UNIVERSITY OF MUMBAI

Bachelor of Engineering

Automobile Engineering

Final Year (Sem. VIII)

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 VIII)

Course Code	Course Name	Teaching Scheme (Contact Hours)		Credits Assigned		
		Theory	Pract.	Theory	Pract.	Total
AEC801	Autotronics	4	2	4	1	5
AEC802	Vehicle Dynamics	4	2	4	1	5
AEC803	Vehicle Maintenance	4	2	4	1	5
AEE802X	Elective II	3	2	3	1	4
AEP802	Project II	--	12#	--	6	6
Total		**15**	**20**	**15**	**10**	**25**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract./ oral	Total
		Internal Assessment			End Sem. Exam.	Exam. Duration (in Hrs)			
		Test1	Test 2	Avg.					
AEC801	Autotronics	20	20	20	80	03	25	25	150
AEC802	Vehicle Dynamics	20	20	20	80	03	25	--	125
AEC803	Vehicle Maintenance	20	20	20	80	03	25	25	150
AEE802X	Elective II	20	20	20	80	03	25	--	125
AEP802	Project II	--	--	--	--	--	50	100	150
Total		**--**	**--**	**80**	**320**	**--**	**150**	**150**	**700**

* Only ORAL examination based on term work and syllabus

# indicates work load of Learner (Not faculty) in VII and VIII semester for Project

Project –I and II: Students groups and load of faculty per week

Project Groups : Students can form groups with minimum 2 (Two) and not more than 4 (Four)

Faculty Load: In semester VII – ½ an hour per week per project group

In semester VIII - 1 hour per week per project group

Each faculty is permitted to take (guide) maximum 4 (Four) project groups.

Course Code	Elective II
AEE8021	Noise Vibrations & Harshness
AEE8022	Vehicle Safety
AEE8023	World Class Manufacturing &
AEE8024	Knowledge Management
AEE8025	Project Management &
AEE8026	Artificial Intelligence
AEE8027	Virtual Reality

& Common with Mechanical Engineering

Course Code	Course/Subject Name	Credits
AEC 801	**Autotronics**	**4+1**

Objectives

1. To study basic and advance Automotive Electronics systems.
2. To study working of different Automotive Electronics systems and subsystems.
3. To study basic and advance electronics technologies like Battery, Fuel Cell, ECM etc.
4. To have basic idea about how automotive electrical systems are developed.

Course Outcomes: Learner will be able to……

1. Practically identify different automotive Electronics systems and subsystems.
2. Practically identify and demonstrate Systems like Battery, Alternator, Dynamo, Starter Motors, and Sensors etc.

Module	Detailed Contents	Hrs.
01	**1. Battery** 1.1 Requirement, 1.2 Construction, 1.3 Principle of operation, 1.4 Working of Lead acid, alkaline, Zebra, Sodium Sulphur, Swing, batteries, 1.5 Ratings, 1.6 Charging. 1.7 Maintenance & testing of Lead acid battery. **2. Fuel Cells** 2.1 Introduction of Fuel Cells & fuel used 2.2 Constructions and Operation of proton Exchange membrane 2.3 Alkaline Fuel Cell. 2.4 Medium & high temperature fuel cells, 2.5 Reformers. **3. 42-volt technology** 3.1 Introduction, 3.2 Transition from 12V to 42V electrical system, 3.3 Need of 42V automotive electrical system. 3.4 42V automotive power system, 3.5 Method of controlling 12V system in 42V architecture, 3.6 Present developments in 42 volt technology.	08
02	**1. Charging System** 1.1 Requirements of charging system 1.2 Dynamo 1.2.1 Principle of operation 1.2.2 Construction 1.2.3 Working 1.2.4 Regulators, Combined current & voltage regulator etc. 1.3 Alternator 1.3.1 Principle of operation 1.3.2 Construction 1.3.3 Working 1.3.4 Rectification from AC to DC **2. Starting system** 2.1 Requirements of starting system	08

	2.2 Various torque terms used 2.3 Starter motors drives 2.3.1 Bendix 2.3.2 Folo through Barrel 2.3.3 Rubber compression 2.3.4 Compression spring 2.3.5 Friction clutch 2.3.6 Overrunning clutch 2.3.7 Dyer 2.4 Starter motor solenoids & switches 2.5 Glow plugs **3. Integrated Starter and Alternator**	
03	**1. Electronic Ignition System** 1.1 Capacitor Discharge Ignition system 1.2 Distributer less Ignition System 1.3 Direct Ignition System, 1.4 Hall Effect pulse generator 1.5 Inductive pulse generator 1.6 Constant dwell system 1.7 Constant energy system **2. Electronic Engine controls** 2.1 Electronic control module (ECM) 2.2 Operating modes of ECM (closed loop & open loop) 2.3 Inputs required & output signals from ECM 2.4 Electronic spark timing 2.5 Electronic spark control 2.6 Air management system 2.7 idle speed control	08
04	**1. Sensors & Actuators** 1.1 Automotive Sensors, 1.1.1 Thermisters, 1.1.2 Inductive Sensors, 1.1.3 Position Sensors (Rotary, Linear) 1.1.4 Pressure Sensors, 1.1.5 Knock Sensor, 1.1.6 Optical Sensor 1.1.7 Hot wire & thin film air flow sensor, 1.1.8 Turbine fluid flow sensors 1.1.9 Light sensor, 1.1.10 Methanol sensor 1.1.11 Rain sensor operating principles 1.1.12 Oxygen sensor 1.1.13 Application & new developments in sensor technology 1.2 Automotive Actuators 1.2.1 Introduction, 1.2.2 Function & operating principle 1.2.3 Construction & working of solenoid actuators, 1.2.4 Relays 1.2.5 Motorized actuators, 1.2.6 Thermal Actuators 1.2.7 Electro hydraulic & Electrochemical Valve actuators, 1.2.8 Application & new developments in the actuators technology. 1.2.9 Stepper motors.	08

