



SARASWATI Education Society's  
**SARASWATI College of Engineering**

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Kharghar, Navi Mumbai - 410 210.

Department-AUTOMOBILE ENGINEERING  
 Semester-III  
 Scheme (R-16/R-19)-R-19

Course Code:	AEC301		Course Name	Subject- ENGINEERING MATHEMATICS-III		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	-	1.1	1.1.2	5	1	Apply the concept of Laplace transforms and use to solve real integrals in engineering problems
2	-	2.1	2.1.2	3,4	2	Identify the concept of inverse linear transform and compare to various functions and its applications
3	-	3.1	3.1.6	3	3	Determine and develop Fourier series for real life problems and applications.
3	-	3.2	3.2.1	3	4	Apply the properties of Complex analysis and select the application to orthogonal trajectories.
1	-	1.1	1.1.3	3	5	Use the concept of matrices to solve problems in machine learning, computer graphics and in Google page ranking
12	-	12.1	12.1.1	3	6	solve partial differential equations and analytical method for one dimensional heat and wave equations.
Course Code:	AEC302		Course Name	Subject- Strength of Materials#		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 3 (Applying)	1	Learners will be able to Apply fundamental knowledge about various types of loading and stresses induced
1	1	1.4	1.4.1	Level 3 (Applying)	2	Learners will be able to Apply Fundamental knowledge of Force and Moment to Draw the SFD and BMD for different types of loads and support conditions
2	1	2.2	2.2.3	Level 4 (Analysing)	3	Learners will be able to Analyse the bending Stresses, shear stresses and Direct and Bending Stresses induced in beam.
2	1	2.2	2.2.3	Level 4 (Analysing)	4	Learners will be able to Analyse the deflection in beams and stresses in shafts Subjected to Twisting Moment.
2	1	2.2	2.2.3	Level 4 (Analysing)	CO5	Learners will be able to Analyse the Stresses in Thin Cylinders and Thin Spherical Shells and Estimate the strain energy in mechanical elements
2	1	2.2	2.2.4	Level 4 (Analysing)	CO6	Learners will be able to Analyse buckling phenomenon in columns using Euler's and Rankine's Method

Course Code:	AEC303		Course Name	Subject- Production Processes		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 3 (Applying)	1	Demonstrate an understanding of casting process
1	1	1.4	1.4.1	Level 3 (Applying)	2	Demonstrate applications of various types of welding processes.
2	1	2.2	2.2.3	Level 4 (Analysing)	3	Differentiate chip forming processes such as turning, milling, drilling, etc.
2	1	2.2	2.2.3	Level 4 (Analysing)	4	Illustrate principles and working of non-traditional manufacturing
2	1	2.2	2.2.3	Level 4 (Analysing)	5	Understand the manufacturing technologies enabling Industry 4.
2	1	2.2	2.2.4	Level 4 (Analysing)	6	Illustrate the concept of producing polymer components and ceramic components.
Course Code:	AEC304		Course Name	Subject- Materials and Metallurgy		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 2 (Understanding)	1	Learner will be able to Identify the various classes of materials and comprehend their properties
1	1	1.4	1.4.1	Level 3 (Applying)	2	Learner will be able to Apply phase diagram concepts to engineering applications
1	1	1.3	1.3.1	Level 3 (Applying)	3	Learner will be able to Apply particular heat treatment for required property development
1	1	1.3	1.3.1	Level 4 (Analyzing)	4	Learner will be able to Identify the probable mode of failure in materials and suggest measures to prevent them
1	1	1.4	1.4.1	Level 2 (Understanding)	5	Learner will be able to Choose or develop new materials for better performance
4	1	4.1	4.1.2	Level 2 (Understanding)	6	Learner will be able to Decide an appropriate method to evaluate different components in service
Course Code:	AEC305		Subject- Thermodynamics			
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.2	1.2.1	2	1	Understand the basic concept of thermodynamics and application of first law of thermodynamics to various systems.
1	1	1.3	1.3.1	2	2	Apply the concept of Second law of thermodynamics and Entropy to solve problems.
2	1	2.1	2.1.2	3	3	understand the classification of grade of energy and various thermodynamic relations
1	1	1.4	1.4.1	3	4	understand the basic concepts of steam formation and vapour power cycles
1	1	1.4	1.4.1	3	5	Apply the concept of various gas power cycle to solve problems.
2	1	2.4	2.4.1	2	6	Understand and apply the fundamentals of thermodynamics in compressible fluid flow to the relevant systems.

