

C-18 CURRICULUM

DIPLOMA IN ARCHITECTURAL ASSISTANTSHIP



STATE BOARD OF TECHNICAL EDUCATION & TRAINING

TELANGANA, HYDERABAD

V SEMESTER

TEACHING AND EXAMINATION SCHEME

	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal Evaluation(CIE)			Semester end examination (SEE)			
			L	T	P			Sem Mid 1	Sem Mid 2	Internal Evaluation	Max marks Min marks	Total Marks	Min marks for passing including CIE	
1	18A-501C	Transport and Industrial management	3	1	0	60	3	20	20	20	40	14	100	35
2	18A-502C	Design of Machine Elements	3	1	0	60	3	20	20	20	40	14	100	35
2	18A-503C	Autotronics	3	1	0	60	3	20	20	20	40	14	100	35
4	18A-504E	Elective-I	3	1	0	60	3	20	20	20	40	14	100	35
5	18A-505E	Elective-II	3	1	0	60	3	20	20	20	40	14	100	35
6	18A-506P	Automobile Engineering Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	18A-507P	Fuels, Lubricants and I.C. Engines Testing lab.	1	0	2	45	1.5	20	20	20	40	20	100	50
8	18A-508P	Vehicle Diagnosis Laboratory	1	0	2	45	1.5	20	20	20	40	20	100	50
9	18A-509C	Programming in 'C' Laboratory	1	0	2	45	1.5	20	20	20	40	20	100	50
10	18A-510C	Project Work	1	0	2	45	1.5	20	20	20	40	20	100	50
11	Skill Up gradation		0	0	7	105	2.5	0	0	Rubrics			--	-
TOTAL			20	5	17	630	25	200	200	220	400	170	1000	425
Student performance is to be assessed through Rubrics for Skill Up Gradation														

Note: Pass criteria: The minimum marks required for passing in any of courses are given below

1. Cumulative 35% (Sem Mid-1 + Sem mid- 2+ Tutorials+ End examinations) and minimum marks in end examination is 35% (i.e.14marks).
2. If the cumulative of CIE is less than 35% (i.e.21 marks out of 60) therefore more than 35% of SEE is required to get overall 35%.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title :	TRANSPORT AND INDUSTRIAL MANAGEMENT	Course Code	18A-501C
Semester	V	Course Group	: Core
Teaching Scheme in Periods (L:T:P)	35:15:0	Credits	: 3
Methodology	Lecture	Total Contact Periods :	:60
CIE	60 Marks	SEE	: 40 Marks

Course Content and Blue Print of Marks for SEE

Unit Sl No	Unit Name	Questions to be set for SEE				Periods
		R		U	A	
1	Organizational structure	4	1	9(a)	13(a)	10
2	Operations					08
3	Scheduling and transport economics		2	10(a)	14(a)	14
4	Production Management					08
5	Materials Management		3	5, 6	9(b) 11(a) 11(b)	10
6	Marketing ,Sales &Feasibility Study					
			7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)	10
Total Questions		8		8	8	60
Legend:	Remembering (R)	1 Mark				
	Understanding (U)	3 Marks				
	Application (A)	5 Marks				

Pre requisites

This course requires the basic knowledge of Automobile Engineering.

Course Outcomes:

CO1 :	Identify the various types of motor transport systems.
CO2 :	Explain different types of operations.
CO3 :	Describe the various costs and fare methods.
CO4 :	Describe ABC analysis.
CO5 :	Demonstrate the various fare collection systems.
CO6:	Explain the organisational structure.

Course Content:**UNIT I: Organizational structure****Duration: Periods 10 (L: 6 – T:4)**

Importance of motor transport in present day transport system – types of motor transport – Passenger transport and Goods transport – public transport and private transport – classification of carriers – common carriers, contract carriers – Highway carriers , High way passenger carriers – freight carriers – water carriers,. Types of ownership – state, municipality , public and private undertaking, principal functions of transport organisation – administrative, traffic, secretarial and engineering functions – organisational structure – organisation of various departments – staffing – chain of responsibilities – Training Programmes.

