MAHARSHI DAYANAND UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION FOR
B. TECH. (AUTOMOBILE ENGINEERING)
SEMESTER-IV
'F' Scheme effective from 2011-12

MAHARSHI DAYANAND UNIVERSITY, ROHTAK (HARYANA)

SCHEME OF STUDIES & EXAMINATION FOR

Course No.	*Course Title*	*Teaching Schedule*				*Marks For Class Work*	*Marks for Examination*		*Total Marks*	*Duration of Exam*
		L	*T*	*P*	*TOTAL*		*Theory*	*Practical*		
AUE 202-F	Engineering Analysis and Numerical Methods	3	1	-	4	50	100	-	150	3
AUE 204-F	Heat Transfer and Combustion	3	1	-	4	50	100	-	150	3
AUE 206-F	Automotive Petrol Engines	3	1	-	4	50	100	-	150	3
AUE 208-F	Theory of Machines	3	1	-	4	50	100	-	150	3
AUE 210-F	Design of Machine Elements	3	1	-	4	50	100	-	150	3
AUE 212-F	Measurements and Instrumentation.	3	1	-	4	50	100	-	150	3
AUE 214-F	Thermal Engineering Laboratory	-	-	2	2	25	-	25	50	3
AUE 216-F	Measurements & Instrumentation Laboratory	-	-	2	2	25	-	25	50	3
AUE 218-F	Manufacturing Process Laboratory-II	-	-	2	2	25	-	25	50	3
AUE 220-F	Graphics Laboratory – II	-	-	3	3	25	-	25	50	3
GPAE-202 -F	General Proficiency					50	-	-	50	
	TOTAL	18	6	9	33	450	600	100	1150	

B. TECH. (AUTOMOBILE ENGINEERING)

SEMESTER-V

'F' Scheme effective from 2011-12

Course No.	Course Title	Teaching Schedule				Marks For Class Work	Marks for Examination		Total Marks	Duration of Exam
		L	T	P	TOTAL		Theory	Practical		
AUE 301-F	Design of Mechanical Systems	3	1	-	4	50	100	-	150	3
AUE 303-F	Automotive Diesel Engines	3	2	-	5	50	100	-	150	3
AUE 305-F	Material Science & Technology	3	1	-	4	50	100	-	150	3
AUE 307-F	Power Units and Transmission	3	1	-	4	50	100	-	150	3
AUE 309-F	Automotive Chassis	3	1	-	4	50	100	-	150	3
ME-311 -F	Applied Numerical Techniques & Computing (ME, AE).	3	1	-	4	50	100	-	150	3
AUE 313-F	Design Practice	-	-	2	2	25	-	25	50	3
AUE 315-F	Engine Components Laboratory	-	-	2	2	25	-	25	50	3
AUE 317-F	Chassis Components Laboratory	-	-	2	2	25	-	25	50	3
AUE 319-F	Manufacturing Process Laboratory-III	-	-	2	2	25	-	25	50	3
ME-321 -F	Practical Training - I	-	-	2	-	-	-	-	-	
	TOTAL	18	7	10	35	400	600	100	1100	

MAHARSHI DAYANAND UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION FOR
B. TECH. (AUTOMOBILE ENGINEERING)
SEMESTER-VI

Course No.	Course Title	Teaching Schedule				Marks For Class Work	Marks for Examination		Total Marks	Duration of Exam
		L	T	P	TOTAL		Theory	Practical		
AUE 302-F	Automotive Electrical Systems & Electronics	3	2	-	4	50	100	-	150	3
AUE 304-F	Vehicle Body Engineering	3	1	-	4	50	100	-	150	3
AUE 306-F	Two and Three Wheelers	3	1	-	4	50	100	-	150	3
AUE 308-F	Automotive Pollution and Control	3	1	-	4	50	100	-	150	3
AUE 310-F	Quality Control & Reliability Engineering	3	1	-	4	50	100	-	150	3
AUE 312-F	Automotive Electrical & Electronics Laboratory	3	1	-	4	50	100	-	150	3
AUE 314-F	Engine Testing and Pollution Measurement Laboratory	-	-	2	2	25	-	25	50	3
AUE 316-F	CAD Applications in Automotive Engineering - I	-	-	2	2	25	-	25	50	3
AUE 318-F	Vehicle Maintenance Laboratory	-	-	2	2	50	-	50	100	3
GPME-302 -F	General Proficiency	-	-	4	4	50	-	-	50	-
	TOTAL	18	7	10	35	450	600	100	1150	

MAHARSHI DAYANAND UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION FOR
B. TECH. (AUTOMOBILE ENGINEERING)
SEMESTER-VII

Course No.	*Course Title*	*Teaching Schedule*				*Marks For Class Work*	*Marks for Examination*		*Total Marks*	*Duration of Exam*
		L	*T*	*P*	*TOTAL*		*Theory*	*Practical*		
AUE- 403-F	Vehicle Dynamics	*3*	*1*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
ME-401 F	Automobile Engg.	*3*	*1*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
AUE- 405-F	Operations Research and Industrial Management	*3*	*1*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
	Elective-I	*3*	*1*	*-*	*4*	*50*	*100*		*150*	*3*
HU- 407-F	Ethics in Engineering Profession	*3*	*1*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
ME-409F	Automobile Engg. Lab	*-*	*-*	*2*	*2*	*25*	*-*	*25*	*50*	*3*
AUE -411-F	CAD Application in Automotive Engineering - II	*-*	*-*	*3*	*3*	*50*	*-*	*50*	*100*	*3*
AUE- 413-F	Project	*-*	*-*	*4*	*4*	*50*	*-*	*-*	*50*	*3*
ME-415 F	Practical Training – II	*-*	*-*	*2*	*2*	*-*	*-*	*-*	*-*	*-*
	TOTAL	*15*	*5*	*11*	*31*	*375*	*500*	*75*	*950*	

MAHARSHI DAYANAND UNIVERSITY, ROHTAK (HARYANA)
SCHEME OF STUDIES & EXAMINATION FOR
B. TECH. (AUTOMOBILE ENGINEERING)
SEMESTER-VIII

Course No.	*Course Title*	*Teaching Schedule*				*Marks For Class Work*	*Marks for Examination*		*Total Marks*	*Duration of Exam*
		L	*T*	*P*	*TOTAL*		*Theory*	*Practical*		
AUE -404-F	Transport Management and Automobile Industry	*3*	*1*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
ME-402 F	Computer Aided Design	*3*	*1*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
ME-	Deptt. Elective-I	*4*	*-*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
ME-	Deptt. Elective-I1	*4*	*-*	*-*	*4*	*50*	*100*	*-*	*150*	*3*
ME-406 F	CAD Lab.	*-*	*-*	*3*	*3*	*50*	*-*	*50*	*100*	*3*
ME-408 F	Independent Study Seminar	*-*	*-*	*4*	*4*	*50*	*-*	*-*	*50*	*-*
ME-413 F	Project	*-*	*-*	*8*	*8*	*50*	*-*	*100*	*150*	*3*
GFME-402 F	General Fitness for the Profession*	*-*	*-*	*-*	*-*	*50*	*-*	*100*	*150*	*3A*
	TOTAL	*14*	*2*	*15*	*31*	*400*	*400*	*250*	*1050*	

MAHARSHI DAYANAND UNIVERSITY, ROHTAK (HARYANA)

SCHEME OF STUDIES & EXAMINATION FOR

B. TECH. (AUTOMOBILE ENGINEERING)

SEMESTER-III

'F' Scheme effective from 2011-12

Course No.	Course Title	Teaching Schedule				Marks For Class Work	Marks for Examination		Total Marks	Duration of Exam
		L	T	P	TOTAL		Theory	Practical		
MATH-201 - F	Mathematics – III (Common with all Branches	3	1	-	4	50	100	-	150	3
HUM- 201- F	Economics (Common with all Branches)	3	1	-	4	50	100	-	150	3
AUE 201-F	Strength of Materials	3	1	-	4	50	100	-	150	3
AUE 203-F	Fluid Mechanics and Machinery	3	1	-	4	50	100	-	150	3
AUE 205-F	Engineering Thermodynamics	3	1	-	4	50	100	-	150	3
AUE 207-F	Manufacturing Methods	3	1	-	4	50	100	-	150	3
AUE 209-F	Strength of Materials Laboratory	-	-	2	2	25	-	25	50	3
AUE 211-F	Fluid Mechanics and Machinery Laboratory	-	-	2	2	25	-	25	50	3
AUE 213-F	Manufacturing Process Laboratory-I	-	-	2	2	50	-	50	100	4
AUE 215-F	Graphics Laboratory –I	1	-	4	4	50	-	-	50	-
	TOTAL	19	6	10	34	450	600	100	1150	

MATH-201-F **MATHEMATICS-III**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Section -B

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Section -C

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Probability Distributions and Hypothesis Testing: Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Section -D

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), and Chi-square test of goodness of fit.

Linear Programming: Linear programming problems formulation, solving linear programming problems using Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS :

1. Advanced Engg. Mathematics : F Kreyszig.
2. Higher Engg. Mathematics : B.S. Grewal.

REFERENCE BOOKS :

1. Advance Engg. Mathematics : R.K. Jain, S.R.K.Iyenger.
2. Advanced Engg. Mathematics : Michael D. Greenberg.
3. Operation Research : H.A. Taha.
4. Probability and statistics for Engineers : Johnson. PHI.

HUM-201-F **ECONOMICS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics. Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

Section –B

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand. Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale. Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

Section -C

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition(Main features of these markets) Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

Section –D

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

TEXT BOOKS :

1. Principles of Economics : P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS :

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics : S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy : Rudar Dutt & K.P.M. Sundhram

AUE -201-F **STRENGTH OF MATERIALS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Internal forces, Stresses and strains, Elasticity, Hooke's law, Poisson's ratio, Elastic constants and their relationship. Stress-strain diagram for ductile materials. Definition of creep, fatigue and stress relaxation. Statically determinate and indeterminate problems.

Section –B

Bending of Beams: Shear force and bending moment diagrams for simply supported and cantilever beams. Pure bending. Bending stress in straight beams. Shear stresses in bending of rectangular and I-section beams. Beams of uniform strength.

Section –C

Torsion and Columns: Torsion of circular shafts. Shear stresses and twist in solid and hollow shafts. Combined bending and torsion. Closely coiled helical springs. Definition of columns, Types of Columns, Equivalent length, Slenderness ratio, Rankine's formula. Biaxial Stresses: Analysis of biaxial-stresses, Mohr's circle. Principal stresses and maximum shear stress-deductions from Mohr's circle.

Section –D

Stresses in thin walled pressure vessels. Combined bending and torsion. Deflection of Beams: Differential equation of the elastic axis, double integration and moment methods. Strain energy in tension, compression, shear, bending and torsion. Castigiliano's theorem.

REFERENCE BOOKS :

1. Timenshenko.S. And Young.D.H., Elements of Strength of Materials, T.Van Nostrand Co Inc., Princeton.N.J.1977.
2. Malhotra.D.R, and Gupta.H.C, The Strength of Materials, Satya Prakashan Tech., India Punlications, New Delhi, 1995.
3. Kazimi.S.M.A., Solid Mechanics, Tata McGraw Hill, 1976.
4. Dym.C.L, and Shames.I.H., Solid Mechanics, McGraw Hill, Kogakusha, Tokyo, 1973.
5. Khurmi.R.S, Strength of Materials, S.C Chand and Co, 1998

AUE -203-F **FLUID MECHANICS AND MACHINERY**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

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Section -A

Introduction: Classification of fluids. Properties of fluids. Centre of pressure. Plane and curved surfaces. Buoyancy and stability of floating bodies.