05	**1. Automotive Lighting and wiring harness systems.** 1.1 Lighting 1.1.1 Energy demand of lighting system 1.1.2 Types of Lamps i. Head lamp: Construction & types. Setting & control ii. Fog Lamp iii. Side Lamp iv. Tail lamp v. Parking lamp vi. Brake warning light vii. Trafficators viii. Blinkers ix. Flashers x. Electronic flasher circuit xi. Instrument panel lights xii. Body interior illumination xiii. Adaptive lighting system. 1.1.3 Reflectors: Parabolic, Bifocal, Homifocal, poly-ellipsoidal 1.1.4 Gauges: Fuel, Temperature, Oil pressure etc. 1.1.5 Accessories: Electric horn, wipers, Fuel pump, Power operated windows. 1.2 Wiring 1.2.1 Cables 1.2.2 Sizes 1.2.3 Colors & color codes 1.2.4 Connectors 1.2.3 Multiplex wiring system	08
06	**Introduction to Automotive embedded system and Intelligent vehicle system. Telematics, X by wire, GPS etc.**	08

List of Experiments

1. Study of Lead Acid Battery.
2. Study of Fuel Cells.
3. Dismantling, Inspection & assembly of A. C. Generator/Dynamo.
4. Dismantling, Inspection & assembly of Starter motor.
5. Measurement of Temperature using sensor.
6. Measurement of Pressure using sensor.
7. Measurement of Position using sensor.
8. Measurement of Oxygen using sensor.
9. Study of Air Management System under different operating conditions.
10. Study of effect of operating variables on injector's activating Pulses.
11. Study of functioning/working of Idle speed control system.
12. Study of effect of spark advances on the Engine Emissions.
13. Study of Idle Speed Control.
14. Study of Electro-magnetic fuel Injector.

Term Work

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

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.

Practical/Oral examination

1. Practical examination is based on list of experiments proposed.
2. Demonstration of automobile electronic systems like Battery, Alternator, Dynamo, Starter Motors, Sensors etc
3. 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
5. Students work along with evaluation report to be preserved till the next examination

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. Understanding Automotive Electronics by William B. Ribbens
2. Automobile Electrical & Electronics by Tom Denton.
3. Intelligent Vehicle Technologies by Michel Parent
4. Light weight Electric/Hybrid vehicle design by John Fenton & Ron Hodkinson
5. Computerized engine control by Dick King
6. Automotive electrical equipments by P.L.Kohli
7. Automotive Mechanics by William Crouse and Anglin.
8. Automotive Electronic Hand book by Ronald K. Jurgen
9. Car electronics (Second edition) edited by Shuji Mizutani.

Course Code	Course /Subject Name	Credits
AEC802	**Vehicle Dynamics**	**4+1**

Objective

1. To provide students with the fundamental knowledge in the field of automotive dynamics.

Outcome: 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	Details	Hrs
1	**Fundamentals of vehicle dynamics** Road loads, Aerodynamics - Drag, side force, Lift force, Rolling resistance, Total road loads, Ride, Vehicle response properties, Perception of ride. **Tyres** Tyre construction, Tractive properties, Cornering properties, Camber thrust, Aligning moment, Combined braking and cornering, Conicity and ply steer, Tire vibrations, Tyre properties affecting vehicle rollover	**10**
2	**Suspension systems** Fundamental approach to vehicle modeling, Single mass system with two degree of freedom, Theory and problems of double Conjugate points, Motion after the hump, Acceleration for stepped input, Solid axles, Independent suspensions, Anti- Squat and anti- pitch suspension geometry, Equalizing type of suspension, Active suspension, Semi Active.	**10**
3	Roll Center of suspension linkages, Roll axes and roll angles, Non- Roll layout, No Roll suspensions, **Vehicle Rollover** Characteristics of on road rollover, Rollover résistance, Anti rollover Braking, Anti- roll bar and its effects **Equation of Motion** Euler's equation of motion, Inertia tensor axes	**08**
4	**Steering Systems** Steering geometry, Front wheel geometry, Steering system forces and, moments, Steering system effects, Influence of front wheel drive, Four wheel steering, Steering oscillations, Shimmy & wheel wobble, Jack Knifing of articulated vehicles	**07**
5	**Handling characteristics** Steady state cornering, Low speed turning, High speed cornering, Stability derivatives (Derivation and problems), Suspension effect of cornering, Steady state and Transient behavior	**07**
6	**Recent trends in vehicle dynamics** Stability Control systems, Introduction of vehicle sensors, Central tyre, inflation systems, Influence of parameters at vehicle rollover, Vehicle dynamics simulations	**06**

