UNIVERSITY OF MUMBAI

Bachelor of Engineering

Automobile Engineering

Final Year (Sem. VII)

Revised Syllabus (REV- 2012)
w.e.f. Academic Year 2015-2016

Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

B. E. Automobile-(Semester VII)

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract.	Theory	Pract.	Total
AEC701	Chassis Body Engineering	3	2	3	1	4
AEC702	CAD/CAM/CAE[&]	4	2	4	1	5
AEC703	Automotive Design	4	2	4	1	5
AEC704	Product Design and Development	4	2	4	1	5
AEE701X	Elective I	3	2	3	1	4
AEP701	Project I	--	6[#]	--	3	3
Total		**18**	**16**	**18**	**8**	**26**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract./ oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test1	Test2	Avg.					
AEC701	Chassis Body Engineering	20	20	20	80	03	25	25	150
AEC702	CAD/CAM/CAE[&]	20	20	20	80	03	25	25	150
AEC703	Automotive Design	20	20	20	80	03	25	25*	150
AEC704	Product Design and Development	20	20	20	80	03	25	--	125
AEE701X	Elective I	20	20	20	80	03	25	--	125
AEP701	Project I	--	--	--	--	--	50	--	50
Total		**--**	**--**	**100**	**400**	**--**	**175**	**75**	**750**

[&] Common with Mechanical Engineering * Only ORAL examination based on term work and syllabus

Course Code	Course/Subject	Credits
AEC701	**Chassis and Body Engineering**	**3+1**

Objectives

1. Understand fundamentals of Vehicle Body design
2. Study different vehicle structural design and their requirements.
3. Study Vehicle Aerodynamics.
4. Design vehicle body structures

Outcomes: Learner will be able to……

1. Design and implement knowledge practically of Vehicle structures.
2. Develop efficient and safe designs with consideration of all constraints.

Module	Detailed Contents	Hrs.
01	**Fundamental aspects of Vehicle Bodies** **1.1** Chassis and structure types: Open, Semi integral and Integral bus structure. Frames: functions and types of frames, Loads on frames, Load distribution of structure. 1.2 Classification of motor vehicle, Location of power plant, Location of different chassis components, 1.3 Terminology and overview of structural surface types, history and Overview of structural types. Basic concept of design. 1.4 Vehicle body materials and their selection: Detail study of materials used in vehicle body building (Steel sheet, timber, plastics, FRP, GRP etc, properties of materials-Corrosion anticorrosion methods, scalation of paint and painting process)	8
02	**Vehicle body styles** **2.1 Car Body Details:** Types: Saloon, Convertibles, Limousine, Estate van, racing and sports car. Visibility: regulations, driver's visibility, test for visibility, Methods of improving visibility and space in cars. Safety: safety design, safety equipments for car. Car body construction, Front assembly, Roof Assembly, Under floor, bonnet etc. **2.2 Bus Body Details:** Types, mini bus, single Decker, double Decker, two levels, split level and articulated bus. Bus Body Lay Out: Floor height, engine location, entrance and exit location, seating dimensions. Constructional details: Frame construction, Double skin construction-Types of metal section used-Regulations-Conventional and Integral type construction. **2.3Commercial Vehicle Body Details:** Types of bodies, flat platform, drop side, fixed side, tipper body, tanker body, light construction vehicle body types, Dimensions of driver seat in relation to control, Driver cabin design.	8
03	**Vehicle Aerodynamics:** Objectives, Vehicle drag and types, various types of forces and moments, Effects of forces and moments, side wind effects on forces and moments, various body optimization techniques for minimum drag .Calculation of drag.	6

04	**Ergonomics and Preliminary Design** **3.1** Design and requirement of Driver, Passenger and child seat. 3.2 Drawing of the preliminary design-Vehicle Body Weight Analysis, Calculation of C.G for Vehicle, Vehicle Weight Distribution and Master Model. 3.3 Overall Criteria for Vehicle Comparison: Design, Running costs, Overall Design Efficiency.	6
05	**Body Loads** **5.1 Loads on Vehicles:** Bending, Torsion, Lateral and Braking and Acceleration Load Cases, Shear Panel Method **5.2** Calculation of loading cases Static loading case, Asymmetric loading case, Longitudinal loads, Side Loads, Calculation of different cases.	4
06	**Strength of Vehicle Body Elements** 6.1 Thin Walled Structures-General Principle, Torsion, Torsion centre, Forces in End Load Carrying Members. Effect of Holes, Spot welded joints. 6.2 Latest Trends in Design, Manufacturing and Materials.ULSAB Design, Tailored blanks. Manufacturing Process: Hydro forming tubular, Sheet Stamping	4

List of Experiments

1. Structural Analysis of Chassis Frame using CAD Software for different sections (C-section, I-section, L-section, O-section, Hat section, Tubular section etc)
2. Mini Project: Containing a 3D Model of Chassis or Body or combination of both (Min 2 Max 4 Students per Group)
3. Industrial Visit

Term Work

Term work shall consist of experiments from the list, 6 assignments based on complete syllabus, industrial visit report and a mini project report

The distribution of marks for term work shall be as follows:

- Laboratory work (Experiments) **:** **05 marks**
- Mini project : **05 marks**
- Assignment**:** **05 marks**
- Industrial visit report: **05 marks**
- Attendance (Theory and Practical) **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Practical/Oral examination

1. Practical examination duration is 2 hours.
2. Practical examination shall be based structural analysis and mini project mentioned in the term work.
3. The distribution of marks for practical/oral examination shall be as follows:
    i. Practical performance: 15 marks
    ii. Oral: 10 marks
4. Evaluation of practical examination to be done based on the experiment performed and the output of the experiments during practical examination.
5. Students work along with evaluation report to be preserved till the next examination

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. John Fenton, "Vehicle Body Layout & Analysis", Hutchinson, London.
2. J Powloski, "Vehicle Body Engineering", Business Books Ltd., London.
3. J.G. Giles, "Body Construction and Design", Vol. 6. llefe Books/Butterworth & Co. London
4. P. L. Kohli, "Automotive Chassis & Body", Papyrus Publishing House, New Delhi.
5. John Fenton, "Handbook of Automotive Body Construction and Design Analysis" Professional Engineering Publishing.