Section -B

Fluid Dynamics: Laws of kinematics of fluid flow. Lagrangian and Eulerian method. Stream function and potential functions. Continuity, momentum and energy equations. Bernoulli's equations and its applications. Pressure measurements, pitot static tube, venturimeter, and orifice plate. Applications of momentum equations.

Section -C

Dimensional Analysis: Buckingham's theorem, Non-dimensional numbers, similarities of flow. Model studies. Laminar and Turbulent Flows: Reynolds experiments. Flow relation between shear stress and pressure gradient. Flow between parallel plates. Characteristics of turbulent flow. Flow through pipes. Energy losses in pipes. Flow around immersed bodies.

Section -D

Fluid Machinery: Principles of operations of centrifugal and axial pumps. Turbo blowers and turbines. Principles and working of gear, vane and reciprocating pumps.

REFERENCE BOOKS :

1. Shames I.H., Mechanics of Fluids, Kogakusha, Tokyo, 1998.
2. Rathakrishnan.E, Introduction to Fluid Mechanics, PrenticeHall, India, 1999.
3. Yuvan.S.W, Foundation of Fluid Mechanics, Prentice Hall, 1998
4. Milne Thomson, L.M., Theoretical Hydrodynamics, McMillan, 1985.
5. Kumar.K.L, Fluid Mechanics, Eurasia Publishing House, 1990.

AUE- 205 -F **ENGINEERING THERMODYNAMICS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Basic Concepts: Systems, Zeroth law, First law. Steady flow energy equation. Heat and work transfer in flow and non- flow processes. Second law, Kelvin Planks and Clausius statements. Concept of entropy, Clausius inequality, Entropy changes in non-flow processes. Properties of gases and vapours, Rankine cycle.

Section -B

Air standard cycles: Otto, Diesel Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Reciprocating air compressors. One dimensional fluid flow: Application of continuity and energy equations. Isentropic flow of ideal gases through nozzles. Simple jet propulsion system.

Section -C

Refrigeration and Air-Conditioning: Principles of refrigeration, air-conditioning and heat pumps. Vapour compression and vapour absorptionsystems, co-efficient of performance. Properties of refrigerants.

Section -D

Heat Transfer: Conduction in parallel, radial and composite wall, Convective heat transfer with laminar and turbulent flows, Overall heat transfer co-efficient. Flow through heat exchangers. Fundamentals of radiative heat transfer.

REFERENCE BOOKS :

1. Nag.P.K, Engineering Thermodynamics, Tata McGraw Hill Co Ltd., Seventh Edn, 1993.
2. Mayhew and Rogers, Engineering Thermodynamics, Longman Green & Co Ltd., London, E.L.B.S. Edn, 1990.
3. Van Wylen.G.J. and Sonntag. R.E., Fundamentalss of Classical Thermodynamics (SI Version) 2nd Edn, 1986
4. D.H.Bacon, Engineering Thermodynamics, Butterworth & Co., London, 1989.
5. M.A.Sadd Thermodynamics for Engineers, Prentice Hall of India Pvt Ltd., 1989
6. Reynolds, Thermodynamics, Int.Student Edn, McGraw Hill Book Co Ltd., 1990.

AUE- 207 -F **MANUFACTURING METHODS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Classification and comparison of manufacturing processes. Criteria for selection of a process. Casting: sand-casting, types, procedure to make sand moulds, cores-moulding tools, pouring of metals, principle of die casting. Centrifugal casting. Investment casting Shell moulding and CO2 process.

Section -B

Welding: Classification of welding processes. Principles and equipment used in Gas welding, Arc welding, Resistance welding, Thermitt welding. Soldering. Brazing. Conventional Machining: General principles of working. Types and commonly performed operations in Lathe, Shaper, Planer, Milling machine, Drilling machine, Grinding machine, Gear cutting.

Section -C

Unconventional Machining: Need for unconventional machining processes. Principles and application of Abrasive jet machining, Ultrasonic machining, Electro discharge machining, Electromechanical machining, Chemical machining, Laser beam machining, Electron beam machining, Plasma arc machining.

Section -D

Metal Forming: Basic concepts and classification of forming processes. Principal equipment used and application of Forging, Rolling, Extrusion, Wire drawing, Spinning. Powder metallurgy, steps involved, applications.

REFERENCE BOOKS :

1. Hajra Choudhury, Elements of Workshop Technology, Vol-I and Vol-II Asia Publishing House, 1996.
2. R.K.Jain and S.C.Gupta, Production Technology, Hanna Publishers, 1997

AUE -20 9-F **STRENGTH OF MATERIALS LABORATORY**

L T P	Class work Marks: 25
- - 2	Exam Marks: 25
	Total Marks: 50
	Exam duration: 3 hrs

List of Experiments :

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.

2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.

3. To study the Vickers hardness testing machine & perform the Vickers hardness test.

4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.

5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).

6. To study the Universal testing machine and perform the tensile test.

7. To perform compression & bending tests on UTM.

8. To perform the sheer test on UTM.

9. To study the torsion testing machine and perform the torsion test.

10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.

11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.

12. To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.

13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.

14. To find Moment of Inertia of a Fly Wheel.

Note:
1. At least ten experiments are to be performed in the semester.

2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

AUE- 211-F FLUID MECHANICS AND MACHINERY LABORATORY

L	T	P
-	-	2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments:

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orificemeter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoullis Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

AUE- 213 -F **MANUFACTURING PROCESS LABORATORY –I**

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments:

1. To make a pattern for a given casting with all the necessary allowances, parting line, running system details. Prepare the mold and make the casting. Investigate the casting defects and suggest the remedial measures.

2. To make a component involving horizontal and vertical welding and study the welding defects and suggests their remedies.

3. To prepare a job on surface grinder/cylindrical grinder and measure the various parameters of the finished piece.

4. To cut external threads on a lathe.

5. Manufacture and assembly of a unit consisting of 2 to 3 components to have the concept of tolerances and fits (shaft and bush assembly or shaft, key and bush assembly or any suitable assembly).

6. Leveling of machine tools and testing their accuracy.

7. Disassembly and assembly of small assemblies such as tail stock, bench vice, screw jack etc.

8. Development and manufacture of complex sheet-metal components such as funnel etc.

9. Multi slot cutting on milling machine by indexing.

10. Drilling and boring of a bush.

11. Modeling of 3D runner system and creation of drawing for manufacturing of the casting patterns.

12. Development of blank size for complex sheet metal components using CAD/CAE software and compare results with manual calculation method.

Note:
1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list including exercises 11 and 12. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

AUE -215 -F **GRAPHICS LABORATORY-I**

L	T	P
-	-	2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

The students will be required to carry out the following exercises using educational soft-wares (AutoCad-2002, I-DEAS, Pro-Engineer etc).

List of Experiments:

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.
4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5. Draw quarter sectional isometric view of a cotter joint.
6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.
8. Draw a spiral by extruding a circle.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

AUE-202-F ENGINEERING ANALYSIS & NUMERICAL METHODS

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Solution of equations and eigenvalue problems: Iterative method, Newton-Raphson method for single variable and for simultaneous equations with two variables. Solutions of linear system by Gaussian, Gauss-Jordan, Jacobi and Gauss-Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigenvalue of a matrix by power and Jacobi methods.

Section -B

Interpolation: Newton's divided difference formula, Lagrange and Hermit's polynomials. Newton forward and backward difference formulae, Stirling's and Bessel's central difference formulae. Finite difference solution for one-dimensional heat equation one-dimensional wave equation and two-dimensional Laplace and Poisson equations.

Section -C

Numerical Differentiation and Integration: Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's rules. Two and three point Gaussian quardrature formula. Double integrals using Trapezoidal and Simpson's rules.

Section -D

Initial value problems for ordinary differential equations: Single Step Methods-Taylor Series, Euler and Modified Euler, Runge-Kutta method of order four for first and second order differential equations. Boundary value problems for ordinary and partial differential equations: Finite difference solution for the second order ordinary differential equations.

REFERENCE BOOKS :

1. Sastry, S.S Introductory Methods of Numerical Analysis (Third Edition), Prentice Hall of India, New Delhi, 1998.

2. Kandasamy, P., Thilakavathy, K, and Gumnavathy, K, Numerical Methods, S.Chand & Co., New Delhi, 1999.

3. Grewal, B.S and Grewal J.S.Numerical Methods in Engineering and Science, Hanna Publishers, New Delhi, 1999.

4. Jain, M.K., Iyengar, S.R.K and Jain, R.K.Numerical Methods for Engineering and Scientific Computation (Third Edition), New Age International (P) Ltd., New Delhi, 1995.
5. Gerald, C.F. and Wheatley, P.O.Applied Numerical Analysis (Fifth Edition), Addison-Wesley, Singapore, 1998.
6. Narayanan, S., Manickavachakam Pillai, K.and Ramanaiah, G.Advanced Mathematics for Engineering Students Volume-III,S Viswanathan Pvt.Ltd.1993.

AUE 204 -F HEAT TRANSFER AND COMBUSTION

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Conduction: Fourier law of heat conduction for isotropic material. Thermal conductivity. Derivation of the energy equation in three dimensions including transient effect. Nondimensional-thermal diffusivity and Fourier number. Types of boundary conditions-(Dirchlet, Neumann, mixed type). One-dimensional solution with and without heat generation. Analogy with electrical circuits.

Section -B

Fins: rectangular and pin fins. Fin effectiveness and efficiency. Critical thickness of insulation.
Radiation: Physical mechanism of thermal radiation, laws of radiation, definition of black body emissive power, intensity of the radiation, emissivity, reflectivity, transmittivity, irradiation, radiosity. Radiation exchange between black bodies. Concept of Gray-Diffuse Isotropic (GDI) surface. Radiation exchange between GDI surfaces.

Section -C

Convection: Introduction, Newton's law of cooling and significance of the heat transfer co-efficient. Momentum and energy equations in two dimensions, nondimensionalisation, importance of nondimensional quantities and their physical significance. Order of magnitude analysis for flow over a flat plate. Velocity and Analogies between momentum, heat and mass transfer. Natural convection. Heat exchangers: Types of heat exchangers, parallel and counter flow types, Introductions to LMTD. Correction factors, fouling factor

Section -D

Combustion Analysis: Fuels, HIV and LTV, Air requirements, excess air, analysis of products of combustion. Enthalpy of formation, adiabatic flame temperature, enthalpy of combustion, heat of reaction. Analysis of fuels and fuel gas. Orsats apparatus.

REFERENCE BOOKS :

1. Fundamentals of Heat and Mass Transfer by F.P.Incropera and D.P.Dewitt, 4th ed., John Wiley & Sons.

2. Heat Transfer by J.P.Holman, 8th ed., McGrawhill.
3. Elements of Heat & Mass Transfer by Vijay Gupta, 2nd ed., New Age International Publishers.
4. Heat Transfer - A Basic Approach by M.N.Ozisik, McGrawhill.

AUE- 206-F **AUTOMOTIVE PETROL ENGINES**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Engine Construction and Operation: Constructional details of 4-stroke petrol engine. Working principle, Otto cycle, actual indicator diagram. Two stroke engine construction and operation. Comparison of four stroke and two-stroke engine operation. Firing order and its significance.

Section -B

SI Engine Fuel System: Carburettor working principle. Requirements of an automotive carburettor; Starting, idling, acceleration and normal circuits of carburettors, compensation, Maximum power devices, constant choke and constant vacuum carburetors. Fuel feed systems, Mechanical and electrical pumps. Petrol injection.