List of Experiments

1. Mathematical modeling of suspension system (Quarter suspension model and half vehicle).
2. Live problem on suspension design of modern vehicle in passenger car segment, heavy vehicle segment etc

Term Work

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

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. Fundamentals of Vehicle Dynamics By Thomas. D. Gillespie.
2. Multibody Systems Approach to Vehicle Dynamics Mike Blundell and Damian Harty.
3. Mechanics of Road vehicle By Steeds.
4. Mechanics of vehicles By J.J. Taborelc.
5. Automobile suspension and Handling By Colin Campell.
6. Car suspension By Bastow.

Course Code	Course /Subject Name	Credits
AEC803	**Vehicle Maintenance**	**4+1**

Objectives

1. To study basics of vehicle maintenance
2. To study maintenance of vehicle systems and subsystems
3. To study different automotive diagnostic tools

Outcomes: Learner will be able to……

1. Effectively use automotive diagnostic tools in industries.
2. Improve existing vehicle maintenance practices in industries.

Module	Details	Hrs.
1	**Types of Maintenance** **Automotive Engine Diagnosis:** Lower End Theory and Service, Upper End Theory and Service, Engine Lubrication Diagnosis and Service, Cooling System Diagnosis	06
2	**Electrical System Diagnostic and Service** Batteries: Theory Diagnosis, and Service Starting System Diagnosis, and Service Charging Systems Basic Lighting System Diagnosis	10
3	**Electrical Accessories** Windshield Wiper/Washer Systems , Horns/Clocks/Cigarette Lighter Systems, Sound Systems , Power Lock Systems, Power Windows, Power Seats, Power Mirror System, Rear-Window Defrosters an Heated Mirror Systems, Other Electronic Equipment, Security and Antitheft Devices	06
4	**Restraint Systems: Theory, Diagnosis, and Service** Seat Belts , Seat Belt Service, Air Bags, Electrical System Components Diagnosis, Servicing the Air Bag System, Other Protection Systems	06
5	**Manual transmissions and transaxles** Clutch Problem Diagnosis and Service, Diagnosis of Drive Shaft and U-Joint Problems, Transmission/Transaxle Problem Diagnosis and Service, Servicing the Final Drive Assembly and Diagnosing Differential Noises	08
6	**Suspension And Steering Systems** Tire/Wheel Run out, Tire Replacement, Tire Repair, Installation of Tire/ Wheel Assembly on the Vehicle, Basic Front-Suspension Diagnosis and Service, Manual-Steering Systems and Power-Steering System Diagnosis and service, Alignment Geometry Performing an Alignment on Two wheel drive Four-Wheel-Drive Vehicle Alignment **Brakes** Drum Brake Inspection, Brake Shoes and Linings, Wheel Cylinder Inspection and Servicing, Drum Parking Brakes. Disc Brake Diagnosis and Service, General Caliper Inspection and Servicing, Rear Disc Brake Calipers, Antilock Brake System Diagnosis and Service	12

	Engine Performance OBD-II Self- Diagnostics, Basic Diagnosis of Electronic Engine Control Systems Using Scan Tool Data, Symptom-Based Diagnosis, Ignition System Diagnosis and Service, Fuel Injection System Diagnosis and Service, Emission Control Diagnosis and Service, EGR System Diagnosis and Service , Catalytic Converter Diagnosis, Air System Diagnosis and Service	

List of Experiments

1. To perform engine analysis of petrol & diesel engines using a computerized engine analyzer or Auto Master.
2. To perform wheel balancing on a computerized wheel balancer.
3. To find the steering geometry of a vehicle using a computerized wheel aligner
4. Removing and refitting of tyre using an automatic tyre changer.
5. Dismantling, inspection and repairing and assembly of engine components.
6. Experiment on calibration of the fuel injection pump.
7. Study of body repairing and reconditioning methods.

Term Work

Term work shall consist of 7 experiments from the list, and minimum 6 assignments covering maximum portion of the syllabus (one on each module).

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.

Practical/Oral examination

1. Practical examination duration is 2 hours.
2. Examination is based on experiments performed during the semester
3. 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
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. Automotive Technology :A Systems Approach, 5e Jack Erjavec/Delmar Cengage Learning
2. Automotive Mechanics, William Crouse and Donald Anglin /TATA Mc Graw-hill
3. Automotive Technology, Joseph Heitner
4. Automotive Electrical and Electronic Systems by John F. Kershaw, James D. Halderman
5. Automotive Engines: Theory and Servicing by J.D.Halderman & Mitchell/Pearson Education.

Course Code	Course/Subject Name	Credits
AEE 8021	**Noise, Vibrations and Harshness**	**3+1**

Objectives

1. To study basic concepts of noise, vibration and harshness and their effects
2. To study various methods of Vibration control
3. To study and analyze sounds and detection of noise from automobiles.