Course Code	Course/Subject Name	Credits
AEC702	**CAD/CAM/CAE[&]**	**4+1**

[&] Common with Mechanical Engineering

Objectives

1. To introduce new and exciting field of Intelligent CAD/CAM/CAE with particular focus on engineering product design and manufacturing.
2. To develop a holistic view of initial competency in engineering design by modern computational methods.

Outcome: A learner will be able to….

1. Identify proper computer graphics techniques for geometric modelling.
2. Transform, manipulate objects and store and manage data.
3. Prepare part programming applicable to CNC machines.
4. Use rapid prototyping and tooling concepts in any real life applications.
5. Identify the tools for Analysis of a complex engineering component.

Modules	Details	Hrs.
01	**Computer Graphics and Techniques for Geometric Modeling** Computer Graphics: Two dimensional computer graphics, vector generation, the windowing transformation, Three dimensional Computer graphics, viewing transformation, Homogeneous coordinates, Perspective projection, Hidden line removal & hidden surface removal algorithm, light & shade ray tracing. The parametric representation of geometry, Bezier curves, Cubic Spline curve, B-Spline curve, parametric representation of line, circle, ellipse & parabola. Constructive solid geometry (CSG), Boundary Representation (B-Rep), Wire Frame Modeling, Solid Modeling, Surface Modeling, Parametric Modeling, feature based modeling, Feature recognition, Design by feature.	08
02	**Transformation, Manipulation & Data Storage** 2D & 3D Transformations (Translation, Rotation, & Scaling & Magnification), Concatenations, Matrix representation, Problems & object oriented programming on Transformations. Object transformation, mirror transformation, Artificial Intelligence in Design & Manufacturing, Representation of Knowledge, and Knowledge base Engineering.	08
03	**NC & CNC Technology** Tape coding & format, Manual Part Programming, Computer Aided Part Programming, CNC functions & advantages, DNC, adaptive Control, CNC programming concepts, Trends & new developments in NC, Part programmers job, functions of a post processor, NC part programming languages, Elements of a APT language, The Macro Statement in APT, NC programming with interactive graphics. Constructional details of CNC machines, Feed back devices- Velocity & displacement, Machining Centers and its types, Automated Material Handling & storage Systems like Robots, AGVs and AS/RS etc.	08
04	**Computer Aided Engineering (CAE)** Fundamentals of computer aided engineering, CAE includes mass property calculations, kinematic analysis and animation (movement, visualization, simulation and FEA). Case study based on modeling and analysis of structural, thermal/fluid, and dynamic (vibration analysis) system. Parameter optimization.	08

05	**Computer Integrated Manufacturing & Technology Driven Practices** Introduction, Evolution, Objectives, CIM Hardware and Software, CIM Benefits, Nature and role of the elements of CIM, Identifying CIM needs, Data base requirements of CIM, Role of CAD/CAM in CIM, Obstacles to Computer Integrated Manufacturing, Concept of the future CIM systems, Socio -techno- economic aspects of CIM.	08
06	**Rapid Prototyping and Tooling** Introduction to RP, Technology Description, Overview of RP, Benefits and Application. RP Processes: Process overviews, STL file Generation, Classes of RP systems: Stereo-lithography Approach (SLA), SLA with photo-polymerization (mathematical modelling of the process), SLA with liquid thermal polymerization, Selective Laser Sintering (SLS), Fused deposition modelling, Laminated object manufacturing, Laser powder forming. Prototype properties: Material properties, colour, dimensional accuracy, stability, surface finish, machinability, environmental resistance, operational properties. RP Applications: Design, Concept Models, Form & fit checking, Functional testing, CAD data verification, Rapid Tooling, Rapid manufacturing, Science & Medicine, RP processes for MEMS, Photolithography, Direct Laser Writer, Bulk Lithography for 3D micro fabrication (Modelling of beam propagation and curing in resin system).	08

List of Exercises

1. Programming for transformations,
2. Solid modeling using any 3D modeling software
3. Part programming and part fabrication on CNC trainer (Turning / Milling)
4. Geometrical optimization of any mechanical component using computer aided engineering concepts.
5. Development of physical 3D mechanical structure using any one of the rapid prototyping processes.
6. Rapid tooling for any one of the engineering or medical applications.

Term Work

Term work shall consist of any three exercises from the above list and a course project in a group of not more than three (3) students on either computer aided engineering or rapid prototyping and tooling

The distribution of marks for term work shall be as follows:

- Exercises : **15** marks
- Course Project : **05** marks
- Attendance (Theory & Practical) : **05** marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems.

Practical / Oral Examination

Practical examination of 2 hours duration based on any one of the following.