Section -C

Cooling and Lubrication System: Need for cooling system. Types of cooling system, Liquid cooled system, Thermosyphon system, Pressure cooling system. Lubrication system, Mist lubrication system, Wet sump and dry sump lubrication. Properties of lubricants. Properties of coolants.

Section -D

Combustion and Combustion Chambers: Combustion in SI engines, stages of combustion, flame propagation, rate of pressure rise, abnormal combustion, knocks. Effect of engine variables and knock. Combustion chambers, Different types, Factor controlling combustion chamber design. Two Stroke Engines: Types of two strokes engines, Terminologies and definitions, Theoretical scavenging methods. Scavenging pumps. Types of scavenging.

REFERENCE BOOKS :

1. Ganesan.V, Internal Combustion Engines, Tata McGraw Hill Publishing Co., New York, 1994.
2. Heldt.P.M, High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta, 1975.
3. Obert.E.F, International Combustion Engines Analysis and Pratice, International Text Book Co., Scranton, Pennsylvania, 1988.
4. Wiliam.H.Crouse, Automotive Engines, McGraw Hill Publishers, 1985.
5. Ellinger.H.E, Automotive Engines, Prentice Hall Publishers, 1992

AUE -208-F **THEORY OF MACHINES**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Mechanisms and machines; Elements of kinematic chain, mobility and range of movements, miscellaneous mechanisms, Straight line generating mechanisms. Intermittent motion mechanism.

Section -B

Velocity and acceleration- analysis of displacement, planar mechanisms by graphical, analytical and computer aided methods,

Section -C

Synthesis of linkages, Kinematic analysis of machine elements, Freudeustein's equation, Dimensional analysis for motion, Functioning and path generation.

Section -D

Dynamics of rotary and reciprocating machines, Critical speeds, Turning moment diagrams and flywheels, Cam profile analysis, gear tooth profiles, static and dynamic force analysis of constrained kinematic systems, Precisional motions and gyroscopic stability.

REFERENCE BOOKS :

1. Mechanism and Machine Theory by J.S.Rao and R.V.Dukkipati, New Age International.
2. Theory of Machines and Mechanisms by J.J.Shigley and J.J.Uicker, McGrawhill.
3. Theory of Machines by S.S.Rattan, TMH.

AUE -210-F **DESIGN OF MACHINE ELEMENTS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

General considerations and procedure of machine design, design stress, factor of safety, stress and deflection analysis

Section -B

Engineering materials and applications, fits and tolerances

Section -C

Design of fasteners and fastenings - pin, cotter, knuckle, screw, rivets and welded joints.

Section -D

Design of shafts and couplings, common power and force transmitting power screws, belt drives and springs.

REFERENCE BOOKS :

1. Mechanical Engineering Design by J.F.Shigley, McGrawhill.
2. Design of Machine Elements by M.F.Spotts, Prentice Hall.
3. Mechanical Analysis and Design by A.H.Burr and J.B.Cheathak, 2nd ed., Prentice Hall.

AUE- 212 -F **MEASUREMENT AND INSTRUMENTATION**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Basic concepts: Definition of terms, calibration, standards, generalized measurement systems static and dynamic performance characteristic, Analysis of experimental data; Instrumentation for measurement of position and displacement, force, velocity, temperature, proximity and range.

Section -B

Concept of feedback; Open and close loop control systems, transducers and devices for engineering applications, digital readouts, data acquisition and processing.

Section -C

Metrology: Standards, slip gauges, Measurement of angles, tapers, threads, coordinates, inspection of straightness, flatness, alignment and surface finish, gear measurements

Section -D

Measurements of various product features using Mechanical, Pneumatic, Optical and Electronic Instruments, Interferometry and use of optical flats.

REFERENCE BOOKS :

1. Experimental Methods for Engineers by J.Holman, 6th ed. McGrawhill.
2. Mechanical Measurements by T.G.Beckwith, N.L.Buck and R.D.Marangoni, 3rd ed., Narosa Publishing House.
3. Measurement Systems - Application and Design by E.O.Doeblin, 4th ed., McGrawhill.
4. Instrumentation, Measurement and Analysis by B.C.Nakra and K.K.Chaudhary, TMH.
5. Metrology for Engineers by J.W.F. Gallies and C.R.Shotbolt, Cassel.
6. Metrology by R.K.Jain.

AUE- 214 -F THERMAL ENGINEERING LABORATORY

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. To determine the thermal conductivity of a metallic rod.
2. To determine the thermal conductivity of an insulating power.
3. To determine the thermal conductivity of a solid by the guarded hot plate method.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emmisivity of the gray body (plate) at different temperature and plot the variation of emmisivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
10. To verify the Stefen-Boltzmann constant for thermal radiation.
11. To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe. Also plot temperature variation along the length with time or three pipes.
12. To study the two phases heat transfer unit.
13. To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.
14. Design of Heat exchanger using CAD and verification using thermal analysis package eg. Ideas etc.

Note:

1. At least ten experiments are to be performed in the semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

AUE -216-F MEASUREMENT AND INSTRUMENTATION LAB.

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. To Study various Temperature Measuring Instruments and to Estimate their Response times.

(a) Mercury – in glass thermometer

(b) Thermocouple

(c) Electrical resistance thermometer

(d) Bio-metallic strip

2. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up.

3. To study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.

4. To study the characteristics of a pneumatic displacement gauge.

5. To measure load (tensile/compressive) using load cell on a tutor.

6. To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer.

7. To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).

8. To measure the stress & strain using strain gauges mounted on simply supported beam/cantilever beam.

9. To measure static/dynamic pressure of fluid in pipe/tube using pressure transducer/pressure cell.

10. To test experimental data for Normal Distribution using Chi Square test.

11. To learn the methodology of pictorial representation of experimental data and subsequent calculations for obtaining various measures of true value and the precision of measurement using Data acquisition system/ calculator.

12. Vibration measurement by Dual Trace Digital storage Oscilloscope.

13. To find out transmission losses by a given transmission line by applying capacitive /inductive load.

14. Process Simulator.

Note:

1. At least ten experiments are to be performed in the Semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

AUE- 218-F MANUFACTURING PROCESS LABORATORY – II

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. Specimen preparation and making of lap joint, Butt, T- joints with oxy- acetylene gas welding.

2. Making of lap, Butt, T- joints etc. with electric arc welding.

3. Study of MIG welding equipment and making a weld joint in this process.

4. Study of TIG welding equipment and making a weld joint in this process.

5. Study of different process parameters in Friction welding and preparing a weld joint by this process.

6. To study various welding equipments namely generators welding torch etc.

7. To study the resistance welding processes and prepare welded joint.

8. To study the Basic Forging processes like upsetting
9. To study the Basic Forging processes drawing down
10. To study the Basic Forging processes forge welding

Note:

1. At least eight experiments should be performed from the above list. Remaining two Experiments may either be performed from the above list or designed & set by the Concerned institution as per the scope of the Syllabus.

AUE -220-F **GRAPHICS LABORATORY – II**

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments:

Drafting exercises involving preparation of detailed drawings of product assembly, Aggregation of assembly, exploded machine kinematics, foundation of structure Drawings and multilayered system drawing, Computer aided drafting using software like CATIA, AUTOCAD and Pro Engineer.

AUE 301 -F **DESIGN OF MECHANICAL SYSTEMS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Design for variable loads: Endurance limit, Goodman and Soderberg criteria, Design of shafts, clutches and brakes - calculation of heat generation and heat dissipation.

Section -B

Gears: Gear tooth geometry, tooth systems, gear trains, gear box design, design of helical, bevel and worm gears from strength and wear considerations; Flywheel design.

Section -C

Bearings and lubrication: selection procedure of antifriction bearings, journal bearings, hydrodynamic theory, design factors, the relation of the variables, heat balance, hydrostatic bearings.

Section -D

Concept of concurrent and simultaneous engineering. Example problems in design of mechanical systems.

REFERENCE BOOKS :

1. Computer Aided Mechanical Design and Analysis by V.Ramamurhti, 3rd ed., TMH.
2. Mechanical Analysis and Design by A.H.Burr and J.B.Cheatham, 2nd ed., Prentice Hall.
3. Mechanical Engineering Design by J.E.Shigley, McGraw hill.

AUE 303 -F **AUTOMOTIVE DIESEL ENGINES**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Engine construction and operation. Two stroke and four stroke diesel engines. Diesel cycle. Fuel-air and actual cycle analysis. Diesel fuel, Ignition quality. Cetane number.

Section -B

Fuel Injection System: Requirements, Air and solid injection, function of components, Jerk and distributor type Pumps. Pressure waves, Injection lag, Unit injector, Mechanical and Pneumatic governors. Fuel injector-types of injection nozzle, Spray characteristics, injection timing, pump calibration.

Section -C

Combustion Chambers: Importance of air motion-swirl, squish and turbulence-swirl ratio. Fuel air mixing –stages of combustion, delay period, factors affecting delay period. Knock in CI engines-comparison of knock in CI & SI engines. Direct and indirect injection. Combustion Chambers-Air cell chamber, combustion chamber design objectives. Different types of combustion chamber.

Section -D

Supercharging and Turbo charging: Necessity and limitation, Charge cooling, Types of supercharging and turbo charging, relative merits, matching of turbocharger. Diesel Engine Testing and Performance: Automotive and stationary diesel engine testing and related standards. Engine power and efficiencies. Performance characteristics. Variables affecting engine performance. Methods to improve engine performance. Heat balance. Performance maps.

REFERENCE BOOKS :

1. Ganesan.V.Internal Combustion Engines, Tata-McGraw Hill Publishing Co., New Delhi, 1994.
2. Heldt.P.M.,High Speed Combustion Engines, Oxford IBH Publishing Co.,1985.
3. Obert.E.F.,Internal Combustion Engine analysis and Pratice,International Text Book Co.,Scranton,Pennsylvania,1988.
4. Maleev.V.M, Diesel Engine Operation and Maintenance, McGraw Hill, 1974.
5. Dicksee.C.B, Diesel Engines, Blackie & Son Ltd., London, 1964.

AUE 305 -F **MATERIALS SCIENCE AND TECHNOLOGY**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Elasticity. Stress and strain relationship in engineering materials. Deformation mechanism. Strengthening material: Strain hardening, alloying, polyphase mixture, martensitic, precipitation, dispersion, fiber and texture strengthening. Iron carbon diagram.

Section -B

Fracture, Fatigue and Creep: Fracture, classification and types, Griffith's theory, notch effects, stress concentration, concept of fracture toughness. Ductile brittle transition. Fatigue Mechanism of crack initiation and growth, factors affecting fatigue creep, creep curve, Ashby deformation mechanism maps, and creep mechanism, metallurgical variables of creep.

Section -C

Characteristics of Materials: Castability, machinability, formability and weldability of engineering materials such as steel, cast iron, alloy steels, brass, bronze and aluminum alloys.
Composite materials: fabrication techniques, materials for high temperature. Cryogenic wear, corrosion fatigued creep and oxidation resistance application.
Selection of materials: Criteria of selecting materials for automotive components viz Cylinder block, Cylinder head, Piston, Piston ring, Gudgeon pin, Connecting rod, Crank shaft, Crank case, Cam, Cam shaft, Engine valve, Gear wheel, Clutch plate, Axle bearings, Chassis, Spring, body panel radiator, brake lining etc. Application of non-metallic materials such as composite, ceramic and polymers in automobile.