Course Code:	AEL301		Course Name	Subject- Materials Testing		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 3 (Applying)	1	Learners will be able to Prepare metallic samples for studying its microstructure following the appropriate procedure.
2	1	2.2	2.2.2	Level 4 (Analysing)	2	Learners will be able to Identify effects of heat treatment on microstructure of medium carbon steel and hardenability of steel using Jominy end Quench test.
2	1	2.2	2.2.3	Level 4 (Analysing)	3	Learners will be able to Perform Fatigue Test and draw S-N curve
2	1	2.2	2.2.3	Level 4 (Analysing)	4	Learners will be able to Perform Tension test to Analyze the stress - strain behaviour of materials
2	1	2.2	2.2.3	Level 4 (Analysing)	5	Learners will be able to Measure torsional strength, hardness and impact resistance of the material
2	1	2.2	2.2.3	Level 4 (Analysing)	6	Learners will be able to Perform flexural test with central and three point loading conditions
Course Code:	AEL302		Course Name	Subject- Machine Shop Practice		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 3 (Applying)	1	Know the specifications, controls and safety measures related to machines and machining operations.
2	1	2.2	2.2.2	Level 4 (Analysing)	2	Use the machines for making various engineering jobs.
2	1	2.2	2.2.3	Level 4 (Analysing)	3	Perform various machining operations
2	1	2.2	2.2.3	Level 4 (Analysing)	4	Perform Tool Grinding
2	1	2.2	2.2.3	Level 4 (Analysing)	5	Learners will be able to Measure torsional strength, hardness and impact resistance of the material
2	1	2.2	2.2.3	Level 4 (Analysing)	6	Perform welding operations
Course Code:	AESBL301		Course Name	Subject- CAD –Modeling		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 3 (Applying)	1	Illustrate basic understanding of types of CAD model creation.
2	1	2.2	2.2.2	Level 4 (Analysing)	2	Visualize and prepare 2D modeling of a given object using modeling software
2	1	2.2	2.2.3	Level 4 (Analysing)	3	Build solid model of a given object using 3D modeling software.
2	1	2.2	2.2.3	Level 4 (Analysing)	4	Visualize and develop the surface model of a given object using modeling software.
2	1	2.2	2.2.3	Level 4 (Analysing)	5	Generate assembly models of given objects using assembly tools of a modeling software
2	1	2.2	2.2.3	Level 4 (Analysing)	6	Perform product data exchange among CAD systems.

Course Code:	AEPBL301		Course Name	Subject- MINI PROJECT -1A		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	Level 3 (Applying)	1	Analyse the impact of solutions in societal and environmental context for sustainable development.
2	1	2.2	2.2.2	Level 4 (Analysing)	2	Draw the proper inferences from available results through theoretical/ experimental/ simulations.
2	1	2.2	2.2.3	Level 4 (Analysing)	3	Analyse the impact of solutions in societal and environmental context for sustainable development.
2	1	2.2	2.2.3	Level 4 (Analysing)	4	Demonstrate capabilities of self-learning in a group, which leads to life long learning
2	1	2.2	2.2.3	Level 4 (Analysing)	5	Demonstrate project management principles during project work.
2	1	2.2	2.2.3	Level 4 (Analysing)	6	Excel in written and oral communication.
Course Code:	AEC401		Course Name	Subject- Engineering Mathematics-IV		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
3	1	3.2	3.2.1	3	1	Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem.
2	1	2.2	2.2.1	5	2	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
3	2	3.1	3.1.6	3	3	Apply the concept of Correlation, Regression and curve fitting to the engineering problems in data science.
4	2	4.2	4.2.2	4	4	Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
3	1	3.3	3.3.1	3	5	Apply the concept of probability distribution to engineering problems& Testing hypothesis of small samples using sampling theory
2	1	2.4	2.4.1	2	6	Apply the concepts of parametric and nonparametric tests for analysing practical problems
Course Code:	AEC402		Course Name	Subject- Fluid Mechanics		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
PO1	1	1.2	1.2.1	1	1	Define properties of fluids, classify of fluids and evaluate hydrostatic forces on various surfaces.
PO2	2	2.4	2.4.1	2	2	Differentiate velocity potential function and stream function and solve for velocity and accelerataion of fluid
PO1	2	1.4	1.4.1	3	3	Apply Bernoulli's equation to various flow measuring devices
PO2	1	2.1	2.1.2	2	4	Understand the basic concepts of laminar flow in circuler pipes
PO2	1	2.1	2.1.3	3	5	Apply the concept of Major losses and Minor losses in pipes to solve problems.