1) Programming for Algorithms, transformations.
2) Part Programming and machining of components.
3) 3D Modeling on software.
4) Analysis of component for optimization

The distribution of marks for practical/oral examination shall be as follows:

i. Practical performance: 15 marks
ii. Oral: 10 marks

Evaluation of practical examination to be done based on the experiment performed and the output of the experiments during practical examination.
Students work along with evaluation report to be preserved till the next examination

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. "CAD/CAM Computer Aided and Manufacturing" by Mikell P. Groover and Emory W. Zimmers, Jr., *Eastern Economy Edition*
2. "CAD/ CAM , Theory & Practice" by Ibrahim Zeid, R. Sivasubramanian, *Tata McGraw Hill Publications*
3. "Computer Graphics" by Donald Hearn and M. Pauline Baker, *Eastern Economy Edition*
4. "CAD/CAM Principles, Practice and Manufacturing Management" by Chris McMahon, Jimmie Browne, *Pearson Education*
5. "CAD/CAM/CIM" by P. Radhakrishan, S. Subramanyan, V. Raju, *New Age International Publishers*
6. "CAD/CAM Principles and Applications" by P.N. Rao, *Tata McGraw Hill Publications*
7. "Principle of Computer Graphics" by William .M. Neumann and Robert .F. Sproul, *McGraw Hill Book Co. Singapore.*
8. David L. Goetsch, Fundamental of CIM technology ,Delmar publication
9. David Bedworth, Computer Integrated Design and Manufacturing, *McGraw Hill.*
10. "CNC Machines" by B.S. Pabla and M. Adithan, *New Age International Publishers.*
11. "Numerical Control and Computer Aided Manufacturing" , T.K. Kundra, P.N. Rao, N.K. Tiwari, *Tata McGraw Hill*
12. "CNC Technology and Programming", Krar, S., and Gill, A., *McGraw Hill publishers*
13. "Computer Integrated Manufacturing- An Introduction with Case Studies" by Paul G. Ranky, *Prentice Hall International*
14. "Flexible Manufacturing Systems" by H.K. Shivanand, M.M. Benal, V.Koti, *New Age International Publishers*
15. "Automation, Production Systems and Computer Integrated Manufacturing ", Groover M.P., *Prentice-Hall of India Pvt. Ltd*
16. "Mathematical Elements for Computer Graphics", Rogers D F I and Adams J A, McGraw-Hill.

17. “Computer Integrated Manufacturing Hand Book” by Eric Teicholz, Joel N. Orr, McGraw Hill International Editions
18. “Rapid Prototyping” Chee Kai ChuaWorld Scientific Publishing
19. “Rapid Prototyping:Principles and Applications” RafiqNoorani, Wiley
20. “Rapid Prototyping:Principles and Applications” C.K. Chua,K.F.Leong, C.S. Lim World Scientific Publishing
21. “Rapid Prototyping and Manufacturing” P. F. Jacobs, Society of Manufacturing Engineers.

Course Code	Course /Subject	Credits
AEC703	**Automotive Design**	**4+1**

Objective

1. Provide students with the fundamental knowledge in the field of automotive design.
2. Develop analytical abilities to give solutions to Automotive design problems

Outcome: Learner will be able to…

1. Design automotive component to meet desired needs
2. Apply the fundamental knowledge of Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machine for actual design problems

Modules	Details	Hrs.
01	**Design of Principal parts of I.C. Engines** 1. Cylinder and cylinder liner- Material Selection, Design of cylinder 2. Piston, piston rings and piston pin or gudgeon pin- Material Selection, Design considerations, Design calculations 3. Connecting rod with small and big end bearing-forces acting on connecting rod, Design considerations, Design calculations	**12**
02	**Design of Principal parts of I.C. Engines** 1.Crank, crankshaft and crank pin 2. Cam shaft and Valve Operating mechanism.	**08**
03	**Design of Clutches and Gear Boxes:** single plate, multiple plates, centrifugal clutch, lining material, lever design, sliding mesh, constant mesh, synchromesh gear box, gear ratio and gear shifting lever, sliding mechanism	**08**
04	**Design of Drive train:** Design of propeller shaft and U-joints, Design of propeller shaft, criteria, failure theories-joint design, Design of Final drive and differential	**08**
05	**Brakes and Suspension:** internal expanding shoe brake, friction lining material, leaf spring, coil spring, materials, suspension system and linkages, independent suspension	**06**
06	**Advanced automotive Body Structures:** Emphasis is on body concept for design. Material selection and manufacturing constraints	**06**

Term Work

Term work shall consists of exercises on the above topics in the form of design calculations with sketches and/ or drawings, Complete design and preparation of drawings for at least four components using CAD Software and Analysis software, Class Assignments and course project where a group of 3 or 4 students shall perform Stress analysis of any machine element using any analysis software like ANSYS/MSC, NASTRAN etc. and submit report as term work

The distribution of marks for term work shall be as follows:

- Exercises/Assignment : 10 Marks
- Course Project : 10 Marks
- Attendance (Theory & Practical) : 05 Marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Note

Use of standard design data books like PSG data book, Mahadevan book is permitted at the examination and shall be supplied by the college.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems.

Oral examination

1. Oral examination shall be conducted based on term work and syllabus content
2. Examiners are expected to give small task or ask questions either to evaluate understanding of basic fundamentals or to evaluate their capability of applying basic theory to practical applications.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1) Machine Design – Khurmi Gupta. S.Chand pub..
2) Design of machine elements -- V. B. Bhandari. *Tara Mcgraw Hill Pub.*
3) Design of machine elements—Sharma, Purohit, Prentice Hall india publication
4) Machine Design by Pandya & shah, Charolar Publishing
5) Mechanical Engineering Design – J.E.Shiegly- McGraw hill
6) Recommended Design Data Books- PSG, Kalaikathir Achchagam Publishing
7) Recommended Design Data Books -Mahadevan,
8) Design of machine element – Spotts.
9) Design of machine element – V.M.Faires.
10) Machine Design – Black Adams- McGraw Hill
11) Machine Design – Rashetov- Mir Publication

Course Code	Course/Subject Name	Credits
AEC704	**Product Design & Development**	**4+1**