Section -D

Heat Treatment and Surface Treatment: Heat treatment of steel. Annealing –types, normalising, hardening and tempering with specific relevance to automotive components, surface hardening techiniques, induction flame and chemical hardening. Coating and corrosion resistance. Electroplating, phosphating, anodizing, hot dipping, thermal spraying, hard-facing and thin film coatings.

REFERENCE BOOKS :

1. Khanna.O.P.Material Science and Metallurgy, Dhanpat Rai & Sons, 1992.
2. Kapoor, Material Science and Processes, New India Publishing House, 1987.
3. Dieter, G.E., Mechanical Metallurgy, McGraw Hill, New York, 1972.
4. Avner.S.H.Introduction to physical metallurgy, McGraw Hill, New York, 1982.
5. Raghavan.V.Physical Metallurgy, Principle and Pratice, Prentice Hall, 1995.
6. Bawa.H.S.Materials Metallurgy, McGraw Hill, 1986.

AUE 307 -F **POWER UNITS AND TRANSMISSION**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Requirement of transmission system. Different types of clutch: Principle, construction, torque capacity and design aspects. Determination of gear ratios for vehicles. Performance characteristic in different speeds. Different types of gearbox, conventional gearbox.

Section -B

Hydrodynamic Drive: Fluid coupling: Principle of operation. Constructional details, torque capacity. performance characteristics, reduction of drag torques. Torque Converter: Principle of operation, constructional details, performance characteristics, converter coupling, multistage torque converters and polyphase torque converters.

Section -C

Automotive Transmission: Ford—T-model gearbox, Wilson gearbox, Electro-magnetic transmission, Automatic overdrive, Hydraulic control system for automatic transmission.
Hydrostatic Drive and Electric Drive: Hydrostatic drive: Various types of hydrostatic drive systems-Principles of hydrostatic drive system, Advantages and limitations. Comparison of hydrostatic drive with hydrodynamic drive, Construction and working of typical Janny hydrostatic drive.

Section -D

Electric drive: Principles of early and modified Ward Leonard Control system, advantages & limitations. performance characteristics. Automatic Transmission Applications: Chevrolet "Turboglide" transmission, power glide transmission, Toyota "ECT-I" automatic transmission with intelligent electronic control system. Clutch hydraulic actuation system.

REFERENCE BOOKS :

1. Heldt.P.M.Torque Converters, Chilton Book Co., 1992.
2. Newton and Steeds, Motor Vehicles, IIIiffe Publishers, 1985.
3. Judge.A.W.Modern Transmission Systems, Chapman and Hall Ltd., 1990.
4. SAE Transactions 900550 & 930910.
5. Hydrostatic transmissions for vehicle applications, I Mech E Conference, 1981-88.
6. Crouse.W.H.Anglin.,Automotive Transmission and Power Trains Construction, McGraw-Hill, 1976.

AUE- 309 -F **AUTOMOTIVE CHASSIS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Types of chassis layout with reference to power plant locations and drive. Vehicle frames. Various types of frames. Constructional details. Materials. Testing of vehicles frames. Unitised frame body construction, Loads acting on vehicle frame.

Section -B

Front axle and Steering System: Types of front axle. Constructions details, Materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe-in. Conditions for true rolling motion of wheels during steering. Steering geometry. Ackerman and Davis steering system.
Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts. Power and Power assisted steering. Steering of crawler tractors.

Section -C

Drive Line: Effect of driving thrust and torque reactions. Hotch Kiss drive, torque tube drive and radius rods. Propeller shaft. Universal joints. Constants velocity universal joints. Front wheel drive. Final Drive Differential: Different types of final drive. Worm and worm wheel, Straight bevel gear, Sprial bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential principles. Construction details of differential unit. Non-slip differential.
Differential locks. Differential housings. Rear Axles: Construction of rear axles. Types of loads acting on rear axles. Full floating. Three quarter floating and semi floating rear axles. Rear axle housing. Construction of different types of axle housings. Multi axles vehicles. Construction details of multi drive axle vehicles.

Section -D

Suspension System: Need of suspension system, types of suspension, suspension springs, constructional details and characteristics of leaf, coil and torsion bar springs. Independent suspension, Rubber suspension, Pneumatic suspension, Shock absorbers. Braking System: Classification of brakes, drum brake & disc brakes. Constructional details-Theory of braking. Mechanical, hydraulic and Pneumatic brakes. Servo brake. Power and power assisted brakes-different types of retarders like eddy current and hydraulic retarder. Anti lock braking systems.

REFERENCE BOOKS :

1. Heldt.P.M.,Automotive Chassis, Chilton Co., New York,1990.
2. Steed.W.,Mechanics of Road Vehicles,IIIiffe Books Ltd.,London,1960.
3. Newton. Steeds & Garrot.Motor Vehicles, Butterworths, London, 1983.
4. Judge.A.W.Mechanism of the car, Chapman and Halls Ltd., London1986.
5. Giles.J.G.,Steering Suspension and tyres,IIIiffe Book Co.,London,1988.
6. Crouse.W.H, Automotive Chassis and Body, McGraw Hill New York, 1971

ME -311-F APPLIED NUMERICAL TECHNIQUES AND COMPUTING

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

ERRORS IN NUMERICAL CALCULATIONS :Introduction, Numbers and their accuracy, Absolute, relative and percentage errors and their analysis, General error formula.
INTERPOLATION AND CURVE FITTING :Taylor series and calculation of functions, Introduction to interpolation, Lagrange approximation, Newton Polynomials, Chebyshev Polynomials, Least squares line, curve fitting, Interpolation by spline functions.

Section -B

NUMERICAL DIFFERENTIATION AND INTEGRATION: Approximating the derivative, Numerical differentiation formulas, Introduction to Numerical quadrature, Newton-Cotes formula, Gaussion Quadrature.
SOLUTION OF NONLINEAR EQUATIONS: Bracketing methods for locating a root, Initial approximations and convergence criteria, Newton- Raphson and Secant methods, Solution of problems through a structural programming language such as C or Pascal.

Section -C

SOLUTION OF LINEAR SYSTEMS: Direct Methods, Gaussian elimination and pivoting, Matrix inversion, UV factorization, Iterative methods for linear systems, Solution of problems through a structured programming language such as C or Pascal.
EIGEN VALUE PROBLEMS: Jacobi, Given's and Householder's methods for symmetric matrices, Rutishauser method for general matrices, Power and inverse power methods.

Section -D

SOLUTION OF DIFFERENTIAL EQUATIONS: Introduction to differential equations, Initial value problems, Euler's methods, Heun's method, Runge- Kutta methods, Taylor series method, Predictor-Corrector methods, Systems of differential equations, Boundary valve problems, Finite-difference method, Solution of problems through a structured programming language such as C or Pascal.
PARTIAL DIFFERENTIAL EQUATIONS, EIGENVALUES AND EIGENVECTORS:Solution of hyperbolic, parabolic and elliptic equations, The eigenvalue problem, The power method and

the Jacobi's method for eigen value problems, Solution of problems through a structural programming language such as C or Pascal.

REFERENCE BOOKS :

1. Numerical Methods for Mathematics, Science and Engineering by John H.Mathews, PHI New Delhi.
2. Applied Numerical Methods – Carnahan, B.H., Luthar, H.A. and Wilkes, J.O., Pub.- J. Wiley, New York

Reference Books:

1. Numerical Solution of Differential Equations, by M.K. Jain, Published by Wiley Eastern, New York.
2. Introductory Methods of Numerical Analysis by S.D. Sastry, Published by Prentice Hall of India.
3. Numerical Methods – Hornbeck, R.W. , Pub.- Prentice Hall, Englewood Cliffs, N.J.

Note: 1. Programming exercises may be done in MATLAB.

2. The Instructor of the course may cover the use of software MATHEMATICA in the tutorial class.

3. In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attend only 5 questions

AUE 313-F **DESIGN PRACTICE**

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments:

Drawing board exercises compatible to the course AUE 405: Design of Machine Elements.

a) Design of flywheel.
b) Design of connecting rod.
c) Design of crankshaft.
d) Design of suspension system.
e) Design of electric system.
f) Design of cam.

Note:

1. All experiments should be performed from the above list.

2. At least 5 to 10 more exercises to be given by the teacher concerned.

AUE-315-F **ENGINE COMPONENTS LABORATORY**

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. Study of various makes of four-stroke and two-stroke spark-ignition and compression ignition engines and components by dismantling and assembling various parts.
2. Comparison of engine components.
3. To study air fuel ratio meter.
4. To study carburetor.
5. To study internal combustion cooling system.
6. To study fuel pump, fuel injection, fuel filter.
7. To study gudgeon pin.
8. To study MAP sensor.
9. To study spark plug.
10. To study throttle.

Note:

1. At least eight experiments should be performed from the above list. Remaining two Experiments may either be performed from the above list or designed & set by the Concerned institution as per the scope of the Syllabus.

AUE- 317-F CHASSIS COMPONENTS LABORATORY

L T P	Class work Marks: 25
- - 2	Exam Marks: 25
	Total Marks: 50
	Exam duration: 3 hrs

List of Experiments :

1. To study and measurement of various makes of Automobile Chassis, such as Tata, Leyland, Ambassador etc.
2. To study dismantling and Assembling of Front axle & Rear axle Clutch
3. To study dismantling and Assembling of Gear box
4. To study dismantling and Assembling Steering system. Braking system,
5. To study dismantling and Assembling Braking system.
6. To study dismantling and Assembling Differential mechanism.
7. To study tanks system like Bungs, Caps and Nipples.
8. To study cooling system like pumps, radiators and hardware.
9. To study fiberglass bodies like 23 T, 48 Fiat and Funny Car.
10. To study motion control links like - Cables, Levers, Pedals etc.

Note:

1. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

AUE -319-F MANUFACTURING PROCESS LABORATORY – III

L	T	P
-	-	2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. Perform exercises involving machining of complex product configurations.
2. To study machining of spur gear.
3. To study machining of helical gear.
4. To study relieving and profiling.
5. To study contouring method.
6. To study various finishing processes.
7. To study various methods of Grinding of tools and cutters

Note:

1. At least six experiments should be performed from the above list. Remaining one experiment may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

2. At least 5 to 10 more exercises to be given by the teacher concerned.

AUE -302 -F AUTOMOTIVE ELECTRICAL SYSTEMS AND ELECTRONICS

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Batteries: Principles and construction of lead-acid battery. Characteristics of battery, rating capacity and efficiency of batteries. Various tests on battery condition, charging methods. Constructional aspect of alkaline battery. Starting System: Condition at starting. Behavuiour of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units, care and maintenance of starter motor. Starter Switches.

Section -B

Charging System: Generation of direct current. Shunt generator characteristics. Armature reaction. Third brush regulation. Cut-out. Voltage & current regulators. Compensated voltage regulator alternators principle & constructional aspects and bridge benefits. Ignition Systems : Types, Construction & working of battery coil and magneto ignition systems. Relative merits, Centrifugal and vacuum advance mechanisms, types and construction of spark plugs, electronic ignition systems.Lighting System & Accessories: Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Headlight dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system, Trafficator.

Section -C

Automotive Electronics: Current trends in modern automobiles, Open and close loop systems-Components for electronic engine management. Electronic management of chassis system. Vehicle motion control. Sensors and Actuators: Basic sensor arrangement, Types of sensors such as-Oxygen sensors, Crank angle position sensors-Fuel metering/vehicle speed sensor and detonation sensor-Altitude sensor, flow sensor. Throttle position sensors. Solenoids, stepper motors, and relays.