Outcomes: Learner will be able to…

1. Identify and analyze vibrations and noise coming out of automobiles
2. Investigate level of harm caused by noise and harshness and to provide measures to control it.

Module	Detailed Contents	Hrs.
01	1. **Basics of Vibrations:** 1.1 Basic Concepts 1.2 Mathematical Models 1.3 System characteristics and response 1.4 Single and Multi DOF systems	06
02	2. **Vibration control:** 2.1 Isolators 2.2 Tuned absorbers 2.3 Untuned viscous dampers 2.4 Applications: single cylinder engines, multi cylinder engine 2.5 Simple rubber engine mounts 2.6 Hydro elastic mounts 2.7 Semi active mounts and active mounts 2.8 Mass elastic models and measurements 2.9 Limits for passenger comforts	08
03	3. **Sound & sound measurement:** 3.1 Fundamentals of acoustics 3.1.1 General sound propagation 3.1.2 Plane wave propagation 3.1.3 Spherical wave propagation 3.2 Human response to sound – the audible range 3.3 Sound measurement 3.3.1 Instrumentation 3.3.2 Sound level meters 3.3.3 Frequency intensity analyzers 3.3.4 Real time measurements	08
04	4. **Automotive noise:** 4.1 Automotive noise criteria 4.1.1 Drive by noise test 4.1.2 Noise from stationary vehicles 4.1.3 Interior noise in vehicles 4.2 Automotive noise 4.2.1 Sources and control methods i) Engine noise ii) Transmission noise iii) Intake and exhaust noise iv) Aerodynamic noise v) Tyre noise vi) Brake noise	06

05	5. **General noise control principles** 5.1 Sound in enclosures 5.2 Sound energy absorption 5.3 Sound transmission through barriers	04
06	6. **Harshness** 6.1 Causes 6.2 Frequency limits	04

Term Work

Term work shall consist of at 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:

- 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. Rao S S, "Mechanical Vibrations", Addison Wesley Longman, New Delhi, 1995.
2. Heinz Heisler, “Advanced Engine Technology”, SAE 1995.
3. “Automobiles and pollution” SAE Transaction, 1995.
4. Seto, “Mechanical Vibrations ", Schaum Outline Series, McGraw Hill Book Company, New York, 1990.
5. Springer and Patterson, “Engine Emission”, Plenum Press 1990.
6. Thomson W T, "Theory of Vibration with Applications", CBS Publishers and Distributors, New Delhi, 1990.
7. Ashok Kumar Mallik, “Principles of Vibration control”, Affiliated East-West Press (P) Ltd., New Delhi, 1990.
8. Grover G K, "Mechanical Vibrations ", New Chand and Brothers, Roorkey, 1989.
9. Tse Morse and Hinkle, “Mechanical Vibration”, Prentice Hall of India Ltd., New Delhi,1987.

Course Code	Course/Subject	Credits
AEE 8022	**Vehicle Safety**	**3+1**

Objectives

1. To study basic concepts of vehicle safety
2. To study accident reconstruction analysis methods
3. To study different issues in vehicle safety

Outcomes: Learner will be able to……

1. Understand vehicle design from safety point of view
2. Apply the concepts of accident reconstruction analysis in real world

Module	Detailed Contents	Hrs.
01	**Introduction:** Introduction to vehicle safety, Basic concepts of vehicle safety, Risk evaluation and communication, Human error control, Universal design The distracted driver, Special design problems (Design for children, handicap, etc)	06
02	**Safety Regulations and testing:** Vehicle Safety Regulations, Accident Data, Accident Avoidance, Biomechanics and Occupant Simulation, Crash Testing, Vehicle Body Testing, Dynamic Vehicle Simulation Tests, Occupant Protection Pedestrian Protection, Compatibility, Interrelationship among Occupants, Restraint Systems, and Vehicle in Accidents	08
03	**Rear Crash Safety:** Head Restraint Position during Normal Driving, Study of procedure to evaluate Occupant Interaction with seat in rear crashes, Role of seat in Rear crash safety, Performance criteria for different seats, Ultra high Retention seats, Human and dummy responses for Pendulum impacts to the Back Effectiveness of Self –Aligning Head Restraints in preventing whiplash, Energy absorptions properties of Head Restraints, Introduction to RUPD (Rear under rum protection device)	08
04	**Accident Reconstruction Analysis:** Uncertainty in Measurement and cautions, Tire forces, Straight-line Motion Critical speed from Tire Yaw marks, Reconstruction of Vehicular Rollover Accidents, Analysis of Collisions , Impulse – Momentum Theory, Reconstruction Applications , Impulse Momentum Theory, Crush Energy Frontal Vehicle –Pedestrian Collusion, Photogrammetry for accident constructions	08
05	Working of different Automotive safety systems Recent trends in Automotive safety systems	04
06	Key issues in vehicle safety in India and Abroad	02

List of Experiments:

1. Measurement of Windscreen wiping area for different vehicles.
2. Study of Crash test dummies.
3. Measurement of Eye lids, H Point and R Point.
4. Calibration study of Speedometer and Odometer.
5. Study of Tell Tale Symbols in Indian Cars
6. Industrial Visit

Term Work

Term work shall consist of 5 experiments from the list, 6 assignments covering maximum portion of the syllabus (One on each module).