PO2	2	2.1	2.1.2	3	6	Apply the concept of Boundary layer formation to solve numerical on Boundary layer thickness
<b>Sem-IV</b>						
<b>Course Code:</b>	<b>AEC403</b>		<b>Course Name</b>	<b>Subject- Kinematics of Machinery</b>		
<b>PO</b>	<b>PSO</b>	<b>Competency</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
P01	1	1.3	1.3.1	Level 3 (Applying)	1	Identify various components of mechanisms
PO 2	1	2.2	2.2.2	Level 4 (Analysing)	2	Develop mechanisms to provide specific motion
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	3	Draw velocity and acceleration diagrams of various mechanisms
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	4	Choose a cam profile for the specific follower motion
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	5	Predict condition for maximum power transmission in the case of a belt drive
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	6	Illustrate requirements for an interference-free gear pair
<b>Course Code:</b>	<b>AEC404</b>		<b>Course Name</b>	<b>Subject- CAD/CAM</b>		
<b>PO</b>	<b>PSO</b>	<b>Competency</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
P01	1	1.3	1.3.1	Level 3 (Applying)	1	Identify suitable computer graphics techniques for 3D modeling.
PO 2	1	2.2	2.2.2	Level 4 (Analysing)	2	Transform, manipulate objects & store and manage data.
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	3	Develop 3D model using various types of available biomedical data.
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	4	Create the CAM Toolpath for specific given operations.
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	5	Build and create data for 3D printing of any given object using rapid prototyping and tooling processes.
PO 2	1	2.2	2.2.3	Level 4 (Analysing)	6	Illustrate understanding of various cost effective alternatives for manufacturing products.
<b>Course Code:</b>	<b>AEC405</b>		<b>Course Name</b>	<b>Subject- Industrial Electronics</b>		
<b>PO</b>	<b>PSO</b>	<b>Competency</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
PO1	PSO1	1.3	1.3.1	L3	1	Illustrate constructional, working principles and applications of Power Electronics switches.
PO2	PSO2	2.2	2.2.2	L2	2	Understand working of controlled Rectifiers and Inverters for DC and AC motor speed control
PO4	PSO1	4.1	4.1.2	L4	3	Develop circuits using op-amp parameters.
PO2	PSO1	2.1	2.1.2	L1	4	Identify use of different basic gates and use digital circuits for industrial applications

PO5	PSO1	5.1	5.1.1	L3	5	Demonstrate the knowledge of basic functioning of microcontroller
PO2	PSO1	2.2	2.2.3	L4	6	Analyze speed torque characteristic of electrical machines for speed control
<b>Course Code:</b>	<b>AEL401</b>		<b>Course Name</b>	<b>Subject- Industrial Electronics</b>		
<b>PO</b>	<b>PSO</b>	<b>Competency</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
PO1 PO2	PSO1	1.3	1.31 2.1.2	L3	1	Demonstrate characteristic of various electrical and electronics Components.
PO2	PSO1	2.1	2.1.2	L4	2	Develop simple applications built around rectifiers and Inverters components
PO3	PSO2	3.2	3.2.1	L6	3	Create and build circuits built around op-amp parameters.
PO2	PSO1	2.2	2.2.2	L4	4	Identify and use of different basic gates and digital circuits for industrial applications
PO5	PSO1	5.1	5.1.1	L2	5	Understand and demonstrate basic parameters measurement using microcontroller
PO2	PSO2	2.1	2.1.2	L4	6	Test and Analyse speed torque characteristic of electrical machines for speed control
<b>Course Code:</b>	<b>AEL402</b>		<b>Course Name</b>	<b>Subject- Kinematics of Machinery</b>		
<b>PO</b>	<b>PSO</b>	<b>Competency</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
PO1	PSO1	1.3	1.3.1	L3	1	Draw velocity diagram using Instantaneous Centre method
PO2	PSO1	2.1	2.1.2	L4	2	Find velocity and acceleration of a point on a four-bar mechanism by using Relative method.
PO3	PSO2	3.2	3.2.1	L6	3	Analyze velocity and acceleration of a specific link of a slider crank mechanism using graphical approach by Relative method.
PO2	PSO1	2.2	2.2.2	L4	4	Plot displacement-time, velocity-time, and acceleration-time diagrams of follower motion.
PO5	PSO1	5.1	5.1.1	L2	5	Draw cam profile for the specific follower motion.
PO2	PSO2	2.1	2.1.2	L4	6	Develop and build mechanisms to provide specific motion.
<b>Course Code:</b>	<b>AEL403</b>		<b>Course Name</b>	<b>Subject- Python Programming</b>		
<b>PO</b>	<b>PSO</b>	<b>Competency</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
1	1	1.6	1.6.1	2	1	Understand basic concepts in python
3	1.2	3.6	3.6.2	3	2	Exploring contents of files, directories and text processing with python
4	2	4.5	4.5.1	6	3	Develop program for data structure using built in functions in python
5	1	5.4	5.4.2	3	4	To explore django web framework for developing python-based web application.
3	1	3.6	3.6.1	3	5	Able to explore design alternatives
1	2	1.6	1.6.1	2	6	Understand the concept of numpy and pandas