Objectives

1. To understand fundamental product design concepts
2. To understand product design methodologies
3. To understand product design needs and issues in industry

Outcomes: Learner will be able to……

1. To design the products as per the customer/industry requirements
2. To apply product design tools and techniques

Module	Detailed Contents	Hrs.
01	**1. INTRODUCTION** 1.1 Introduction to product design. 1.2 Classification/ Specifications of products. 1.3 Product life cycle & Product mix. 1.4 Modern product development process. 1.5 Innovative thinking. 1.6 Morphology of design (7 phases)	**08**
02	**2. CONCEPTUAL DESIGN** 2.1 Generation, selection & embodiment of concept. 2.2 Product architecture. 2.3 Significance of Industrial design process. 2.4 Introduction to Design Of Experiments (DOE) for Robust Design, Taguchi Designs.	**08**
03	**3. DESIGN FOR MANUFACTURING AND ASSEMBLY** 3.1 Methods of designing for manufacturing & assembly. 3.2 Designs for maintainability. 3.3 Designs for environment. 3.4 Product costing.	**10**
04	**4. DESIGN METHODOLOGIES** 4.1 Value engineering and Value analysis. 4.2 Failure Mode Effect Analysis (FMEA) 4.3 Concurrent engineering 4.4 Quality Function Deployment (QFD) 4.5 Reverse engineering	**10**
05	**5. DESIGN FACTORS** 5.1 Ergonomics and Aesthetics. 5.2 Anthropometry. 5.3 Man-Machine interaction. 5.4 Concepts of size and texture, color 5.5 Comfort criteria. 5.6 Psychological & Physiological considerations. 5.7 Economic factors.	**06**
06	**6. PRODUCT DESIGN NEEDS AND ISSUES IN INDUSTRY** 6.1 Customer needs: types, models and collection of customer needs information, analysis of information**,** Rapid prototyping, Tools for product design – Drafting / Modeling software, CAM interface. 6.2 Creativity Techniques: Creative thinking, conceptualization, Brain storming, primary design, drawing, simulation, detail design. 6.3 Legal and social issues. Engineering ethics and issues of society related to design of products, Patents & IP Acts. Overview, Disclosure preparation.	**06**

Term Work

Term work shall consists of minimum six assignments one from each module and Case studies on product design and development

The distribution of marks for term work shall be as follows:

- Exercises/Assignment : 10 Marks
- Case studies : 10 Marks
- Attendance (Theory & Practical) : 05 Marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. Karl T Ulrich, Steven D Eppinger, "Product Design & Development.", Tata McGraw-Hill New Delhi 2003.
2. David G Ullman, "The Mechanical Design Process." McGrawhill Inc.
3. N J M Roozenberg, J Ekels, N F M Roozenberg "Product Design Fundamentals and
4. Methods", John Willey & Sons 1995.
5. Hollins B & Pugh S "Successful Product Design." Butterworths London.
6. Baldwin E. N. & Neibel B. W. "Designing for Production.", Edwin Homewood Illinois
7. Jones J. C. "Design Methods." Seeds of Human Futures, John Willey New York.
8. Bralla J. G. "Handbook of Product Design for Manufacture, McGrawhill NewYork**.**
9. K. Chitale; R.C. Gupta, Product Design and Manufacturing, Prentice - Hall India.
10. Dieter George E., Engineering Design McGraw Hill Pub. Company, 2000.

Course Code	Course/Subject Name	Credits
AEE7011	**Power Plant Engineering[&]**	**3+1**

[&] Common with Mechanical Engineering

Objectives

1. Study basic working principles of different power plants
2. Study power plant economics

Outcomes: Learner will be able to…

1. Comprehend various equipments/systems utilized in power plants
2. Discuss types of reactors, waste disposal issues in nuclear power plants
3. Illustrate power plant economics

Module	Detailed Contents	Hrs.
01	Introduction: Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants.	04
02	Hydro Electric Power Plants : Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants.	06
03	Steam Power Plants: Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.	08
04	Combined Cycles: Constant pressure gas turbine power plants, Arrangements of combined plants (steam & gas turbine power plants), re-powering systems with gas production from coal, using PFBC systems, with organic fluids, parameters affecting thermo dynamic efficiency of combined cycles. Problems.	06
05	Nuclear Power Plants: Principles of nuclear energy, basic nuclear rea ctions, nuclear reactors- PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.	06
06	Power Plant Economics: Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-out put curves, efficiency, heat rate, economic load sharing, Problems.	06

List of Experiments

1. Case study report on at least two types of power plants
2. Group presentation (Group shall not be more than 3 students) on topics relevant to syllabus
3. Industrial visit to any power plant

Term Work

Term work shall consist of one case study report and 5 assignments covering maximum syllabus

The distribution of marks for term work shall be as follows:

- Case study**:** **05 marks**
- Industrial visit report: **05 marks**
- Presentation: **05 marks**
- Assignments : **05 marks**
- Attendance (Theory and Practical) **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. Power Plant Engineering, A K Raja, Amit Praksh Shrivastava, Manish Dwivedi, New Age International Publishers
2. Power Plant Familiarization, Manual of Central Training Resources Unit of NTPC India, 1991
3. Power Plant Engineering, 2nd ed, P.K. Nag , Tata McGraw-Hill Pub. Com., New Delhi.
4. Hydro-Electric and Pumped Storage Plants, M G Jog, New Age International Publishers
5. A Text Book of Power Plant Engineering, R.K. Rajput, Laxmi Publications
6. A Course in Power Plant Engineering, Arora, Domkundwar, DhanpatRai & Co.
7. Power Plant Engineering, P.C. Sharma, S.K. Kataria& Sons.
8. Power Plant Engineering, G.R. Nagpal, Khanna Publishers
9. Power station Engineering and Economy by Bernhardt G.A. Skrotzki and William A. Vopat, Tata Mc Graw Hill Publishing Campany Ltd., New Delhi
10. Nuclear Energy An Introduction to the Concepts, Systems and Applications of Nuclear Processes, 6th Edition, Raymond L Murray, , ELSEVIER
11. Power Plant Engineering, Manoj Kumar Gupta, PHI Learning
12. Nuclear Power Plant Engineering, James Rust, Haralson Publishing Company
13. Nuclear Power Plants, Edited by Soon Heung Chang, InTech Publishers, 2012
    Nuclear Power Plants, Geotge Petridis and DimitriosNicolau, NOVA Publishers