Section -D

Electronic Fuel Injection and Ignition Systems: Introduction, feedback carburetor systems. Throttle body injection and multi port or point fuel injection., fuel injection systems, Injection system controls. Advantages of electronic ignition systems: Types of solid-state ignition systems and their principle of operation, Contact less electronic ignition system, and electronic spark timing control. Digital Engine Control System: Open loop and closed loop control systems-Engine cranking and warm up control-Acceleration enrichment-Deceleration leaning and idle

speed control. Distributor less ignition-Integrated engine control systems, Exhaust emission control engineering. Electronic dashboard instruments-Onboard diagnosis system, security and warning system.

REFERENCE BOOKS :

1. Judge. A.W., Modern Electrical Equipment of Automobiles, Chapman & Hall, London, 1992.

2. Young. A.P., & Griffiths. L., Automobile Electrical Equipment, English Language Book Society & New Press, 1990.

3. Vinal. G.W. , Storage Batteries, John Wiley & Sons Inc., New York, 1985.

4. Crouse. W.H. , Automobile Electrical Equipment, McGraw Hill Book Co Inc., New York, 1980

5. Spreadbury. F.G. Electrical ignition Equipment, Constable & Co. Ltd., London 1962.

6. Kholi. P.L., Automotive Electrical Equipment, Tata McGraw-Hill Co. Ltd. New Delhi, 1975.

7. Automotive Hand Book, Robert Bosch, Bently Publishers, 1997.

8. William B. Ribbens, Understanding Automotive Electronics, 5th Edition, Butterworth, Heinemann Woburn, 1998.

9 Tom Weather Jr and Cland C. Hunter, Automotive Computers and Control System, Prentice Hall Inc., New Jersey.

10. Young. A.P. and Griffths. L. Automobile Electrical Equipment, English Language Book Society and New Press.

11. Crouse. W.H., Automobile Electrical equipment, McGraw Hill Book Inc., New York,1955.

12. Robert N Brady Automotive Computers and digital Instrumentation reston Book, Prentice Hall, Eagle Wood Cliffs, New Jersy, 1988.

13. Bechtold, Understanding Automotive electronics, SAE, 1998.

14. T.Mellard Automotive Electronics.

AUE- 304 -F **VEHICLE BODY ENGINEERING**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

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.

Section -B

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. Wind tunnel testing: Flow visualization techniques, scale model testing. Component balance to measure forces and moments.

Section -C

Bus Body Details: Types, mini bus, single decker, double decker, two level, 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.

Section -D

Commercial Vehicle Details: Types of body, Flat platform, drop side, fixed side, tipper body, tanker body. Light commercial vehicle body types, Dimensions of driver's seat in relation to controls, driver's cabin design. Body Materials, Trim And Mechanisms: Steel sheet, timber, plastics, GRP, properties of materials-Corrosion anticorrosion methods, scalation of paint and painting process, body trim items. Body mechanisms.

REFERENCE BOOKS :

1. Powloski. J. Vehicle Body Engineering, Business Books Ltd., 1989.

2. Giles. J.C. Body construction and design, IIIiffe Books Butterworth & Co., 1971

3. John Fenton, Vehicle Body layout and analysis, Mechanical Engg Publication Ltd., London,1982

4. Braithwaite.J.B., Vehicle Body building and drawing, Heinemann Educational Books Ltd., London,1977.

AUE -306 -F **TWO AND THREE WHEELERS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Power Unit: Two stroke and four stroke SI engine, merits and demerits. Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes merits and demerits, scavenging efficiency. Scavenging pumps. Rotary valve engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system. electronic Ignition system. Starting system. Kick starter system.

Section -B

Chassis and Sub-Systems: Mainframe, its types. Chassis and shaft drive. Single, multiple plates and centrifugal clutches. Gear box and gear controls. Front and rear suspension- systems. Shock absorbers. Panel meters and controls on handle bar.

Section -C

Brake and Wheels: Drum brakes, Disc brakes, front and rear brake links layouts. Spoked wheel, Cast wheel. Disc wheel. Disc types. Tyres & tubes.

Section -D

Two Wheelers: Case study of major Indian models of motorcycles, SCOOTERS AND MOPEDS. Bajaj, Vespa, Lambretta scooters. Enfield, TVS-Suzuki, Hero-Honda, Yamaha RX-100, Kawasaki Bajaj Motor cycle. Kinetic Spark, Hero Majestic, TVS mopeds. Servicing and maintenance. Three Wheelers: Case study of Indian Models. Front engine and rear engine. Auto rickshaws. Pickup van. Delivery Van and Trailer.

REFERENCE BOOKS :

1. Irving. P.E., Motor cycle Engineering, Temple Press Book, London, 1992
2. The Cycle Motor Manual, Temple Press Ltd., London, 1990.
3. Encyclopedia of Motorcycling, 20 volumes, Marshall Cavensih, New York and London, 1989.
4. Bryaut. R.V., Vespa Maintenance and Repair series.
5. Raymond Broad, Lambretta – A practical guide to maintenance and repair, 1987

AUE -308 -F **AUTOMOTIVE POLLUTION AND CONTROL**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Pollutants-sources-formation-effects-transient operational effects on pollution. SI engine Combustion and Pollutant Formation: Chemistry of SI engine Combustion, HC and CO formation in 4 stroke and 2 stroke SI engines, NO formation in SI Engines, Effect of operating variables on emission formation.

Section -B

Cl engine Combustion and Emissions: Basic of diesel combustion-Smoke emission in diesel engines-Particulate emission in diesel engines. Color and aldehyde emissions from diesel engines, Effect of operating variables on emission formation.

Section -C

Control Techniques for SI and CI: Design changes, optimization of operating factors, exhaust gas re-circulation, fumigation, air injector PCV system-Exhaust treatment in SI engines-Thermal reactors-Catalytic converters, Catalysts, Use of unleaded petrol.

Section -D

Test Procedure & Instrumentation for Emission Measurement and Emission Standards: Test procedures-NDIR analyzer, Flame ionization detectors, Chemiluminescent analyzer, Gas chromatograph, Smoke meters, Emission standards.

REFERENCE BOOKS :

1 Springer and Patterson, Engine Emission, Plenum Press, 1990
2 Ganesan. V., Internal Combustion Engines, Tata McGraw Hill Co., 1994.
3 SAE Transactions, Vehicle emission, 1982 (3 volums).
4 Obert. E.F., Internal Combustion Engines, 1982.
5 Taylor. C.F., Internal Combustion Engines, MIT Press, 1972.
6 Heywood. J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co., 1995.
7 Automobiles and Pollution SAE Transaction, 1995

AUE- 310 -F QUALITY CONTROL AND RELIABILITY ENGINEERING

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Quality Concepts: Quality-Factors influencing quality, quality costs, economics of quality, quality assurance statistical tools used in quality in SQC, Quality planning, Organization for quality. Bureau of Indian standards, ISO 9000-quality circles KAIZEN-TQM concepts-Quality audit.

Section -B

Statistical Process Control: Variation in processes, Factors, Process capability, Analysis of process capability, control charts, variables, Attributes, Establishing and interpreting control charts, X,R, chart for variables, defects, P chart, C-chart and U chart-Con-troll charts for defective quality rating Acceptance Sampling: Lot-by-lot sampling, types probability of acceptance in single double, multiple sampling techniques-O.C. curvesprocedure's Risk and consumers Risk AQL, LTPD, AOQL concepts-standard sampling plans for AQL AND LTPD-uses of standard sampling plans.

Section -C

Life Testing-Reliability-Systems Approach: Life testing-objectives-classification-failure characteristics-failure data analysis-mean time to failure-maintainability and availability-reliability-system reliability-series and parallel systems-systems reliability in terms of probability of failure-MTBF-Acceptance sampling based on reliability test OC curves.

Section -D

Quality and Reliability: Reliability improvement-techniques, use of parato analysis - Design for reliability, Redundancy, standby redundancy, failsafe systems-optimization in reliability, product design, product analysis, product development product cycle.

REFERENCE BOOKS :

1. Betster field D.H. Quality Control-Prentice Hall Pub (1993) (Revised Edn.)
2. Sharma S.C. Inspection Quality Control and Reliability –Khanna Publishers New Delhi (1998)
3. John Bank, The Essence of Total Quality Management, Prentice Hall of India P Ltd New Delhi 1995.
4. Danny Samson, Manufacturing & Operations strategy. Prentice Hall New York (1991)

5. Ganapathy K. Subramaniam B. Narayana V-Quality Circle concepts and implementation – QCFI. Secondrabad 919940.
6. Tapan P. Bagchi ISO9000. Concepts methods and implementation – Wheeler Publisher Allahbad (1994)
7. Conner P.D.T.O. Practical Reliability Engineering John Wiley (1993)
8. Green A.E. and Bourne A.J. Reliability, Technology, Wiley Interscience 1991.

AUE -312-F AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY

L T P	Class work Marks: 25
- - 2	Exam Marks: 25
	Total Marks: 50
	Exam duration: 3 hrs

List of Experiments :

1. To study of rectifier and filters
2. Testing of starting motors and generators
3. To Study of SCR and IC timer, D/A and A/D.
4. Diagnosis of ignition system faults
5. Study of Automobile electrical wiring.
6. Study of rectifiers and filters
7. Study of logic gates, adder and flip-flops
8. Study of SCR and IC timer
9. Interfacing A/D converter and simple data acquisition
10. Micro controller programming and interfacing

Note:

1. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

AUE-314-F ENGINE TESTING AND POLLUTION MEASUREMENT LABORATORY

L T P	Class work Marks: 25
- - 2	Exam Marks: 25
	Total Marks: 50
	Exam duration: 3 hrs

List of Experiments :

1. To Study of Pressure pickups, charge amplifier, storage oscilloscope and signal analysers used for IC engine testing.
2. Performance study of petrol and diesel engines both at full load and part load conditions.
3. Morse test on petrol and diesel engines.
4. Determination of compression ratio, volumetric efficiency and optimum cooling water flow rate in engines.
5. Heat balance test on an automotive engine.
6. Testing of 2 and 4 wheelers using chassis dynamometers.
7. Study of NDIR Gas Analyser and FID
8. Study of Chemiluminescent NOx analyzer
9. Measurement of HC, CO, CO2, O2 using exhaust gas analyzer
10. Diesel smoke measurement.

References:

1. Giles. J.G., Vehicle Operation and performance, IIIiffe Books Ltd., London, 1989.
2. Crouse. W.H. and Anglin. D.L., Motor Vehicle Inspection, McGraw Hill Book Co., 1978.
3. Ganesan. V., Internal Combustion engines, Tata McGraw Hill Co., 1994.
4. BIS code Books, IS-10000 series, 1988.

Note:

1. At least eight experiments should be performed from the above list. Remaining two Experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

AUE -316-F CAD APPLICATION IN AUTOMOTIVE ENGINEERING – I

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. Design and drawing of piston, piston pin and piston rings.
2. Design and drawing of connecting rod small end and big end.
3. Design and drawing of shank.
4. Design and drawing of of big and cap bolts and drawing of the connecting rod assembly
5. Design and drawing of crankshaft, balancing weight calculations, development of short and long crankarms, front end and rear end details.
6 Design and drawing of flywheel & ring gear.
7. Design and drawing of the inlet and exhaust valves.