UNIT II: Operations**Duration : Periods 8(L:4.8 – T:3.2)**

Types of operations – city operation – city – suburban operation – inter-city (short distance and long distance) operation – other specific operations for goods carriers –operating characteristics – utility – capacity , Dependability – safety , distance, speed – road condition- fuel economy , Traffic interference , flexibility – Trip generation – Trip distribution – traffic data – published data – field survey –preparation of time tables for - vehicles and operational staff –duty rosters – Trip sheet – way bill.

UNIT III: Scheduling and transport economics**Duration: Periods 14 (L: 8.4 – T:5.6)**

Basic factors to be considered in bus scheduling – Traffic demand, running time, maintenance time, stand time – vehicle utilization - Basic factors to be considered in crew scheduling – hours of work – Daily and weekly intervals of rest – spread over, spell of duty, overtime allowance – Handling over and taking over time – use of computer in scheduling.

Costs – Capital costs – Maintenance costs- miscellaneous costs – components of vehicle operational costs – fuel, lubricants, tyres, license- operational staff – vehicle taxes – depreciation. Elementary treatment of traffic investigation to improve services – peak hours demand, Slack hour requirement – express, limited stop services - relief services – fare structure – Requirements of a good fare system – different fares for hilly areas – different routes – Express services luxury services – different rates relating to distance – fare methods – straight line scale method, tapered scale method, flat rate , concessional fare, luggage fare – structure and method of drawing of fare stages – Examples for different type of fare structures - stage – fare stage – Designing a stage – Fare collection system . Ticketing system – types – Hand written ticket, card ticket and pre – printed denomination ticket – advance booking and reservation voucher – Ticketing machine.

UNIT IV: Production Management**Duration : Periods 8 (L: 4.8 – T:3.2)**

Production, planning and control, relation with other departments, need for planning and its advantages, Routing, scheduling, dispatching, PERT and CPM, simple problems.

UNIT V: Materials Management**Duration : Periods 10 (L: 6– T:4)**

Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order, level, Economic ordering quantity, stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex.

UNIT VI: Marketing, Sales & Feasibility study**Duration : Periods 10 (L: 6 – T:4)**

Sellers and Buyers markets, Marketing, Sales, monopoly, oligopoly, perfect competition, Cost - Elements of Cost, Contribution, Break even analysis, Market Survey, demand survey, preparation of Feasibility study reports - different products – Mechanical, Electrical, Electronics, consumer items, Consumer desires etc.

Recommended Reference Books:

S.No	Title of Books	Author	Publication
1.	Industrial Organization and Engineering Economics	T.R.Banga & S C Sharma	Khanna Publishers
2.	Industrial Management and Engineering Economics	O.P.Khanna	Khanna publishers
3.	Safety Management in Industry	Krishnan's V	Jaico Publishing House, Bombay, 1997
4.	Vehicle Transport Management	S.L.Bhandarkar	Dhanapath Rai & Co
5.	The central Motor Vehicles Rules 1989 (2001 Edition)	Edited By: Sathpal Puliani	Karnataka Law Journal Publications Bangalore
6.	The central Motor Vehicles Rules 1989 (2005 Edition)	Edited By: Sathpal Puliani	Karnataka Law Journal Publications Bangalore

Suggested Learning Outcomes:

Student will be

1.0 Organizational structure

1. 1 Able to state the importance of Motor Transport Organization.
1. 2 Able to classify the Motor Transport Organization.
1. 3 Able to differentiate between passenger transport and goods transport , public transport and private transport.
1. 4 Able to classify transport carriers.
1. 5 Able to explain the different types of ownership of motor transport organization.
1. 6 Able to give the functional wings of a transport system.
1. 7 Able to draw the Organizational charts for the transport organization, its regional and district branches.
1. 8 Able to explain the criteria and mode of staffing.
1. 9 Able to fix up the chain of responsibilities.
1. 10 Able to state the need and type of staff training Programs.

2.0 Operations

2. 1 Able to state the types of operation.
2. 2 Able to distinguish – city; city-suburban and inter –city operation.
2. 3 Able to state the operating characteristics , speed, road condition, fuel economy, traffic interference.