Course Code	Course/Subject Name	Credits
AEE7012	Supply Chain Management[&]	3+1

[&] Common with Mechanical Engineering

Objectives

1. To develop an understanding of key drivers of supply chain performance and their inter-relationships with strategy.
2. To impart analytical and problem solving skills necessary to develop solutions for a variety of supply chain management & design problems.
3. To understand the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.

Outcomes: Learner will be able to…..

1. Illustrate the role & functions of supply chain management and its processes.
2. Analyze the flows of material, information and funds in an integrated manner.
3. Evaluate various performance measures of supply chain management.

Module	Detailed Contents	Hrs.
01	**Building a Strategic Frame Work to Analyse Supply Chains** Supply chain stages and decision phases, Process view of supply chain: Supply chain flows, Examples of supply chains, Competitive and supply chain strategies, Achieving strategic fit: Expanding strategic scope, Drivers of supply chain performance. Framework for structuring drivers: inventory, transportation facilities, information obstacles to achieving fit.	04
02	**Designing the Supply Chain Network** Distribution Networking: Role, Design, Supply Chain Network(SCN):Role, Factors, Framework for design decisions.	05
03	**Materials Management** Scope, Importance, Classification of materials, Procurement, Purchasing policies, Vendor development and evaluation. Inventory control systems of stock replenishment, Cost elements, EOQ and its derivative modules.	06
04	**Dimensions of Logistics** Introduction: A Macro and Micro Dimensions, Logistics interfaces with other areas, Approach to analyzing logistics system, Logistics and systems analyzing: Techniques of logistics system analysis, factors affecting the cost and Importance of logistics.	06
05	**Warehouse and Transport Management** Concept of strategic storage, Warehouse functionality, Warehouse operating principles, Developing warehouse resources, Material handling and packaging in warehouses, Transportation Management, Transport functionality and principles, Transport infrastructure, transport economics and Pricing. Transport decision making.	07
06	**IT in Supply Chain** 6.1 IT framework, Customer Relationship Management(CRM),internal Supply chain management, Supplier Relationship Management (SRM) and Transaction Management.Coordination in a Supply Chain 6.2 Lack of supply chain coordination and the Bullwhip effect, Obstacle to Coordination, Managerial levers, Building partnerships and trust. Emerging Trends and Issues 6.3 Vendor managed inventory-3PL-4PL, Reverse logistics: Reasons, Role, Activities; RFID systems: Components, Applications, Implementation; Lean supply chain, Implementation of Six Sigma in supply chain, Green supply chain.	08

Term Work

Term work shall consist of,

1. Assignments: On topics drawn from syllabus [At least 1 assignment per module].
2. Seminar / case study on the modules / trending scenario (current) in industry.

The distribution of marks for term work shall be as follows;

Seminar / Case study Presentation & report	**10** marks
Assignments:	**10** marks
Attendance (Theory and Practical):	**05** marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. *Supply Chain Management Strategy, Planning, and operations*, Sunil Chopra and Peter Meindl
2. *Materials Management & Purchasing*, Ammer D.S. Taraporawala
3. *Designing & Managing Supply chain*, David Simchi Levi, Philip Kaminsky& Edith Smichi Levi
4. *Supply Chain Redesign: Transforming Supply Chains into Integrated Value Systems*, Robert B Handfield, Ernest L Nicholas
5. *The Management of Business Logistics: A Supply Chain Perspective*, Coyle, Bardi, Langley

Course Code	Course/Subject Name	Credits
AEE 7013	**Tribology**	**3+1**

Objectives

1. To provide students with the fundamental knowledge in the field of Industrial tribology.
2. To provide basic concepts in the design of automotive lubrication system.
3. To provide knowledge of friction and wear mechanism in automotive system.

Outcome: Lerner will be able to….

1. apply knowledge of tribology for industrial component design
2. apply design concepts practically for automotive lubrication systems

Module	Detailed Contents	Hrs.
1	**Introduction to Tribology** Introduction to Tribology, Tribology in design, Tribology in industry, economic aspects of Tribology, lubrication, basic modes of lubrication, lubricants, properties of lubricants-physical and chemical, types of additives, extreme pressure lubricants, recycling of used oils and oil conservation, disposal of scrap oil, oil emulsion. Types of sliding contact bearings, comparison of sliding and rolling contact bearings	**06**
2	**Friction and Wear** Friction: Introduction, laws of friction, kinds of friction, causes of friction, friction measurement, theories of friction, effect of surface preparation. Wear: Types of wear, various factors affecting wear, measurement of wear, wear between solids and liquids, theories of wear.	**06**
3	**Hydrodynamic lubrication** Theory of hydrodynamic lubrication, mechanism of pressure development in oil film, two-dimensional Reynold„s equation, infinitely long journal bearing, infinitely short journal bearing, finite bearing Hydrodynamic thrust bearing: Introduction, flat plate thrust bearing, pressure equation, load, center of pressure, friction in tilting pad thrust bearing.	**06**
4	**Hydrostatic Lubrication** Hydrostatic lubrication: Basic concept, advantages and limitations, viscous flow through rectangular slot, load carrying capacity and flow requirement of hydrostatic step bearing, energy losses, optimum design of step bearing. Compensators and their actions. Squeeze film lubrication: Introduction, circular and rectangular plates approaching a plane.	**06**
5	**Elasto-hydrodynamic Lubrication and Gas Lubrication** Elastohydrodynamic Lubrication: Principle and application, pressure-viscosity term in Reynolds equation, Hertz theory. Ertel- Grubin Equation Gas lubrication: Introduction, merits and demerits, applications. Lubrication in metal working: Rolling, forging, drawing and extrusion. Bearing materials, bearing constructions, oil seals, shields and gaskets	**06**
6	**Surface Engineering** Introduction to surface engineering, concept and scope of surface engineering, manufacturing of surface layers, solid surface geometrical, mechanical and physic chemical concepts, superficial -layer, development of concept, structure of superficial layer, general characteristics of superficial layer, obtained by machining, strengthening and weakening of superficial layer.	**06**