Course Code:	AESBL401		Course Name	Subject- CNC & 3-D Printing		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
PO 1	1	1.3	1.3.1	3	1	Illustrate basic understanding of types of CAD model creation.
PO 2	1	2.2	2.2.2	4	2	Visualize and prepare 2D modeling of a given object using modeling software
PO 2	1	2.2	2.2.3	4	3	Build solid model of a given object using 3D modeling software.
PO 2	1	2.2	2.2.3	4	4	Visualize and develop the surface model of a given object using modeling software.
PO 2	1	2.2	2.2.3	4	5	Generate assembly models of given objects using assembly tools of a modeling software
PO 2	1	2.2	2.2.3	4	6	Perform product data exchange among CAD systems.
Course Code:	AEPBL401		Course Name	Subject- Mini Project – 1 B		
PO	PSO	Competency	PI	Bloom's Level	CO	Description
PO 1	1	1.3	1.3.1	3	1	Analyse the impact of solutions in societal and environmental context for sustainable development.
PO 2	1	2.2	2.2.2	4	2	Draw the proper inferences from available results through theoretical/ experimental/simulations.
PO 2	1	2.2	2.2.3	4	3	Analyse the impact of solutions in societal and environmental context for sustainable development.
PO 2	1	2.2	2.2.3	4	4	Demonstrate capabilities of self-learning in a group, which leads to life long learning
PO 2	1	2.2	2.2.3	4	5	Demonstrate project management principles during project work.
PO 2	1	2.2	2.2.3	4	6	Excel in written and oral communication.

**Semester-V**  
**Scheme (R-16/R-19)-R-19**

Course Code:	AEC501		Course Name	Subject- MechanicalMeasurements &Controls		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO1 PO2 PO4		1.2 2.1 4.1	1.2.1 2.1.2 4.1.3	4	CO-1	To study the principles of precision measuring instruments & their significance.
PO2 PO4		2.2 4.1	2.2.3 4.1.3	1	CO-2	To familiarize with the handling & use of precision measuring instruments/ equipment's.
PO4 PO5		4.1 5.2	4.1.3 5.2.2	4	CO-3	To impart knowledge of architecture of the measurement system.
PO2 PO5		2.2 5.2	2.2.4 5.2.2	1	CO-4	To deliver working principle of mechanical measurement system.
PO1 PO2 PO4	PSO1	1.2 2.1 4.1	1.2.1 2.1.2 4.1.3	2	CO-5	To study concept of mathematical modelling of the control system.
PO3 PO2 PO4	PSO1	3.4 2.4.4 4.3	3.4.1 2.4.4 4.3.3	5	CO-6	To acquaint with control system under different time domain.
Course Code:	AEC502		Course Name	Subject- Internal Combustion Engines		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	3	CO-1	Apply Air Standard, Fuel-Air and Actual Cycles concepts to solve problems.
2	1	2.1	2.1.3	4	CO-2	Analyze the SI Engine components, Ignition system and Combustion process that applies to a given problem.
2	1	2.1	2.1.2	4	CO-3	Identify CI Engine variables and parameters to solve the CI Engine problems
2	1	2.4	2.4.1	4	CO-4	Apply engine lubrication and cooling system and parameters to solve the problems
2	1	2.2	2.2.3	4	CO-5	Illustrate engine performance characteristics processes for solving the problem,
3	2	3.1	3.1.6	5	CO-6	Comprehend the different technological advances in engines and alternate fuels
Course Code:	AEC503		Course Name	Subject-Machine Design		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	4	1	Demonstrate understanding of various design considerations
2	1	2.1	2.1.3	4	CO-2	Illustrate basic principles of machine design
PO2	1	2.1	2.1.2	3 (Apply)	3	Design machine elements for static as well as dynamic loading
PO4	2	4.3	4.3.1	3 (Apply)	4	Design machine elements on the basis of strength/ rigidity concepts
PO4	2	4.3	4.3.2	3 (Apply)	5	Use design data books in designing various components
PO5	2	5.2	5.2.2	4 (Analyze)	6	Acquire skill in preparing production drawings pertaining to various designs



Course Code:	AEC504		Course Name	Subject- Finite Element Analysis		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	4	1	Select appropriate element for given problem
2	1	2.1	2.1.3	4	2	Select suitable meshing and perform convergence test
2	1	2.1	2.1.3	4	3	Select appropriate solver for given problem
2	1	2.4	2.4.1	2	4	Interpret the result
2	1	2.1	2.5.2	3	5	Apply basic aspects of FEA to solve engineering problems
2	1	2.6	2.6.2	5	6	Validate FEA solution
Course Code:	AEDLO5012		Course Name	Subject- Statistical Techniques		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
2	1	2.3	3.3.1	3	1	Apply the concepts of statistical distributions in Engineering applications
1	1	1.1	1.1.2	3	2	Use sampling theory for a given data set
3	1	3.2	3.2.1	3	3	Fit curve for a given data set
1	1	1.1	1.1.1	5	4	Demonstrate the understanding of correlation & regression analysis
1	1	1.1	1.1.1	3	5	Perform ANOVA from the given experimental data
1	1	1.1	1.1.1	4	6	Demonstrate the understanding of statistical decision making & hypothesis testing
Course Code:	AEL501		Course Name	Subject- Measurement and Engine Testing Lab		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	3	CO-1	Apply Air Standard, Fuel-Air and Actual Cycles concepts to solve problems.
2	1	2.1	2.1.3	4	CO-2	Analyze the SI Engine components, Ignition system and Combustion process that applies to a given problem.
2	1	2.1	2.1.2	4	CO-3	Identify CI Engine variables and parameters to solve the CI Engine problems
2	1	2.4	2.4.1	4	CO-4	Apply engine lubrication and cooling system and parameters to solve the problems
2	2	2.2	2.2.3	4	CO-5	Illustrate engine performance characteristics processes for solving the problem,
3	2	3.1	3.1.6	5	CO-6	Comprehend the different technological advances in engines and alternate fuels