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

- Laboratory work (Experiments) **:** **10 marks**
- Assignments : **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.

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 vehicle safety by George Peters and Barbara Peters, CRC Press, 2002.
2. Understanding Automotive electronics by William Ribbens, Newnes, Sixth Edition, 2003.
3. Vehicle Accident Analysis and Reconstruction Methods by Raymond M. Brach and R. Matthew Brach, SAE International, Second Edition, 2011.
4. Role of the seat in rear crash safety by David C. Viano, SAE International, 2002.
5. Automotive Safety Handbook by Ulrich W. Seiffert and Lothar Wech, SAE International, 2007.

Course Code	Course/Subject Name	Credits
AEE 8023	World Class Manufacturing[&]	3+1

[&] Common with Mechanical Engineering

Objectives

1. To familiarize the students with the concepts of Business excellence and competitiveness.
2. To apprise the students with the need to meet the current and future business challenges.
3. To prepare the students to understand the current global manufacturing scenario.

Outcomes: Learner will be able to..

1. Demonstrate the relevance and basics of World Class Manufacturing.
2. Identify the factors of competitiveness and performance measures based on which, global manufacturing success is bench marked
3. Draw current Status of Indian Manufacturing scenario and design and develop a roadmap to achieve world class manufacturing status.

Module	Details	Hrs.
01	**Historical Perspective** World class organizations: Meaning of world class. Competitiveness and Performance measures. Criteria for world class organizations in Manufacturing. Competing in World markets. Review of frameworks in World Class Manufacturing (WCM). Models for manufacturing excellence: Schonberger, Halls, Gunn & Maskell models and Business Excellence.	05
02	**Benchmark, Bottlenecks and Best Practices** Concepts of benchmarking, Bottleneck & best practices. Best performers, Gaining competitive edge through world class manufacturing, Value added manufacturing, Value Stream mapping, Eliminating different types of waste. Lean Thinking (Toyota Production System), Six Sigma, Theory of Constraints.	07
03	**System and Tools for World Class Manufacturing** Improving Product & Process Design: SQC, Statistical Process Control, Quality Function Deployment (QFD), Seven Basic Quality Tools, FMS, Poka Yoke, 5-S, Optimizing Procurement & stores practices, Total Productive maintenance and Visual Control.	07
04	**HR Dimensions in WCM – WCM Strategy Formulation** 4.1 Adding value to the organization: Organizational learning, techniques of removing Root cause of problems, People as problem solvers, New organizational structures. 4.2 Associates: Facilitators, Teams man ship, Motivation and reward in the age of continuous improvement.	05
05	**Characteristics of WCM Companies** Performance indicators like POP, TOPP and AMBITE systems. Other features of WCM : Supply Chain Management & key issues in SCM, Agile Manufacturing, Green Manufacturing, Role of Information system in WCM, Introduction to Knowledge management, Study of various performance measures in world class organization.	06
06	**Total Quality Management (TQM)** Definition, Understanding quality, Evolution of TQM, Framework for TQM, Commitment and leadership, Customer satisfaction, Employee involvement, Continuous process improvement, Supplier partnership, Performance measures, Formulation and implementation of TQM: Case Study.	06

Term Work

Term work shall consist of at least six assignments on topics drawn from the syllabus [1 assignment per module] and at least 3 case studies and analysis based on the topics mentioned above.

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

- Assignments: **10** marks
- Lab work (Case Studies: at least 3, with inferences): **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. World Class Manufacturing – Strategic Perspective, Sahay B.S., Saxena K B C and Ashish Kumar, Mac Milan Publications, New Delhi.
2. World Class Manufacturing - The Lesson of Simplicity, Schonberger R. J, Free Press, 1986
3. Management strategy: achieving sustained competitive advantage, Marcus, A. A.,New York: McGraw-Hill/Irwin, 2011.
4. Manufacturing Strategy: Process and Content, Voss C. A., Chapman & Hall, London, 1992.
5. Lean production simplified, Pascal. D., 2nd Edition, Productivity Press, 2007
6. Total Quality Management, Besterfield, D. H., Pearson Education, 1999.
7. Advanced Operations Management, Mohanty R. P., Deshmukh S. G., Pearson Education,2003.
8. "Managing Technology and Innovation for Competitive Advantage", Narayanan V.K, Prentice Hall, 2000.
9. "Making Common Sense Common Practice – Models for manufacturing Excellence", Ron Moore, Butter worth Heinmann.
10. The Toyota Way – 14 Management Principles", Jeffrey K.Liker, Mc-Graw Hill, 2003. "Operations Management for Competitive Advantage", Chase Richard B., Jacob Robert., 11th Edition , McGraw Hill Publications, 2005.