References:

1 Heldt. P.M. High speed combustion engine, Chilton Books Co., 1952
2 Giles. J.G., Engine design, IIIiffe Books Ltd., London, 1962.
3 Newton. K. and Steeds. W., The Motor Vehicle, The Engilish Language Book Society and Newnes
Butterworth, London, 1972.
4 Khovak, Motor vehicle engines, MIR Publishers.
5 Kolchin. A. and Demidov.V.Design of Automotive Engines.

Note:

1. At least six experiments should be performed from the above list. Remaining one Experiment may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

2. At least 5 to 10 more exercises to be given by the teacher concerned.

AUE-318-F **VEHICLE MAINTENANCE LABORATORY**

L T P	Class work Marks: 25
- - 2	Exam Marks: 25
	Total Marks: 50
	Exam duration: 3 hrs

List of Experiments:

1. Study and layout of an automobile repair, service and maintenance shop.
2. Study and preparation of different statements/records required for the repair and maintenance works
3. Study and preparation of the list of different types of tools and instruments required.
4. Minor and major tune up of gasoline and diesel engines
5. Fault diagnosis in electrical ignition system gasoline fuel system, diesel fuel system and rectification
6. To study the faults in the electrical systems such as Head lights, Side of Parking lights, Trafficator lights, Electric horn system, Windscreen wiper system, Starter system and charging system
7. To study the fuel filters (both gasoline and diesel engines) and air cleaners (dry and wet).
8. To study simple tinkering & soldering works of body panels.
9. To study the door lock and window glass rising mechanisms.
10. Practice of the following:

Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play

Air bleeding from hydraulic brakes, air bleeding of diesel fuel system

Note:

1. At least eight experiments should be performed from the above list. Remaining two Experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.

AUE- 403-F **VEHICLE DYNAMICS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Fundamentals of vibration, Mechanical vibrating systems. Modeling & simulation. Model of an automobile-Single, two, multi degrees of freedom systems-Free, forced and damped vibration. Magnification factor-Transmissibility, Vibration absorber.

Section -B

Multi Degree Of Freedom Systems: Closed coupled system, Eigen valve problems, Far coupled systems-Orthogonality of mode shapes-Modal analysis, Forced vibration by matrix inversion.

Section -C

Suspension and Tyres: Requirements. Spring mass frequency. Wheel hop, wheel wobble, wheel shimmy. Choice of suspension spring rate. Calculation of effective spring rate. Vehicle suspension in fore and apt directions. Ride characteristics of tyres, behaviour while cornering, power consumed by tyre, effect of driving and braking torque-Gough's tyre characteristics.

Section -D

Vehicle Handling: Oversteer, under steer, steady state concerning. Effect of braking, driving torques on steering. Effect of camber, transient effects in concerning. Directional Stability of vehicles. Stability of Vehicles: Load distribution. Calculation of tractive effort and reactions for different drives-Stability of a vehicle on a slope, on a curve and a banked road. Numerical Methods: Approximate methods for fundamental frequency, Dunker-Ley's lower bound, Rayleigh's upper bound-Holzer method or close-coupled systems and branched systems.

REFERENCE BOOKS :

1 Gillespie. T.D., Fundamentals of vehicle dynamics society of Automotive Engineers, Ic USA 1992
2 Heldt. P.M. Automotive Chassis, Chilton co., New York, 1992
3 Ellis.J.R., Vehicle Dynamics, Business Books Ltd., London, 1991.
4 Giles. J.G. Steering, Suspension and Tyres, IIIifee Books Ltd, London, 1988.
5 Giri. N.K. Automobile Mechanics, Khanna Publishers. New Delhi, 1986.
6 Rao. J.S. & Gupta. K., Theory and Practice of Mechanical Vibrations, Wiley Eastern Ltd., New Delhi, 1999.

ME- 401- F **AUTOMOBILE ENGINEERING**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Inroduction to Automobiles : Classification, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitised Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle; Future trends in automobiles.

Clutches : Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; Clutch Linkages.

Section -B

Power Transmission : Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epi-cyclic Gear Box, Freewheel Unit. Overdrive unit-Principle of Overdrive, Advantage of Overdrive,

Transaxle, Transfer cases.

Drive Lines, Universal Joint, Differential and Drive Axles: Effect of driving thrust and torque reactions; Hotchkiss Drive, Torque Tube Drive and radius Rods; Propeller Shaft, Universal Joints, Slip Joint; Constant Velocity Universal Joints; Front Wheel Drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load coming on Rear Axles, Full Floating, Three quarter Floating and Semi Floating Rear Axles

.

Section -C

Suspension Systems : Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Constructional details and characteristics of leaf springs. Steering System : Front Wheel geometry & Wheel alignment viz. Caster, Camber, King pin Inclination, Toe-in/Toe-out; Conditions for true rolling motions of Wheels during steering; Different types of Steering Gear Boxes; Steering linkages and layout; Power steering – Rack & Pinion Power Steering Gear, Electronics steering.

Section -D

Automotive Brakes, Tyres & Wheels : Classification of Brakes; Principle and onstructional details of Drum Brakes, Disc Brakes; Brake actuating systems; echanical, Hydraulic, Pneumatic

Brakes; Factors affecting Brake performance, Power Power Assisted Brakes; Tyres of Wheels; Types of Tyre & their constructional details, heel Balancing, Tyre Rotation; Types of Tyre wear & their causes.Emission Control System & Automotive Electrical : Sources of Atmospheric Pollutionfrom the automobile, Emission Control Systems – Construction and Operation ofPositive Crank Case Ventilation (PVC) Systems, Evaporative Emission Control, HeatedAir Intake System, Exhaust Gas Recirculation (ECR) Systems, Air Injection System andCatalytic Converters; Purpose construction & operation of lead acid Battery, CapacityRating & Maintenance of Batteries; Purpose and Operation of Charging Systems,Purpose and Operations of the Starting System; Vehicle Lighting System.

Text Books:

1. Automobile Engineering by Anil Chhikara, Satya Prakashan, New Delhi.
2. Automobile Engineering by Dr. Kirpal Singh, standard Publishers Distributors.

Reference Books:

1. Automotive Mechanics – Crouse / Anglin, TMH.
2. Automotive Technology – H.M. Sethi, TMH, New Delhi.
3. Automotive Mechanics – S.Srinivasan, TMH, New Delhi.
4. Automotive Mechanics – Joseph Heitner, EWP.
5. Motor Automotive Technology by Anthony E. Schwaller – Delmer Publishers, Inc.
6. The Motor Vehicle – Newton steeds Garrett, Butter Worths.

AUE- 405-F OPERATIONS RESEARCH AND INDUSTRIAL MANAGEMENT

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Operations Research: Introduction to OR, definition, linear programming; graphical method, simplex method, dual problem, dual simplex method, transportation and assignment problems,

Section -B

Industrial Management: Principles and functions of Management: Leadership and decision making. Project Management: CPM and PERT, Queuing theory, Game theory, Markov chain, Monte Carlo Simulation.

Section -C

Human resources: personnel management, industrial legislation and relations, industrial psychology, manpower planning, training and development, health, safety, welfare, remuneration and incentive schemes.

Section -D

Materials, Purchase and Stores Management: Inventory control. Sales and Marketing Management. Cost Accounting and Control, Budget and Budgetary control.

REFERENCE BOOKS :

1. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
2. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan.
3. Operations Research - An Introduction by H.A.Taha, Prentice Hall of India.
4. Operations Research by J.K.Sharma, Macmillan.

HU- 407 -F **ETHICS IN ENGINEERING PROFESSION**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Science, Technology and Engineering as knowledge and as social and professional activities. Inter-relationship of technology growth and social, economic and cultural growth; historical perspective. Ancient, medieval and modern technology/industrial revolution and its impact; the Indian Science and Technology.

Section -B

Social and human critiques of technology; Mumford and Ellul. Rapid technological growth and depletion of resources; reports of the club of Rome; limits to growth; sustainable development. Energy crisis, renewable energy resources. Environmental degradation and pollution; eco-friendly technologies; environmental regulations; environmental ethics. Technology and the arms race; the nuclear threat. Appropriate technology movement of Schumacher; later developments.

Section -C

Technology and the developing nations; problems of technology transfer; technology assessment/impact analysis. Human operator in engineering projects and industries; problems of man-machine interaction; impact of assembly line and automation; human centred technology. Industrial hazards and safety; safety regulations, safety engineering.

Section -D

Politics and technology; authoritarian versus democratic control of technology; social and ethical audit of industrial organizations. Engineering profession; ethical issues in engineering practice; conflicts between business demands and professional ideals; social and ethical responsibilities of the engineer; codes of professional ethics; whistle blowing and beyond; case studies.

REFERENCE BOOKS :

1. Baum, R.J., ed, Ethical Problems in Engineering
2. Beabout, G.R., Wennemann, D.J., Applied Professional Ethics

ME- 409-F AUTOMOBILE ENGINEERING LAB

L T P
- - 2

Class work Marks: 25
Exam Marks: 25
Total Marks: 50
Exam duration: 3 hrs

List of Experiments :

1. To study and prepare report on the constructional details, working principles and operation of the following Automotive Engine Systems & Sub Systems.

(a) Multi-cylinder : Diesel and Petrol Engines.

(b) Engine cooling & lubricating Systems.

(c) Engine starting Systems.

(d) Contact Point & Electronic Ignition Systems.

2. To study and prepare report on the constructional details, working principles and operation of the following Fuels supply systems:

(a) Carburetors

(b) Diesel Fuel Injection Systems

(c) Gasoline Fuel Injection Systems.

3.. To study and prepare report on the constructional details, working principles and operation of the following Automotive Clutches.

(a) Coil-Spring Clutch

(b) Diaphragm – Spring Clutch.

(c) Double Disk Clutch.

4. To study and prepare report on the constructional details, working principles and operation of the following Automotive Transmission systems.

(a) Synchromesh – Four speed Range.

(b) Transaxle with Dual Speed Range.

(c) Four Wheel Drive and Transfer Case.

(d) Steering Column and Floor – Shift levers.

5. To study and prepare report on the constructional details, working principles and operation of the following Automotive Drive Lines & Differentials.

(a) Rear Wheel Drive Line.

(b) Front Wheel Drive Line.

(c) Differentials, Drive Axles and Four Wheel Drive Line.

6. To study and prepare report on the constructional details, working principles and operation of the following Automotive Suspension Systems.

(a) Front Suspension System.

(b) Rear Suspension System.

7. To study and prepare report on the constructional details, working principles and operation of the following Automotive Steering Systems.

(a) Manual Steering Systems, e.g. Pitman –arm steering, Rack & Pinion steering.

(b) Power steering Systems, e.g. Rack and Pinion Power Steering System.

(c) Steering Wheels and Columns e.g. Tilt & Telescopic steering Wheels, Collapsible Steering Columns.

8. To study and prepare report on the constructional details, working principles and operation of the following Automotive Tyres & wheels.

(a) Various Types of Bias & Radial Tyres.

(b) Various Types of wheels.

9. To study and prepare report on the constructional details, working principles and operation of the Automotive Brake systems.

(a) Hydraulic & Pneumatic Brake systems.

(b) Drum Brake System.

(c) Disk Brake System.

(d) Antilock Brake System.

(e) System Packing & Other Brakes.

10. To study and prepare report on the constructional details, working principles and operation of Automotive Emission / Pollution control systems.

11. Modeling of any two automotive systems on 3D CAD using educational softwares (eg. 3D modeling package/Pro Engineering/I-Deas/ Solid edge etc.)

12. Crash worthiness of the designed frame using Hypermesh and LS-Dyna solver or other software.

NOTE : 1. At least ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or as designed & set by the concerned institution as per the scope of the syllabus.