Course Code:	AEL502		Course Name	Subject- Machine Design		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2	1	2.2	2.2.3	2	1	Demonstrate understanding of various design considerations
PO2	1	2.1	2.1.2	3	2	Illustrate basic principles of machine design
PO4	1	4.3	4.3.1	3	3	Design machine elements for static as well as dynamic loading
PO4	2	4.3	4.3.2	3	4	Design machine elements on the basis of strength/ rigidity concepts
PO5	2	5.2	5.2.2	4	5	Use design data books in designing various components
PO4	2	4.3	4.3.4	5	6	Acquire skill in preparing production drawings pertaining to various designs
Course Code:	AEL503		Course Name	Subject- Finite Element Analysis		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	4	1	Select appropriate element for given problem
2	1	2.1	2.1.3	4	2	Select suitable meshing and perform convergence test
2	1	2.1	2.1.3	4	3	Select appropriate solver for given problem
2	1	2.4	2.4.1	2	4	Interpret the result
2	1	2.1	2.5.2	3	5	Apply basic aspects of FEA to solve engineering problems
2	1	2.6	2.6.2	5	6	Validate FEA solution
Course Code:	AESBL501		Course Name	Subject- Professional Communication and		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	3	1	Plan and prepare effective business/ technical documents which will in turn provide solid
1	1	1.2	1.2.1	3	2	Strategize their personal and professional skills to build a professional image
4	2	4.1	4.1.1	4	3	Emerge successful in group discussions, meetings and result-oriented agreeable solutions
3	2	3.3	3.3.1	4	4	Deliver persuasive and professional presentations.
3	2	3.1	3.1.6	6	5	Develop creative thinking and interpersonal skills required for effective professional
3	2	3.1	3.1.6	6	6	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour

## Sem-VI

Sem-VI						
Course Code:	AEC602		Course Name	Subject- Mechanical Vibrations		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1		1.4	1.4.1	3	1	Apply Vibration concepts to solve Free Undamped
2		2.1	2.1.3	4	2	Single Degree of freedom problems. "
2		2.1	2.1.2	4	3	"Analyze the Free damped Single Degree of freedom
2		2.4	2.4.1	4	4	systemem concepts that applies to a given problem."
2		2.2	2.2.3	4	5	"Identify Free Undamped Multi Degree of freedom
2		2.4	2.4.1	4	6	variables and parameters to solve the Vibration system
Course Code:	AEC603		Course Name	Subject- Vehicle Body Engineering and Safety		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2		2.1	2.1.2	Level-2 Understan d	1	Describe different types of vehicle body design
PO2		2.2	2.2.3	Level-2 Understan d	2	Classify and explain different chassis construction
PO4		4.2	4.2.1	Level-3 Apply	3	Use/Apply roll over analysis to solve rolling problems
PO3		3.2	3.2.3	Level-3 Apply	4	Identify and Use of rolling drag method to solve varying
PO4		4.3	4.3.2	Level-4 Analyse	5	problems
PO4		4.3	4.3.4	Level-4 Analyse	6	Analyse vehicle Areodynamics Drag
Course Code:	AEC604		Course Name	Subject- Automation and Artificial		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	2	1.4	1.4.1	3	1	To understand fundamentals concepts of automation & AI
1	2	1.4	1.4.1	3	2	Design & Develop Pneumatic / Hydraulic circuits
5	2	5.1	5.1.2	6	3	Design & Develop Electropneumatic circuits
1	2	1.4	1.4.1	4	4	Design PLC logic circuits
2	2	2.2	2.2.4	4	5	Understand robot control systems
5	2	5.1	5.1.2	6	6	Understand & classify AI & Machine learning technologies