Course Code	Course/Subject Name	Credits
AEE 8024	**Knowledge Management**	**3+1**

Objectives

1. To study basic concepts of knowledge management
2. To understand knowledge management tools and techniques

Outcomes: Learner will be able to…

1. Effectively implement knowledge management in organizations
2. Improve existing knowledge management practices in organizations

Module	Detailed Contents	Hrs.
01	**Introduction to Knowledge Management:** What Is Knowledge Management? Data ,information and knowledge, Types of knowledge, Forces Driving Knowledge Management, Knowledge Management Systems, Knowledge management systems and existing technology	02
02	**Principles of Knowledge Management** **2.1 Knowledge Management Foundations: Infrastructure, Mechanisms, and Technologies:** Knowledge Management Foundations, Knowledge Management Infrastructure, Knowledge Management Mechanisms, Knowledge Management Technologies, Management of Knowledge Management Foundations **2.2 Knowledge Management Solutions: Processes and Systems:** Knowledge Management Processes, Knowledge Management Systems, Managing Knowledge Management Solutions **2.3 Organizational Impacts of Knowledge Management:** Impact on People, Impact on Processes, Impact on Products, Impact on Organizational Performance	06
03	**Knowledge Management Technologies and systems** **3.1Knowledge Application Systems: Systems that Utilize Knowledge:** Technologies for Applying Knowledge, Developing Knowledge Application Systems, Types of Knowledge Application Systems, Limitations of Knowledge Application Systems **3.2 Knowledge Capture Systems: Systems that Preserve and Formalize** **Knowledge:** What Are Knowledge Capture Systems? Knowledge, Management Mechanisms to Capture Tacit Knowledge: Using Organization Stories, Techniques for Organizing and Using Stories in the Organization Designing the Knowledge Capture System, Concept Maps, Context-Based Reasoning, Barriers to the Use of Knowledge Capture Systems **3.3 Knowledge Sharing Systems: Systems that Organize and Distribute Knowledge:** What Are Knowledge Sharing Systems?, Designing The Knowledge Sharing System, Barriers to The Use of Knowledge Sharing Systems, Specific Types of Knowledge Sharing Systems, Lessons Learned Systems, Communities Of Practices (COP), Expertise Locator Knowledge Sharing Systems, The Role of Ontologies and Knowledge Taxonomies in the Development of Expertise Locator Systems, Shortcomings of Knowledge Sharing Systems 3.**4 Knowledge Discovery Systems: Systems that Create Knowledge:** Mechanisms to Discover Knowledge: Using Socialization to Create, New Tacit Knowledge, Technologies to Discover Knowledge: Using Data Mining to Create, New Explicit Knowledge, Designing the Knowledge Discovery System, Barriers to the Use of Knowledge Discovery Systems	10

04	**4.1 Emergent Knowledge Management Practices** **4.2 Factors Influencing Knowledge Management:** A Contingency View of Knowledge Management, The Effects of Task Characteristics, The Effects of Knowledge Characteristics, The Effects of Organizational and Environmental Characteristics, Identification of Appropriate Knowledge Management Solutions **4.3 Leadership and Assessment of Knowledge Management:** Leadership of Knowledge Management, Importance of Knowledge Management Assessment, Types of Knowledge Management Assessment, Assessment of Knowledge Management Solutions, Assessment of Knowledge, Assessment of Impacts	08
05	**The Future of Knowledge Management:** Using Knowledge Management as a Decision-Making Paradigm to Address Wicked Problems, Promoting Knowledge Sharing While Protecting Intellectual Property, Involving Internal and External Knowledge Creators, Addressing Barriers to Knowledge Sharing and Creation, KM for innovation	06
06	**Case studies in Knowledge Management**	04

List of Experiments

1. Case studies on knowledge Management
2. Group seminar (Group shall not be of more than 3 members)

Term Work

Term work shall consist of a case study, report of group seminar, 6 assignments covering maximum portion of the syllabus (one on each module).

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

- Case study**:** **10 marks**
- Seminar: **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. Encyclopedia of knowledge management by David Schwartz, publisher : Idea Group Reference
2. Knowledge Management Foundations by Steve Fuller,publisher: Butterworth–Heinemann.
3. KM tools and techniques : practitioners and experts evaluate KM solutions / Madanmohan Rao ,publisher Elsevier Butterworth–Heinemann
4. Knowledge management strategies for business development / Meir Russ, editor. Published by Business Science Reference
5. The Knowledge-Creating Company by Ikujiro Nonaka by Harvard Business Review.
6. The complete guide to knowledge management: a strategic plan to leverage your company's intellectual capital / Edna Pasher and Tuvya Ronen.
7. The Knowledge management Toolkit:Practical Techniques for building a Knowledge management System by Amrit Tiwana/ Pearson Education

Course Code	Course/Subject Name	Credits
AEE 8025	Project Management[&]	3+1

[&] Common with Mechanical Engineering

Objectives

1. To familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques.
2. To apprise the students with the project management lifecycle and make them knowledgeable about the various phases from project initiation through closure.

Outcomes: Learner will be able to..

1. Apply selection criteria and select an appropriate project from different options.
2. Write work break down structure for a project and develop a schedule based on it.
3. Identify opportunities and threats to the project and decide an approach to deal with them strategically.
4. Use Earned value technique and determine & predict status of the project.
5. Capture lessons learned during project phases and document them for future reference.