Term Work

Term work shall consist of at least one (1) assignment from each module and a case study or seminar by each student.

The distribution of marks for term work shall be as follows;

- Assignments: 10 marks
- Seminar / Case study Presentation & report: 10 marks
- Attendance (Theory and Practical): 05 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. Cameron A., "Basic Lubrication Theory", Wiley Eastern Ltd.
2. Shizhu Wen, "Principles of Tribology", Wiley
3. Majumdar, "Introduction to Tribology and Bearings", S.Chand and Company Ltd. New Delhi
4. Fuller D. D., "Theory and Practice of Lubrication for Engineers", John Wiley and Sons
5. Halling J., "Principles of Tribology", McMillan Press Ltd.
6.
7. B. Bhushan, B.K. Gupta, "Handbook of tribology: materials, coatings and surface treatments", McGraw-Hill
8. Davis J., "Surface Engineering for corrosion and Wear Resistance", Woodhead Publishing, 2001
9. Tadausz Burakowski, "Surface Engineering of Metals: Principles, Equipments, Technologies", Taylor and Francis

Course Code	Course/Subject Name	Credits
AEE 7014	**Computational Fluid Dynamics[&]**	**3+1**

[&] Common with Mechanical Engineering

Objectives

1. Study basic principles of modeling a system using software
2. Study grid generation and discretization methods

Outcomes: Learner will be able to…

1. Demonstrate & explain geometrical model of a fluid flow
2. Describe specific boundary conditions and solution parameters

Module	Detailed Contents	Hrs.
01	**Introduction:** What is CFD, Scope and Application of CFD, Methods of Predictions like Experimental and theoretical, Working of Commercial CFD Softwares, Solution methodology-Preprocessing, Solver, Post processing.	04
02	**Mathematical description of Physical Phenomenon:** Governing Differential Equations, Meaning of Differential equation, The Continuity Equation, A Momentum equation, The Energy Equation, The General Differential Equation, Boundary Conditions, Initial and Boundary Conditions, Initial and Boundary Value problems	06
03	**Grid Generation and Discretization Methods:** Structured and unstructured Grids: O-type, H-type, C-type of Structured Grid Generation, Mesh Adaptation. The Nature of Numerical Methods: The Discritization Concept, The Structure of the Discritization Equation. Methods of Deriving the Discretization Equations, Taylor-Series Formulation, Variational Formulation, Method of Weighted Residuals, Control Volume Formulation	08
04	**Heat Conduction, Convection and Diffusion:** Steady One-dimensional Conduction, Unsteady One-dimensional Conduction, Two and Three-dimensional Situations, Over relaxation and Under relaxation, Steady One-dimensional and Two Dimensional Convection-Diffusion, Unsteady One-dimensional Convection	06
05	**Incompressible Fluid Flow:** Governing Equations, Stream Function-Vorticity Method, Determination of Pressure for Viscous Flow, The SIMPLE, SIMPLER Algorithm, Introduction to Turbulence Modeling, Basic Theories of Turbulence, The Time-Averaged Equations for Turbulent Flow.	06
06	**Finite Volume Methods**: FVM solutions to steady one, two and three dimensional diffusion problems and unsteady one and two dimensional diffusionproblems, FVM solutions to convection-diffusion problems - one and twodimensional, steady and unsteady; Advection schemes; Pressure velocity coupling	06

List of Experiments

1. Simulate and solve, two problems, each 2-d and 3-d steady and unsteady flows using any commercial CFD package like Ansys-FLUENT, STAR CCM, FLUIDYNE, Ansys-CFX, etc.
2. Write codes for, at least one each, 1-d and 2-d steady conduction with and without source and do the post processing to verify with analytical results
3. Write codes, at least one, for steady, 2-d conduction-advection problems and do the post processing to verify with analytical results

Term Work

Term work shall consist of experiments from the list, 3 assignments covering maximum portion of the syllabus.

The distribution of marks for term work shall be as follows:

- Laboratory work (Experiments) **:** **15 marks**
- Assignments : **05 marks**
- Attendance (Theory and Practical) **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. An introduction to computational fluid dynamics-The finite volume method, Versteeg.H.K. , Malalasekera.W., Prentice Hall
2. Computational Fluid Mechanics and Heat Transfer, Anderson, D.A., Tannehill, I.I., and Pletcher, R.H., Hemishphere Publishing Corporation, New York, USA, 1984.
3. Introduction to Computational Fluid Dynamics, Niyogi P. ,Laha M.K., Chakrabarty S.K., Pearson Education, India.
4. Computational Fluid Flow and Heat Transfer, Muralidhar, K.,andSundararajan,T., Narosa Publishing House ,New Delhi1995.
5. Computer Simulation of flow and heat transfer, Ghoshdasdidar, P. S., Tata McGraw-Hill Publishing Company Ltd., 1998.
6. Finite Element Programming of the Navier Stock Equation, Taylor, C and Hughes J.B., Pineridge Press Ltd.U.K.1981.
7. Computational Techniques for Fluid Dynamics: Fundamental and General Techniques, Fletcher, C.A.J., Springer-Verlag, 1987.
8. Numerical Fluid Dynamics, Bose, T. K., Narosa Publishing House, 1997.