AUE -411-F CAD APPLICATION FOR AUTOMOTIVE ENGINEERRING –II

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Design and drawing of Cam and Camshaft, Cam profile generation. Design of combustion chamber.

Section -B

Design and drawing of engine complete assembly with cylinder block, cylinder head, crankcase, valve ports, water jackets, front and rear end details.

Section -C

Clutch: Components and assembly drawing using CAD Software.

Section -D

Gear Box: Gear train calculations. Layout of gearbox. Calculation of bearing loads and selection of bearings. Complete assembly drawing using CAD Software.

REFERENCE BOOKS :

1. Heldt. P.M. High speed combustion engine, Chilton Books Co., 1952.
2. Giles. J.G., Engine design, IIIiffe Books Ltd.., London, 1962.
3. Newton. K. and Steeds. W., The Motor Vehicle, The English Language Book Society and Newnes Butterworth, London, 1972.
4. Khovak, Motor vehicle engines, MIR Publishers.
5. Kolchin. A. and Demidov. V. Design of Automotive Engines.

AUE- 404-F TRANSPORT MANAGEMENT AND AUTOMOBILE INDUSTRY

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Management Training and Operations: Basic principles of supervising. Organising time and people. Job instruction training, training devices and techniques. Driver and mechanic hiring. Driver checklist, Lists for driver and mechanic. Trip leasing. Vehicle operation and types of operation. Automobile Industry: History and development of the automobile industry, market trends, current scenario in Indian auto industry, Auto ancillary industries, Role of the automobile industry in national growth.

Section -B

Vehicle Maintenance: Scheduled and unscheduled maintenance Planning and scope. Evaluation of PMI program, Work scheduling, Overtime, Breakdown analysis, Control of repair backlogs, Cost of options. Scheduling and Fare Structure: Route planning, Scheduling of transport vehicles, Preparation of timetable, Costs, fare structure, methods of the fare collection, Preparation of fare table.

Section -C

Vehicle Parts, Supply Management and Budget: Cost of inventory, Balancing inventory cost against downtime, Parts control, Bin tag systems. Time management, Time record keeping, Budget activity, Capital expenditures, Classification of vehicle expenses. Fleet management and data processing, Data processing systems- Software. Models – Computer controlling of fleet activity. Energy management.

Section -D

Motor Vehicle Act: Schedules and sections, Registration of motor vehicles, Licensing of drivers, Control of permit, Limits of speed, traffic signs. Constructional regulations. Description of goods carrier, delivery van, tanker, tipper, Municipal, fire fighting and break down service vehicle.

REFERENCE BOOKS :

1. John Dolu, Fleet Management, McGraw Hill Co., 1984
2. Government Publication, The Motor Vehicle Act, 1989
3. Kitchin. L. D., Bus Operation, IIIiffe and Sons Ltd., London, III Edition, 1992
4. Kadiyali. L.R., Traffic Engineering and Transport Planning.

ME- 402-F **COMPUTER AIDED DESIGN**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Introduction to CAD/CAM, Historical developments, Industrial look at CAD/CAM, Introduction to CIM; Basics of geometric and solid modeling, explicit, implicit, intrinsic and parametric equations, coordinate systems.

Transformations: Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, orthographic and perspective projections, reconstruction of 3-D objects.

Section -B

Curves: Algebraic and geometric forms, tangents and normal, blending functions reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.

Surfaces: Algebraic and geometric forms, tangents and normal, blending functions, reparametrization , sixteen point form, four curve form, plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, bezier surface, B-spline surface.

Section -C

Solids: Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation, cell decomposition, spatial occupancy enumeration.

Automation and Numerical Control: Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming.

Section -D

Group Technology: Part families, part classification and coding, production flow analysis, Machine cell design, Advantages of GT

Flexible Manufacturing Systems & Computer aided process planning:

Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, advantages and applications Coventional process planning, types of CAPP, Steps invariant process planning, planning for CAPP.

TEXT BOOKS:

1. CAD/ CAM by Groover and Zimmer, Prantice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
3. Numerical Control and Computer Aided Manufacturing by Kundra, Rao & Tiwari, TMH.

REFERENCE BOOKS :

1 CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan & Jimmie Browne, Published by Addison- Wesley.

ME- 406 -F **COMPUTER AIDED DESIGN LAB**

L T P
- - 2

Class work Marks: 50
Exam Marks: 50
Total Marks: 100
Exam duration: 3 hrs

The students will be required to carry out the following exercises using software packages (e.g. 3D modeling package/ Pro Engineer/ I-Deas/ Solid Edge etc.).

1. Implement simple programmes for the graphics representation of
(i) Transformation and projections.
(ii) Conic Sections, cubic splines, and B-splines.
(iii) Surfaces- Bilinear, Bicubic surface patch and Bezier surface.

2. CAD Modelling Assignments.
(i) Construction of simple machine parts and components.
(ii) Modelling of machine components.
(iii)face of a Diffuser section, Propeller.
(iv)Gear blank and other mechanical parts.
(v) Mechanical assembly of parts.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

Elective Papers

AUE- 408 -F **OPTIMISATION FOR ENGINEERING DESIGN**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Single Variable Optimization for engineering design: Introduction-Engineering optimization problems-Optimality criteria-Bracketing methods-Region elimination methods-Point estimation methods-Gradient based methods-Root finding using optimization techniques- Computer programmes.

Section -B

Multi Variable Optimization Algorithm: Optimality criteria-Unidirectional search-Direct search methods-gradient based methods- Computer programmes. Constrained Optimization Algorithms: Kuhn – Tucker conditions –Transformation methods – sensitivity analysis – Direct search for constrained minimization-Unearized search techniques – feasible direct method-generalised reduction gradient method-Gradient projection method- Computer programmes.

Section -C

Specialized Algorithms : Integer programming – Geometric programming.

Section -D

Non-Traditional Optimization Algorithms: Genetic algorithms – Simulated annealing – Global optimization – Computer programmes.

REFERENCE BOOKS :

1. Kalyanmay Deb, Optimization for Engineering Design, Prentice Hall of India, New Delhi.
2. Taha. M.A., Operations Research, Macmillan, New York, 1989
3. Rao.S.S., Optimisation Theory and Application, Wiley Eastern, New Delhi, 1990
4. Muirthy, Linear Programming, Wiley, New York, 1987.
5. Rekiaaitis. G.V. Ravindran.A. And Regedell K.M., Engineering optimization methods and applications, Wiley, New York, 1986.
6. Conley. W., Computer Optimization Techniques, Pntrecelli Book, 1980.

AUE -410 -F **TRACTORS AND FARM EQUIPMENT**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

General Design of Tractors : Classification of Tractors-Main components of Tractor-Safety Rules. Farm Equipments: Working attachment of tractors-Farm equipment – Classification – Auxiliary equipment – Trailers and body tipping mechanism.

Section -B

Control of the Tractor and Fundamentals of Engine Operation: Tractor controls and the starting of the tractor engines-Basic notions and definition-Engine cycles-Operation of multicylinder engines-General engine design - Basic engine performance characteristics.

Section -C

Engine Frame Work and Valve Mechanism of Tractor: Cylinder and pistons-Connecting rods and crankshafts Engine balancing – Construction and operation of the valve mechanism-Valve mechanism components – Valve mechanism troubles.

Section -D

Cooling system, Lubrication System and Fuel System of a Tractor: Cooling system – Classification – Liquid cooling system – Components, Lubricating system servicing and troubles – Air cleaner and turbo charger – Fuel tanks and filters –Fuel pumps.

REFERENCE BOOKS :

1. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987
2. Kolchin. A., and V.Demidov Design of Automotive engines for tractor, MIR Publishers, 1972

AUE- 412-F **OFF-ROAD VEHICLES**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Classification and Requirements of Off Road Vehicles: Power plants, chassis and transmission, Multiaxle vehicles.

Section -B

Land clearing machines: Bush cutter, stumpers, Tree dozer, Rippers.

Section -C

Earth Moving Machines: Bulldozers, cable and hydraulic dozer. Crawler trach, running and steering gears, scrapers, drag and self powered types – Dump track and dumpers – Loaders, single bucket, multi bucket and rotary types- Power and capacity of earth moving machines.

Section -D

Scrapers and Graders: Scrapers, elevating graders, self powered scrapers and graders. Shovels and Ditchers : Power shovel, revolving and stripper shovels – drag lines – ditchers – Capacity of shovels.

REFERENCE BOOKS :

1. Abrosimov.K. Bran berg. A. and Katayer. K., Road making Machinery, MIR Publishers, Moscow, 1971.
2. Wang. J.T., Theory of Grand vehicles, John Wiley & Sons, New York, 1987
3. Off the road Wheeled and combined traction devices – Ashgate Publishing Co. Ltd. 1988.

AUE- 414 -F **TOTAL LIFE CYCLE MANAGEMENT**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Definition of total life cycle (TLC)-Concept of TLC-Life cycle impacts-Integrating life cycle technologies-Products and processes within TLC-TLC methodology-TLC accessment data to complex products-Results Improvement for product.

Section -B

Vehicle End Life: Design for end of old vehicle management –Problems of old vehicles in emerging markets-recovery and economic feasibility of materials such as Plastics, rubber aluminum, steel,etc.

Section -C

Tradeoffs: Applying life cycle thinking to define tradeoffs along the supply, manufacture-use and end of life chain-Effect on the customer- Expectation of the customer-Evaluate product cost on fuel consumption, emissions, durability, environment and health.

Section -D

Sustainability: What is sustainability-Use of renewable resources-View to design horizon.
Harmonization of Environmental Goals: TLC for emerging vs. developed markets-Rules and regulations to guide designers-International
common practices for end of life vehicles.

REFERENCE BOOKS :

1.Collaborative Product and Service **Life Cycle Management** by Richard Curran, Shuo-Yan Chou, Amy Trappey

AUE-416-F COMPUTER SIMULATION OF IC ENGINES PROCESSES

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Introduction-Heat of reaction-Measurement of URP-Measurement of HRP-Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constsant pressure adiabatic combustion. Calculation of adiabatic flame temperature-Isentropic changes of state

Section -B

SI Engine Simulation With Air As Working Medium: Deviation between actual and ideal cycle-Problems, I engine simulation with adiabatic combustion, temperature drop due to fuel vapourisation, full throttle operation-efficiency calculation, part-throttle operation, super charged operation

Section -C

Progressive Combustion: SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance.

Section -D

Simulation of 2-Stroke SI Engine: Diesel Engine Simulation: Multi Zone model for combustion, different heat transfer models, equilibrium calculations, simulation of engine performance, simulation for pollution estimation.

REFERENCE BOOKS :

1. Ganesan. V. Computer Simulation of spark ignition engine process, Universities Press (I) Ltd. Hyderabad, 1996.
2. Ramoss. A.L., Modelling of Internal Combustion Engines Processes, McGraw Hill Publishing Co., 1992.
3. Ashley Campbel, Thermodynamic analysis of combustion engines, John Wiley & Sons, New York, 1986
4. Benson. R.S., Whitehouse. N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

AUE- 418-F NON-DESTRUCTIVE TESTING METHODS

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Non-Destructive Testing: Introduction, classification of NDT techniques, Visual examination: Bore-scopes, video devices.

Section -B

Magnetic particle testing: Operating principal, magnetising technique. Liquid Penetrating technique: Principle, process description.

Section -C

Ultrasonic Testing: Definition, advantages and applications, inspection methods. Radiography: Electromagnetic radiation sources, process description.