Module	Detailed Contents	Hrs.
01	**Project Management Foundations** Definition of project management, project manager and project. Project types, project phases and knowledge areas.	04
02	**Initiating Projects** How to get a project started; Your project sponsor and creating charter; The project team and team dynamics; running meetings	06
03	**Planning Projects** Project estimating and scheduling techniques. PERT, CPM, GANTT chart. Introduction to any one project scheduling software.	08
04	**Planning Projects** Risk planning methods; Cost planning; Communication plan and Final project plan.	04
05	**Executing Projects** 5.1 Team management; communicating and engaging with all stakeholders of the projects. **Controlling Projects** 5.2 Earned Value Management techniques for measuring your work completed; Using milestones for measurement; change requests and scope creep. Keeping up with the project, Updating the project, Project Issues management and Dealing with troubled projects.	08
06	**Closing the Project** Customer acceptance; completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study.	06

Term Work

Term work shall consist of,

1. Assignments: On topics drawn from syllabus [At least 1 assignment per module].
2. One scheduling exercise on any project management software where writing WBS and Scheduling on PMIS software for a simple project or a Case Study on project selection/ risk management.
3. Case Studies (at least 2 with inferences).

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

- Assignments: **10** marks
- Scheduling on PMIS software: **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. Project Management and Control,Narendra Singh; Himalaya Publishing House
2. Preparation, Appraisal, Budgeting, Implementing and Review, Prasanna Chandra TMGH
3. Project Management: A managerial approach, Jack Meredith & Samuel Mantel, Wiley India, 7th Ed.
4. Project Management, Dennis Lock, Gower Publishing England, 9th Ed.
5. Project Management, Gido Clements & Cengage Learning.
6. Project Management, Gopalan, Wiley India
7. Projects- Planning, Analysis, Selection, Financing, Implementation and Review, Prasanna Chandra, TMGH

Course Code	Course/Subject Name	Credits
AEE 8026	**Artificial Intelligence**	**3+1**

Objectives

1. Introduction to the basic concepts of Artificial Intelligence.
2. To develop the design and programming skills.
3. Implement, evaluate, and compare the performance of various AI Techniques.

Course Outcomes: Learner will be able to …..

1. Apply the concept in Automobile industry

2. Model and simulate real life problem of Automobile industries.

Module	Detailed Contents	Hrs.
01	**AI and Internal Representation** Artificial Intelligence and the World, Representation in AI, Properties of Internal Representation, The Predicate Calculus **Intelligent Agents:** Concept of Rational Agent, Structure of Intelligent agents, Agent Environments**.** **Problem Solving :** Solving problems by searching, Problem Formulation, Search Strategies, Uninformed Search Techniques, DFS, BFS, Uniform cost search, Iterative Deepening, Comparing different Techniques, Informed search methods – Best First Search, heuristic functions, Hill Climbing, A*.IDA*. Crypt Arithmetic, Bactracking for CSP	**06**
02	**Programming in LISP or PROLOG** Lisps, Typing at Lisp, Defining Programs, Basic Flow of Control in Lisp, Lisp Style, Atoms and Lists, Basic Debugging, Building Up List Structure, More on Predicates, Properties, Pointers, Cell Notation and the Internals (Almost) of Lisp, Destructive Modification of Lists, The for Function, Recursion, Scope of Variables Input/Output, Macros	**06**
03	**Fundamentals Concepts and Models of Artificial Neural Systems** Biological Neuron and their Artificial Models, Models of ANN, Learning and Adaptation, Neural Networking Learning Rules. Single-layer Perception Classifiers **Multilayer Feed forward Networks :** Linearly Nonseparable Pattern Classification, Delta Learning Rule, Feed forward Recall and Error Back-Propagation Training, Learning Factor	**06**
04	**Fuzzy Systems** **Fuzzy Sets: Fuzzy** Relations, Fuzzy Function, Fuzzy Measures, probabilities possibilities. Fuzzy Modeling and applications of Fuzzy Control. Neural and fuzzy machine Intelligence	**06**
05	**Generic Algorithm:** Simple generic algorithm, Simulation by hands, similarity templates (Schemata), Mathematical foundations, Schema processing at work, Two armed and k armed Bandit Problem, Building blocks hypothesis, Minimal Deceptive Problem, Computer implementation of generic algorithm, Data structures, Reproduction, Cross over and mutation. Time to response and time to cross mapping objective function to fitness from fitness scaling. Application of generic algorithm. De Jong and Function Optimization. Improvement in basic techniques, Improvement to genetics based machine learning, application of genetic based machine learning	**06**

06	**Data Mining & Information Retrieval** Data warehousing & Data Mining. Online Analytic Processing [OLAP]: its architecture and its use. Java implementations, classification trees and exploratory data analysis [EDA]. EDA Vs Hypothesis Testing, Computational EDA Techniques, Graphical [Data Visualization], EDA techniques for function fitting, data smoothing, layering, tessellations, contour projections, Verification of results of EDA. Applications & trends in data mining. Case Studies	**06**

Term Work

Term work shall consist of, Assignments on each module [At least 1 assignment per module]. The distribution of marks for term work shall be as follows:

1. Assignments: **20** marks
2. 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. Introduction to Artificial intelligence By Eugene Charniak, Drew McDermott Addison Wesley
1. Artificial Neural Networks- B.Yegnanarayana, PHI, 1999.
2. Genetic Algorithms in search, Optimization & Machine Learning by David E Goldberg-Addison wesley
3. Data Mining by Pieter Adriaans and Dolt Zantinge - Pearson Education Asia
4. Data Warehousing in the Real World by Sam Anahory and Dennis Murray.
5. Artificial Intelligence, Elaine Rich, Kevin Knight, S. Nair, McGraw Hill Publishing Company Ltd
6. Principles of Artificial Intelligence – N.J. Nilsson, Tioga Hill, 1992.
7. Artificial Intelligence and Design of Expert Systems – C.F. Luger & W.A. Stubblefeild, Addison-Wesley.
8. Introduction to Data Mining & Knowledge Discovery – Edelstein, Herbert A.
9. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House, 2001.
10. Neural Network – SimsonHaykin, Macmillan Publication, 1994.
11. Fuzzy Set Theory & its Applications – H.J.Zimmermann, Allied Publishers Ltd, 1996.

Course Code	Course/Subject Name	Credits
AEE8027	**Virtual Reality**	**3+1**

Objectives

1. Introduction to the basic concepts of Virtual Reality.
2. To develop the design and programming skills.
3. Implement, evaluate, and compare the performance of various Virtual Reality Techniques

Outcomes: Learner will be able to….

1. Apply the concept in Automobile industry

2. Model and simulate real life problem of Automobile industries.

Module	Detailed Contents	Hrs.
01	**Introduction:** A short history of early virtual reality, early commercial VR Technology, VR becomes an Industry, The five classical components of VR Systems. **Input Devices: Trackers, Navigations and Gesture Interfaces.** Three Dimensional Position Trackers: Tracker performance parameters, Mechanical trackers, Magnetic trackers, Ultrasonic trackers, Optical Trackers and Hybrid Inertial Trackers Navigation and Manipulation Interfaces: Tracker based Navigation/Manipulation Interfaces, Trackballs, and three Dimensional Probes Gesture Interfaces: The Pinch Glove, the 5DT Data Glove, the Didjiglove, the Cyberglove	**06**
02	**Output Devices: Graphical, Three Dimensional Sound and Haptic Displays:** Graphical Display: The human visual system, personal graphics displays, large volume displays. Sound displays: the human auditory system, the convolvotron, Speaker based three dimensional sound. Haptic Feedback: The human haptic system, Tactile Feedback Interfaces, Force Feedback Interfaces.	**06**
03	**Computing Architectures for Virtual Reality:** The Rendering Pipeline: The graphical rendering pipeline, The haptics rendering pipeline. PC Graphics Architectures: PC Graphics Accelerators, Graphics Benchmarks. Work Station Based Architectures: the Sun Blade 1000 Architecture, The SGI Infinite Reality Architecture. Distributed VR Architectures: Multipipeline Synchronization, Colocated rendering Pipelines, Distributed Virtual Environments.	**06**
04	**Modeling:** Geometric Modeling: Virtual Object Shape, Object Visual Appearance. Kinematics Modeling: Homogeneous Transformation Matrices, Object Position, Transformation Invariants, Object Hierarchies, viewing the three dimensional words. Physical Modeling: Collision Detection, Surface Deformation, Force Computation, Force Smoothing and Mapping, Haptic Texturing. Behavior Modeling and Model Management: Level of Detail Management, Cell Segmentation.	**06**
05	**Virtual Reality Programming:** Toolkits and Scene Graphs. World Toolkit: Model Geometry and Appearance, The WTK Scene Graph, Sensors and Action Functions, WTK Networking, JAVA 3D: Model Geometry and Appearance, Java 3D Scene graph, Sensors and Behaviors, Java 3D Networking, WTK and Java 3D Performance Comparison. General Haptics Open Software Toolkit: GHOST Integration with the Graphics Pipeline, The GHOST Haptic Scene Graph, Collision Detection and response, Graphics and PHANToM	**06**

	Calibration. **Human Factors in Virtual Reality:** Methodology and Terminology: Data Collection and Analysis, Usability Engineering Methodology. User Performance Studies: Test bed Evaluation of universal VR Tasks, Influence of System Responsiveness on User Performance, Influence of Feedback Multimodality.	
06	**Traditional Virtual Reality Applications:** Medical Application of VR: Virtual Anatomy, Triage and Diagnostic and Rehabilitation. Education, Arts and Entertainment: VR in Education, VR and, Surgery the Arts. Entertainment Application of VR. Military VR Application: Army use of VR, VR Application in Navy, Air Force use of VR. **Emerging Application of VR:** VR Application and Manufacturing: Virtual Prototyping, other VR Application in Manufacturing; Application of VR in Robotics: Robot Programming, Robot Tele operation. Information Visualization: Oil Exploration and Well Management, Volumetric Data Visualization.	**06**

Term Work

Term work shall consist of, at least one (1) assignments on each module

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. GrigoreBurdea, Philippe Coiffet, " Virtual Reality Technology" 2nd edition. Wiley India
2. John vince, "Virtual Reality Systems" Pearson Education Asia
3. Understanding Virtual Reality, Sherman, Elsever.

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