Course Code:	AEDLO6021		Course Name	Subject- Press Tool Design		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.4	1.4.1	3	1	Demonstrate various press working operations for mass production of sheet metal parts
2	2	2.1	2.1.3	3	2	Prepare working drawings and setup for economic production of sheet metal components
2	1	2.2	2.2.3	2	3	Identify press tool requirements to build concepts pertaining to design of press tools
2	1	2.2	2.2.3	3	4	Illustrate the principles and blank development in bent & drawn components
3	2	3.1	3.1.4	5	5	Select suitable materials for different elements of press tools
3	2	3.1	3.1.6	2	6	Elaborate failure mechanisms of pressed components, safety aspects and automation in press working
Course Code:	AEDLO6022		Course Name	Subject- Tool Engineering		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.3	1.3.1	2	1	Calculate the values of various forces involved in the machining operations.
2	1	2.1	2.1.3	3	2	Design various single and multipoint cutting tools.
2	1	2.1	2.1.3	3	3	Analyze heat generation in machining operation and coolant operations.
2	1	2.4	2.4.1	3	4	Illustrate the properties of various cutting tool materials and hence select an appropriate tool material for particular machining application.
2	1	2.1	2.1.2	3	5	Demonstrate the inter-relationship between cutting parameters and machining performance measures like power requirement, cutting time, tool life and surface finish.
2	1	2.2	2.2.2	2	6	Analyze economics of machining operations.
Course Code:	AEL601		Course Name	Subject- Automotive System Design		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1		1.2	1.2.1	1	1	Define the clutch functionality
1		1.3	1.3.1	3	2	Apply the transmission knowledge to be build up for correct vehicle
1		1.4	1.4.1	3	3	Apply correct drive line for the automotive vehicle systems.
1		1.2	1.2.1	2	4	Understanding the the load distribution for drive and rear axle problems.
2		2.4	2.4.1	5	5	Evaluate the braking power and suspension value for the vehicle under study
2		2.4	2.4.1	5	6	Evaluate the steering system.

Course Code:	AEL603		Course Name	Subject- Vehicle Body Engineering and Safety		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2	1	2.1	2.1.2	Level-2 Understand	1	Describe different types of vehicle body design
PO2	1	2.2	2.2.3	Level-2 Understand	2	Classify and explain different chassis construction
PO4	1	4.2	4.2.1	Level-3 Apply	3	Use/Apply roll over analysis to solve rolling problems
PO3	1	3.2	3.2.3	Level-3 Apply	4	Identify and Use of rolling drag method to solve varying problems
PO4	2	4.3	4.3.2	Level-4 Analyse	5	Analyse vehicle Areodynamics Drag
PO4	2	4.3	4.3.4	Level-4 Analyse	6	Propose the design procedure for commercial vehicle body Structure
Course Code:	AEPBL601		Course Name	Subject- Mini Project – 2 B		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2	PSO1	2.2	2.2.2	L3	CO1	Identify problems based on societal /research needs.
PO3		3.7	3.7.1	L2	CO2	Apply Knowledge and skill to solve societal problems in a group.
PO2		2.2	2.2.2	L3	CO3	Develop interpersonal skills to work as member of a group or leader.
PO2,PO5,PO7	PSO2	2.1 7.1	5.4 2.1.2 5.4.1 7.1.1	L1	CO4	Analyse the impact of solutions in societal and environmental context for sustainable development
PO5 PO9 PO10	PSO2	5.4 9.5 10.6	5.4.1 9.5.1 10.6.1	L3	CO5	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
PO5 PO9 PO10	PSO2	5.4 9.5 10.6	5.4.1 9.5.1 10.6.1	L2	CO6	Demonstrate project management principles during project work.

**Department-AUTOMOBILE ENGINEERING**  
**Semester-VII**  
**Scheme (R-16/R-19)-R-19**

Course Code:	AEC701		Course Name	Subject- Autotronics		
	PO	PSO		Competancy	PI	Bloom's Level
PO-1	-	1.4	1.4.1	2	1	Illustrate working of different batteries and modern Energy storage methods used in automobiles.
PO-2	-	2.1	2.1.2	3	2	Demonstrate working of Charging system used in automobiles.
PO-2	-	2.1	2.1.3	3	3	Illustrate working of starting system and drives used in automobiles.
PO-2	-	2.2	2.2.3	3	4	Draw and Interpret lighting and wiring systems in automobile.
PO-2	-	2.4	2.4.4	2	5	Comprehend working of different Automotive & Communication Protocols and actuators used in automobiles.
PO-3	-	3.1	3.1.6	4	6	Elaborate working of Automotive Diagnostics with its procedure and equipment used.
Course Code:	AEC702		Course Name	Subject- Vehicle Dynamics		
PO	PSO	Competancy		PI	Bloom's Level	CO
1	1	1.2	1.2.1	3	1	Define the road loads
1	1	1.3	1.3.1	4	2	Apply moments and forces on the tire
1	2	1.4	1.4.1	6	3	Apply isolation and vibration concept towards stability of the vehicle
1	1	1.2	1.2.1	4	4	Understanding the the load distribution for drive and rear
2	1	2.4	2.4.1	2	5	axle problems.
2	2	2.4	2.4.1	4	6	Evaluate suspension effect on the steering