Section -D

Thermography: Infrared theory, contact, non-contact methods. Accoustic emission testing, eddy current testing, Leak testing: Bubble emission testing, Air leak testing. Case studies on defects in casting, rolling, welding, and heat-treating.

REFERENCE BOOKS :

1. Non-Destructive Testing by Warren J.Mcgomnagle, McGrawhill.
2. Non-Destructive Testing by Baldev Raj et. al., Narosa Publishing House.

ME- 420-F **INDUSTRIAL ENGINEERING**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Production Planning and Control; Product: product design, customer requirements, value engineering, quality, reliability, service life, and competitiveness.

Section -B

Plant: location, layout, material handling, equipment selection, maintenance of equipment and facilities.

Section -C

Processes: Job, batch and flow production methods, Group Technology Work study and Time and Motion study, Work/job evaluation, quality control (SPC), control charts.

Section -D

Resource planning: production/ operation control, forecasting, capacity management, scheduling and loading, line balancing, breakeven analysis, inventory of materials and their control, manufacturing planning, MRP - II, JIT.

REFERENCE BOOKS :

1. Production, Planning and Inventory Control by S.L.Narasimhan, D.W.McLeavey, P.J.Billington, Prentice Hall.
2. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
3. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan.

ME- 422-F **FINITE ELEMENT METHODS AND ITS APPLICATION**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction : Review of various approximate methods in structural analysis. Stiffness and flexibility matrics for simple cases. Basic concepts of finite element method. Formulation of governing equations and convergence criteria.

Section -B

Discrete Elements: Use of bar and beam elements in structural analysis. Computer implementation of procedure for these elements. Continuum Elements: Different forms of 2D elements and their applications for plane strees, plane strain and axi-symmetric problems. Consistent and lumped formulation. Use of local coordinates. Numerical integration.

Section -C

ISO Parametric Elements: Definition and use of different forms of 2D and 3D elements. Computer implementation of formulation of these elements for the analysis of typical structural parts.

Section -D

Solution Schemes: Different methods of solution of simultaneous equations governing static, dynamic and stability problems. General purpose software packages.

REFERENCE BOOKS :

1. Segerlind. L.J., Applied Finite Element Analysis, Secon Edition, John Wiley and Sons Inc., New York, 1984.
2. Bathe.K.J. and Wilson. E.L., Numerical methods in finite element analysis, Prentice Hall of India Ltd., 1983.
3. Cook. R.D., Concepts and Applications of Finite Element analysis, 3rd Edition, John Wiley & Sons, 1989.
4. Krishnamurthy. C.S., Finite Element Analysis, Tata McGraw Hill., 1987
5. Ramamurthi.V., Computer Aided Design in Mechanical Engineering, Tata McGraw Hill, 1987.

AUE -424 -F **ALTERNATE FUELS AND ENERGY SYSTEMS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Estimation of petroleum reserve-Need for alternate fuel-Availability and properties of alternate fuels-general use of alcohols- LPG-Hydrogen-Ammonia, CNG, and LNG-Vegetable oils and Biogas-Merits and demerits of various alternate fuels.

Section -B

Alcohols: Properties as engine fuels, alchohols and gasoline blends-Combustion characteristics in engines-emission characteristics. Vegetable Oils: Various vegetable oils for engines-Esterification-Performance in engines-Performance and emission characteristics

Section -C

Natural Gas, LPG, Hydrogen and Biogas: Availability of CNG, properties modification required to use in engines-performance and emission characteristics of CNG using LPG in SI & CI engines. Performance and emission for LPG-Hydrogen-Storage and handling, performance and safety aspects.

Section -D

Electrical and Solar Powered Vehicles: Layout of an electric vehicle-Advantage and limitations-Specifications-System component, Electronic control system-High energy and power density batteries-Hybrid vehicle-Solar powered vehicles.

REFERENCE BOOKS :

1. Maheswar Dayal, Energy today & tomorrow, I & B Horishr India,1982
2. Nagpal, Power Plant Engineering, Khanna Publishers,1991.
3. Alchohols and Motor fuels progress in technology, Series No.19,SAEPublicartion USA 1980.
4. SAE paper Nos.840367, 841156,841333,841334.
5. The properties and performance of modern alternate fuels SAE paper No 841210.
6. Bechtold.R.L. Alternative Fuels Guide Book, SAE, 1997.

AUE- 426-F MICROPROCESSOR APPLICATION IN AUTOMOBILES

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Architecture: General 8 bit microprocessor and its architecture 8085,Z-80 and MC 6800 MPU and its pin functions-Architecture-Functions of different sections.

Section -B

Instruction Set: Instruction format-addressing modes-instruction set of 8085 MPU-T-STATE-Machine cycle and instruction cycles-Timing diagrams-Different machine cycles-Fetch and execute operations-estimation of execution times.

Section -C

Assembly Language Programming: Construct of the language programming-Assembly format of 8085-Assembly Directive-Multiple precision addition and subtraction-BCD to Binary and Binary to BCD Multiplication, Division, Code conversion using look up tables-stack and subroutines.
Data Transfer Schemes: Interrupt structure-Programmed I/O, DMA-Serial I/O.

Section -D

Interfacing Devices: Types of interfacing devices-Input/Output ports 8212, 8255,8251,8279. Octal latches and tristate buffers-A/D and D/A converters-Switches, LED's ROM and RAM interfacing. Applications: Data acquisitions-Temperature control-Stepper motor control-Automotive applications engine control, Suspension system control, Driver information systems, Development of a high speed, high precision learning control system for the engine control.

REFERENCE BOOKS :

1. Ramesh, Goankar.S., Microprocessor Archietecture Programming and Applications, Wiley Eastern Ltd.,New Delhi,1986.
2. Aditya .P. Mathur, Introduction to Microprocessors, III Edition Tata McGraw Hill Publishuing Co Ltd New Delhi,1989.
3. Ahson. S. I., Microprocessors with Applications in Process Control,Tata McGraw Hill New Delhi,1986.
4. SAE Transactions,1986 Sec 3.
5. Jabez Dhinagfar .S., Microprocessor Applications in Automobiles.
6. L. Bianco and A. Labella., Automotive Micro Electronics, Elsevier science Publishers,1986.

ME- 428 -F **MANAGEMENT INFORMATION SYSTEMS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction to Management Information Systems (MIS); Data, information and knowledge concepts, concepts of information representation: storage, dissemination, discrimination and transmission.

Section -B

Data base management systems, design and implementation of RDBMS for managerial applications, retrieval aspects, and security and privacy aspects.

Section -C

Specification and configuration of computer based systems; Manufacturing Management Information systems- its subsystems and outputs; costing and performance audit applications in MIS.

Section -D

Types of information system used in management Information Systems. Communication devices, media, systems; network hardware and software; network configuration; network applications; coding of data. cost/benefit analysis; distributed versus centralised systems; architectures, topologies and protocols; installation and operation of bridges, routers and gateways; network performance analysis; privacy, security, reliability; installation and configuration of LAN and WAN networks.

REFERENCE BOOKS :

1. Management Information Systems, Organisation and Technology by Loudon and Loudon, 4th ed., Prentice Hall.

ME- 430-F **TOTAL QUALITY MANAGEMENT**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Basic concepts, definitions and history of quality control. Quality function and concept of quality cycle. Quality policy and objectives. Economics of quality and measurement of the cost of quality. Quality considerations in design.

Section -B

Process control: Machine and process capability analysis. Use of control charts and process engineering techniques for implementing the quality plan.

Section -C

Acceptance Sampling: single, double and multiple sampling, lot quality protection, features and types of acceptance sampling tables, acceptance sampling of variables and statistical tolerance analysis. Quality education, principles of participation and participative approaches to quality commitment.

Section -D

Emerging concepts of quality management: Taguchi's concept of off-line quality control and Ishikawa's cause and effect diagram.

REFERENCE BOOKS :

1. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
2. Quality Control and Applications by Housen & Ghose
3. Industrial Engineering Management by O.P. Khanna

AUE -432 -F **INFORMATION TECHNOLOGY**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Hardware: CPU architecture, memory, registers, addressing modes, buses, instruction sets, multi processors versus single processors; Peripheral devices: hard disks, CDs, video display monitors, device controllers, input/output; operating systems - functions and types.

Section -B

Operating system modules: processes, process management, memory and file system management; examples of hardware architectures; examples of operating systems; basic network components, switches, multiplexers and media; installation and configuration of multi user operating systems.

Section -C

Data structure and representation: characters, records, files, multimedia; precision of data; information representation, organisation and storage; algorithm development; object representation compared to conventional data flow notation; programming control structures; program correctness, verifications and validations; file structures and representation.

Section -D

Communication devices, media, systems; network hardware and software; network configuration; network applications; coding of data; cost/benefit analysis; distributed versus centralised systems; architectures, topologies and protocols; installation and operation of bridges, routers and gateways; network performance analysis; privacy, security, reliability; installation and configuration of LAN and WAN networks; monitoring of networks; management of telecommunications and communications standards. Intranet and Internet.

REFERENCE BOOKS:

1. Computer Architecture and Organisation – John. P. Haryes, Tata McGraw Hill
2. Data Structure and Program Design – Robert L. Kruse, PHI
3. Modern Operating System – Andrew S. Tanenbaum, PHI
4. Data and Computer Communication – William Stallings, PHI

AUE- 434 -F **ENTREPRENEURSHIP AND E-BUSINESS**

L T P
3 1 0

Class work Marks: 50
Theory Marks: 100
Total Marks: 150
Exam duration: 3 hrs

NOTE: For setting up the question paper, question no 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section -A

Introduction: Concept of Entrepreneurship - need and scope for entrepreneurship - Entrepreneur and society - qualities of entrepreneur Risks, relevance and benefits of small scale Industry - definition of tiny, small ancillary industry - prevailing industrial policy of SSI - incentives and benefits of SSI units. Motivation theories - Maslow, McCllend - Motivation model - need, want, motive and behaviour - attitude towards work - self assessment and goal setting - Achievement, motivation and behaviour measurement, SWOT analysis, TA analysis - Stress and conflict management; coping with uncertainty; creativity and innovation.

Section -B

Project identification and formulation: Sources of information - opportunity guidance - choice of technology and its evaluation; Consumer behaviour; market survey and research; demand and resource based industry- servicing industry - import substitution- Techno economic feasibility assessment - short listing, preliminary project report, detailed project report, assessing viability and feasibility of a report.

Section -C

Forms of business organisations/ownership - formation of a Company - procedures and formalities for setting up of new industrysources of information to contact for what and where - subsidies and concessions for SSI - role of State and Central Government Agencies in promotion of Small Scale Industry. Sickness and nursing of sickness in SSI. Labour Laws - The Factories Act 1948, Minimum Wages Act - Payment of Wages 1936, Workmen Compensation Act, 1923.

Section -D

Taxation - State and Central - Concessions. Introduction to e-business; EDI and e-commerce; EDI standard, implementation and Tools; e-commerce imperatives, e-commerce applications: I - Markets, Customer care, Vendor Management and Extended supply chain management; security aspects - cryptography, digital signature, digital watermarking, secured socket layers, understanding threats to security, securing internet connections, Firewall techniques, electronic payment systems - ATM model, Payment Models, credit card based payment system, 1st virtual banking, ecash, smart cards; Electronic Data interchange EDI) - Value added networks.

REFERENCE BOOKS:

1. Handbook for New Enterpreneurs, EDII, Ahmedabad.
2. Entrepreneurial Development by P.Saravanavel.