Course Code	Course/Subject Name	Credits
AEE 7015	**Automotive Embedded Systems**	**3+1**

Objectives

1. To provide broad introduction to automotive embedded systems
2. To provide a comprehensive overview about existing and future automotive electronic systems.
3. To enable undergraduates to be able to design and apply embedded systems.

Outcomes: Learner will be able to…

1. Ability to design automotive component to meet desired needs.
2. Competence to apply the fundamental knowledge of Applied Mechanics, Strength of Materials, Engineering Materials and Theory of Machine for actual design problems.
3. Develop analytical abilities to give solutions to automotive design problems.

Module	Detailed Contents	Hrs.
01	**Introduction** Body and convenience electronics, Vehicle power supply controllers and lighting modules, Door control modules Safety electronics: Active safety systems such as ABS, ASR& ESP etc., Passive safety systems such as restrained systems and their associated sensor in an automobile. Power train electronics :Petrol Engine Management, Infotainment electronics: Dashboard /Instrument cluster, car audio, telematics system, navigation system, multimedia systems etc. Cross application technologies:42 volt vehicle power supply system	06
02	**Embedded Communications** A Review of Embedded Automotive Protocols, Dependable Automotive CAN Networks, Flex Ray Protocol	08
03	**Drive By Wire** Challenges and opportunities of X by Wire: System and design requirements steer by wire, brake by wire, suspension by wire, gas by wire, power by wire, and shift by wire. Future of automotive Electronics	06
04	**Hardware Modules** MC9S12XD family features Modes of operation: functional block diagram overview, Programming model Map Overview Pulse width Modulator(PWM) On chip ADC serial communication protocol: SCI,SPI,IIC,CAN	06
05	**Software Developments Tools** Introduction to HCS12XDT512 Student learning kit & PBMCU(Project board), Introduction to code warrior IDE: editing, debugging simulating simple programs. Flashing code into HCS12XDT512 SLK board and testing	06
06	**Integration of Software and Hardware** Downloading the software from Host Machine to target Machine, Implementing Application Prototype: Power windows and automotive lighting system	04

Term Work

Term work shall consist of 6 assignments (One on each module) covering maximum portion of the syllabus.

The distribution of marks for term work shall be as follows:

- Assignments : **20 marks**
- Attendance (Theory and Practical) **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. Automotive Electronics By Tom H.Denton
2. Automotive Electrical and Electronic Systems by John F. Kershaw, James D. Halderman / Pearson Education
3. Automtive Embeded System Handbook by Nicolas Navet/CRC PRESS
4. Distributed Automotive Embeded System
5. Embeded System Handbook by Richard Zurawski

Course Code	Course/Subject Name	Credits
AEE 7016	**Industrial Robotics**	**3+1**

Objectives

1. To understand basic needs and requirements of robotics in industry.
2. To learn basic kinematics required in designing of robots.
3. To write and embed programs in robots.

Outcomes: Learner will be able to…

1. Appreciate the significance of robot in industry.
2. Design and make the robot for particular industrial problem.

Module	Detailed Contents	Hrs.
01	**Fundamentals of Robotics** Introduction, Fundamentals of Robot Technology, Programming, and Applications **Robot Technology: The Robot and its Peripherals** Control Systems and Components, Robot Motion Analysis and Control, Robot End Effectors, Sensors in Robotics, Machine Vision	08
02	**Kinematics of robotics.** Types of joints and motion, Basic of kinematics in robotics, Inverse kinematics, Balancing of **robots**	06
03	**Robot Programming and Languages** Robot Programming on microcontrollers., Robot Languages, Artificial Intelligence	04
04	**Robot Applications in Manufacturing** Application of robot in processing, assembly and inspection. ASRS(Automatic storage and retrieval system), AGV(Automated guided Vehicles)	06
05	**Implementation Principles and Issues** Technical issues involved in implementing Robotics, its Safety, Training, Maintenance and Quality	06
06	**Social Issues and the Future of Robotics** Social and Labor Issues, Robotics Technology of the Future	06

Term Work

Term work shall consist of 6 assignments (one on each module) covering maximum portion of the syllabus.

The distribution of marks for term work shall be as follows:

- Assignments : **20 marks**
- Attendance (Theory and Practical) **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
2. J.J, Craig, Introduction to Robotics, Pearson Education
3. Fu, Gonzales and Lee, Robotics, McGraw Hill
4. Curtis D. Johnson, Process Control Instrumentation Technology, PHI Publication, Eighth Edition
5. Staughard, Robotics and AI, Prentice Hall of India
6. Grover, Wiess, Nagel, Oderey, Industrial Roboticsî, McGraw Hill
7. Walfram Stdder, Robotics and Mechatronics,
8. Niku, Introduction to Robotics, Pearson Education
9. Klafter, Chmielewski, Negin, Robot Engineering, Prentice Hall of India
10. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications
11. George L Balten Jr., Programmable Controllers , Tata McGraw Hill publication
12. Handbook of Industrial Robotics: Ed. Shimon Y. Nof, John Wiley. ISBN: 9780471177838.

