works (CVT)
9	https://www.youtube.com/watch?v=kTuybtMAiN8	General Servicing of a Two-Wheeler
10	https://www.youtube.com/watch?v=DUK6gjsLpQ	Bajaj Auto Gearbox
11	https://www.youtube.com/watch?v=m6AZ7_mACUg	Hero Honda Training Film
12	https://www.youtube.com/watch?v=QWAhLyL2lBk	Overhauling of a Gear Box of a Two-Wheeler

Note :

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students