Course Code:	AEDLO7033		Course Name	Subject- Automotive Aerodynamics and Aesthetics		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
2	2	2.3	2.3.1	3	CO1	To understand various flow phenomena related to vehicles
2	2	2.3	2.3.1	3	CO2	To analyse interpret different types of drag forces
3	3	3.2	3.2.2	4	CO3	To analyse various aerodynamic forces & moments acting on vehicles for stability
1	2	1.4	1.4.1	3	CO4	To understand aerodynamics of commercial high performance vehicles
3	2	3.2.	3.2.2	5	CO5	To understand wind tunnel & simulation practices for drag analysis.
3	2	3.4	3.4.1	4	CO6	To understand and apply principles of aesthetic design in vehicles.
Course Code:	AEDLO7041		Course Name	Subject- Transport Management Systems		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
3	1	3.5	3.5.1	2	1	Demonstrate transport management systems.
3	2	3.6	3.6.2	3	2	Implement advance techniques in traffic management.
6	1	6.4	6.4.1	2	3	Demonstrate understanding of motor vehicle act.
6	2	6.3	6.3.1	4	4	Interpret about vehicle insurance and taxation.
2	1	2.8	2.8.3	2	5	Illustrate the knowledge of Passenger transport operation.
2	1	2.8	2.8.3	2	6	Illustrate the knowledge of Goods transport operation

Course Code:	ILO7011		Subject- Product Lifecycle Management			
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.2	1.2.1	1	1	Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation.
3	1	3.1	3.1.1	4	2	Illustrate various approaches and techniques for designing and developing products.
3	1	3.1	3.1.1	3	3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc.
3	1	3.3	3.3.1	3	4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant
6	1	6.1	6.1.1	6	5	To create awareness about environmentally responsible product design requirements.
6	1	6.1	6.1.1	6	6	To create awareness about Life cycle Assessment
Course Code:	AEL701		Course Name	Subject- Vehicle Maintenance		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
4	1	4.1	4.1.2	2	CO 1	Demonstrate the maintenance procedure for automotive Engine and prepare checklist
3	2	3.1	3.1.1	2	CO 2	Comprehend of the operation of OBD for diagnosing various faults.
4	2	4.1	4.1.1	1	CO 3	Identify the trouble diagnosis procedure for steering and suspension system
4	1	4.1	4.1.1	2	CO 4	Illustrate the trouble diagnosis procedure for electrical systems like Battery, starting system etc.
4	1	4.1	4.1.1	2	CO 5	Illustrate trouble diagnosis procedure for lubrication and fuel delivery system etc.
4	3	4.1	4.1.1	2	CO 6	Illustrate trouble diagnosis procedure for heating system of automobile.



Course Code:	AEL702		Course Name	Subject- Vehicle Dynamics		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1	1	1.2	1.2.1	3	1	Are you Able to Plot Performance charecteristic curves for shcok absorber
1	1	1.3	1.3.1	4	2	Are you able to simulate ride behaviour using quarter car model
1	2	1.4	1.4.1	6	3	Are you able to simulate ride behaviour using half car model
1	1	1.2	1.2.1	4	4	Are you able to simulate using different road profiles for a quarter car model and hald car model
2	1	2.4	2.4.1	2	5	Are you able to calculate drag coefficient for diferent vehicles
2	2	2.4	2.4.1	4	6	Are you able to perform test on chasis dynamometer
Course Code:	AEL703		Course Name	Subject- Industrial Skills		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO2	PSO1	2.2	2.2.2	L3	CO1	prepare and edit documents and slides skillfully on MS Word and MS PowerPoint etc.
PO3		3.7	3.7.1	L2	CO2	Compute functions on MS Excel.
PO2		2.2	2.2.2	L3	CO3	use navigate tasks and execute functions in G-suite.
PO2,PO5	PSO2	2.1 5.4	2.1.2 5.4.1	L1	CO4	Recognize and practice metacognitive skills of creativity and problem solving.
PO9	PSO2	5.4 9.5 10.6	5.4.1 9.5.1 10.6.1	L3	CO5	Develop skills for team building and group leadership
Course Code:	AEP701		Course Name	Subject- Major Project I		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
2	1	2.1	2.1.1	3	1	To acquaint with the process of identifying the needs and utilize it by converting it into aproblem.

2	1	2.2	2.2.3	2	2	To familiarize and infer the process of solving the problem in a group .
2	1	2.4	2.4.4	4,5	3	To analyze and choose the process of applying basic engineering fundamentals to attempt solutions to the problems.
9	2	9.3	9.3.1	3	4	To develop interpersonal skills to work as a member of a group or leader.
12	2	12.2	12.2.2	6	5	To adapt the process of self learning and research in a group which leads to a life long learning.
10	2	10.3	10.3.2	5	6	To perceive project management principles during project work.
<b>Course Code:</b>	<b>AEC 801</b>		<b>Course Name</b>	<b>Subject- Vehicle Maintenance</b>		
<b>PO</b>	<b>PSO</b>	<b>Competancy</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
PO 4		4.1	4.1.2	Level-2	1	Demonstrate the maintenance procedure for automotive Engine and prepare checklist
PO 3		3.1	3.1.1	Level-2	2	Comprehend of the operation of OBD for diagnosing various faults.
PO 4		4.1	4.1.1	Level-1	3	Identify the trouble diagnosis procedure for steering and suspension system.
PO 4		4.1	4.1.1	Level-2	4	Illustrate the trouble diagnosis procedure for eletrical systems like Battery, starting Systems etc.
PO 4		4.1	4.1.1	Level-2	5	Illustrate trouble diagnosis procedure for lubrication and fuel delivery system etc.
PO 4		4.1	4.1.1	Level-2	6	" Illustrate trouble diagnosis procedure for heating system of automobile.
<b>Course Code:</b>	<b>AEC 802</b>		<b>Course Name</b>	<b>Subject- Vehicle Dynamics</b>		
<b>PO</b>	<b>PSO</b>	<b>Competancy</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
1		1.2	1.2.1	1	1	Define the road loads
1		1.3	1.3.1	3	2	Apply moments and forces on the tire
1		1.4	1.4.1	3	3	Apply isolation and vibration concept towards stability of the vehicle
1		1.2	1.2.1	2	4	Understanding the the load distribution for drive and rear axle problems.