Course Code	Course/Subject Name	Credits
AEE 7017	**Transportation Management & Motor Industries**	**3+1**

Objectives

1. To study basic concepts of transport management
2. To study different types of motor insurance

Outcomes: Learner will be able to…

1. To improve existing transport management systems
2. To implement advance techniques in traffic management

Module	Detailed Contents	Hrs.
01	**1. Motor Vehicle Act** 1.1 Short titles & definitions 1.2 Laws governing to use of motor vehicle & vehicle transport 1.3 Licensing of drivers & conductors 1.4 Registration of vehicle 1.5 State & interstate permits 1.6 Traffic rules, Signals & controls 1.7 Accidents, Causes & analysis 1.8 Liabilities & preventive measures 1.9 Rules & regulations 1.10 Responsibility of driver 1.11 Public & public authorities 1.12 Offences, penalties & procedures 1.13 Different types of forms 1.14 Government administration structure 1.15 Personnel, Authorities & duties 1.16 Rules regarding construction of motor vehicles	04
02	**2. Taxation** 2.1 Objectives 2.2 Structure & methods of laving taxation 2.3 One time tax 2.4 Tax exemption & tax renewal	08
03	**3. Insurance** 3.1 Insurance types & significance 3.1.1 Comprehensive 3.1.2 Third party insurance 3.2 Furnishing of particulars of vehicles involved in accident 3.3 MACT (Motor Accident Claims Tribunal) 3.4 Solatium Fund 3.5 Hit & Run case 3.6 Duty of driver in case of accident 3.7 Surveyor & Loss Assessor, Surveyor.s report	04
04	**4. Passenger Transport Operation** 4.1 Structure of passenger transport organizations 4.2 Typical depot layouts 4.3 Requirements and Problems on fleet management 4.4 Fleet maintenance 4.5 Planning - Scheduling operation & control 4.6 Personal & training-training for drivers & conductors 4.7 Public relations, Propaganda, publicity and passenger amenities 4.8 Parcel traffic.	08

	4.9 Theory of fares-Basic principles of fare charging 4.10 Differential rates for different types of services 4.11 Depreciation & debt charges 4.12 Operation cost and Revenues 4.13 Economics & records	
05	**5. Goods Transport Operation** 5.1 Structure of goods transport organizations 5.2 Scheduling of goods transport 5.3 Management Information System (MIS) in passenger / goods transport operation 5.4 Storage & transportation of petroleum products	06
06	**6. Advance Techniques in Traffic Management** 6.1 Traffic navigation 6.2 Global positioning system	06

List of Experiments

1. Organization & Management of Motor Vehicle Department
2. Collection & study of different types of RTO forms.
3. Central Motor Vehicle rules
4. Taxation, Insurance & Permits
5. Study of accidents claims & survey report including post accident procedure
6. Study of depot layouts (passenger & goods transport)
7. Case study of MIS in passenger / goods transports organization
8. Collection & study of goods transport records.
9. Study of vehicle navigation system
10. Advanced traffic control devices

Term Work

Term work shall consist of 8 experiments from the list, 6 assignments (One on each module) covering maximum portion of the syllabus.

The distribution of marks for term work shall be as follows:

- Laboratory work (Experiments) **:** **10 marks**
- Assignments : **10 marks**
- Attendance (Theory and Practical) **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

Internal Assessment

Assessment consists of two tests out of which; one should be compulsory class test (on minimum 40% of curriculum) and the other is either a class test (on minimum 70% of curriculum) or assignment on live problems or course project.

Theory Examination

In question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total four questions need to be solved.

References

1. Motor Vehicle Act - Governmment of India Publications
2. Economics of Transport, S.K. Shrivastava
3. Transport Development in India, S. Chand & Co. Pvt. Ltd., New Delhi.

Course Code	Course/Subject Name	Credits
AEP701 / AEP802	**Project I/ II**	**3 / 6**

Objective

1. To acquaint with the process of undertaking literature survey/industrial visit and identifying the problem
2. To familiarize the process of solving the problem in a group
3. To acquaint with the process of applying basic engineering fundamental in the domain of practical applications
4. To inculcate the process of research

Outcome: Learner will be able to…

1. Do literature survey/industrial visit and identify the problem
2. Apply basic engineering fundamental in the domain of practical applications
3. Cultivate the habit of working in a team
4. Attempt a problem solution in a right approach
5. Correlate the theoretical and experimental/simulations results and draw the proper inferences
6. Prepare report as per the standard guidelines.

Guidelines for Project

- Students should do literature survey/visit industry/analyze current trends and identify the problem for Project and finalize in consultation with Guide/Supervisor. Students should use multiple literatures and understand the problem.
- Students should attempt solution to the problem by experimental/simulation methods.
- The solution to be validated with proper justification and report to be compiled in standard format.

Guidelines for Assessment of Project I

- Project I should be assessed based on following points
  - Quality of problem selected
  - Clarity of Problem definition and Feasibility of problem solution
  - Relevance to the specialization
  - Clarity of objective and scope
  - Breadth and depth of literature survey
- Project I should be assessed through a presentation by the student project group to a panel of Internal examiners appointed by the Head of the Department/Institute of respective Programme.

Guidelines for Assessment of Project II

- Project II should be assessed based on following points
  - Quality of problem selected
  - Clarity of Problem definition and Feasibility of problem solution
  - Relevance to the specialization / Industrial trends
  - Clarity of objective and scope
  - Quality of work attempted
  - Validation of results
  - Quality of Written and Oral Presentation
- Report should be prepared as per the guidelines issued by the University of Mumbai.
- Project II should be assessed through a presentation by the student project group to a panel of Internal and External Examiners approved by the University of Mumbai
- Students should be motivated to publish a paper based on the work in Conferences/students competitions