2		2.4	2.4.1	5	5	Evaluate suspension effect on the steering
2		2.4	2.4.1	5	6	Evaluate ESC system
<b>Course Code:</b>	<b>AEC 803</b>		<b>Course Name</b>	<b>Subject- VEHICLE SAFETY</b>		
<b>PO</b>	<b>PSO</b>	<b>Competancy</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
PO2		2.4	2.4.4	2	1	Describe the basic safety concepts
PO2		2.2	2.2.3	2	2	Classify/Ilustrate and explain accident reconstruction analysis method
PO3		3.1	3.1.5	3	3	Sketch different issues in vehicle safety
PO4		4.3	4.3.4	4	4	Relate and analyse rear crash of automotives
PO4		4.3	4.3.3	4	5	Analysis the reconstruction of vehicle roll-over
PO6		6.1	6.1.1	4	6	Propose the different automotive Safety systems
<b>Course Code:</b>	<b>AEDLO8044</b>		<b>Course Name</b>	<b>Subject- Transport Management and Motor Industry</b>		
<b>PO</b>	<b>PSO</b>	<b>Competancy</b>	<b>PI</b>	<b>Bloom's Level</b>	<b>CO</b>	<b>Description</b>
PO-3	1	3.5	3.5.1	2	1	Demonstrate transport management systems.
PO-3	2	3.6	3.6.2	3	2	Implement advance techniques in traffic management.
PO-6	1	6.4	6.4.1	2	3	Demonstrate understanding of motor vehicle act.
PO-6	2	6.3	6.3.1	4	4	Interpret about vehicle insurance and taxation.
PO-2	1	2.8	2.8.3	2	5	Illustrate the knowledge of Passenger transport operation.
PO-2	1	2.8	2.8.3	2	6	Illustrate the knowledge of Goods transport operation
<b>Course Code:</b>	<b>ILOC8029</b>		<b>Course Name</b>	<b>Subject- Environmental Management</b>		

PO	PSO	Competancy	PI	Bloom's Level	CO	Description
7		7.1.2	1	1	1	To Understand and identify environmental issues relevant to India and global concerns
7		7.2.1	2	2	2	To Study the needs for sustainable development
7		7.1.1	1	3	3	To Learn concepts of ecology
7		7.2.2	2	4	4	To Understand the Scope and implementation of Environment Management in corporates
7		7.1.1	3	5	5	To Learn Total Quality Environmental Management and its certification process
7		7.2.2	2	6	6	To Familiarize environment related legislations
<b>Course Code:</b>	<b>AEDLO8043</b>		<b>Course Name</b>	<b>Subject- Product Design and Development</b>		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
1		1.4	1.4.1	3	1	Apply Product Lifecycle Management (PLM).
2		2.1	2.1.3	4	2	Analyze Product Design concepts that applies to a given problem.
2		2.1	2.1.2	4	3	Identify Product Data Management (PDM) system problems."
2		2.4	2.4.1	4	4	Apply Virtual Product Development Tools to solve the problems.
2		2.2	2.2.3	4	5	Illustrate the Integration of Environmental Aspects in Product Design for solving the problems,
2		2.4	2.4.1	4	6	Apply Life Cycle Assessment and Life Cycle Cost Analysis.
<b>Course Code:</b>	<b>AEP801</b>		<b>Course Name</b>	<b>Subject- Project II</b>		
PO	PSO	Competancy	PI	Bloom's Level	CO	Description
PO 2		2.2	2.2.3	Level-1	1	Do literature survey/industrial visit and identify the problem
PO 1		1.3	1.3.1	Level-3	2	Apply basic engineering fundamental in the domain of practical applications

PO 9		9.1	9.1.2	Level-3	3	Cultivate the habit of working in a team
PO 4		4.1	4.1.1	Level-3	4	Attempt a problem solution in a right approach
PO 4		4.3	4.3.2	Level-1	5	Correlate the theoretical and experimental/simulations results and draw the proper inferences
PO 4		4.3	4.3.3	Level-1	6	Prepare report as per the standard guidelines.