- 2.5 Able to explain the terms – trip generation, factors to be considered for trip generation.
- 2.6 Able to explain about traffic data – published data - field survey.
- 2.7 Able to prepare Able to state the factors such as utility, capacity, dependability, safety, distance, flexibility time table for– vehicles- operational staff.
- 2.8 Able to explain the following terms – duty rosters – trip sheet, way bill.
- 2.9 Able to state the causes for accidents and remedial measures.
- 2.10 Able to state the incentive schemes for accident prevention
- 2.11 Able to list the intra carrier conditions, co–ordination of schedules and interchange of equipment.
- 2.12 Able to state the meaning of trip generation and explain the factors to be considered for trip generation.
- 2.13 Able to explain the trip distribution
- 2.14 Able to state the collection methods of traffic data.
- 2.15 Able to explain the method of preparation of Time – Table for operational staff.
- 2.16 Able to state the meaning of ‘trip sheet ‘ and ‘waybill’

3.0 Scheduling and transport economics

- 3. 1 Able to state the factors to be considered in bus scheduling.
- 3. 2 Able to calculate number of buses required.
- 3. 3 Able to state the factors to be considered in crew scheduling.
- 3. 4 Able to explain how the productivity can be increased by scheduling.
- 3. 5 Able to applications of computer in scheduling.
- 3. 6 Able to state the different types of costs involved in a transport organization.
- 3. 7 Able to explain the components of vehicle operational cost.
- 3. 8 Able to compute the total cost for specific type of operation.
- 3. 9 Able to explain Vehicles taxes and depreciation
- 3. 10 Able to state the different types of fares
- 3. 11 Able to explain the fare structure.
- 3. 12 Able to state the requirements of good fare system.
- 3. 13 Able to explain different services, fares relating to distances.
- 3. 14 Able to state the different fare methods.
- 3. 15 Able to explain straight line scale method, tapered scale method, flat fare, concessional fare and luggage fare.
- 3. 16 Able to explain the method of drawing fare tables with suitable examples
- 3. 17 Able to explain the term fare stage.
- 3. 18 Able to explain how to design a fare stage.
- 3. 19 Able to explain the fare collection system.
- 3. 20 Able to state the types of ticketing system.
- 3. 21 Able to know about hand written ticket, card ticket, pre printed denomination ticket, advance booking and reservation voucher and ticketing machine.

4.0 Production Management

- 4.1 Able to differentiate and integrate production, planning and control.
- 4.2 Able to relate the production department with other departments.
- 4.3 Able to explain the stages of Production, planning and control and their advantages.
- 4.4 Able to explain routing methods.
- 4.5 Able to explain scheduling methods.
- 4.6 Able to explain dispatching.
- 4.6 Able to draw PERT/CPM networks.
- 4.8 Able to identify the critical path.

5.0 Materials Management

- 5.1 Able to explain the role of the materials in Industry.
- 5.2 Able to derive expression for inventory control.
- 5.3 Able to explain ABC analysis.
- 5.4 Able to define safety stock.
- 5.5 Able to define re-order level
- 5.6 Able to derive an expression for economic ordering quantity.
- 5.7 Able to list out stores records.
- 5.8 Able to explain the Bin card.
- 5.9 Able to describe Cardex method.
- 5.10 Able to explain purchasing procedures.
- 5.11 Able to list out purchase records.
- 5.12 Able to describe the stores equipment

6.0 Marketing, Sales & Feasibility study

- 6.1 Able to explain marketing functions.
- 6.2 Able to explain Sales function.
- 6.3 Able to list the market conditions.
- 6.4 Able to differentiate Sellers and Buyers 'market.
- 6.5 Able to differentiate monopoly, oligopoly and perfect competition.
- 6.6 Able to conduct market and demand surveys.
- 6.7 Able to identify the input materials, i.e. Bill of materials
- 6.8 Able to list the elements of cost.
- 6.9 Able to explain the concept of contribution.
- 6.10 Able to explain break-even analysis.
- 6.11 Able to prepare feasibility study.
- 6.12 Able to list different products currently in demand with market or industry.

Suggested E-Learning references

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. <http://transport.telangana.gov.in/>
5. <https://www.youtube.com/watch?v=OqmRZXfVoE4>
6. <https://www.toolshero.com/management/five-functions-of-management/>
7. <https://www.mooc-list.com/course/sales-marketing-alignment-coursera>
8. <https://www.investopedia.com/terms/o/organizational-structure.asp>
9. https://www.youtube.com/watch?v=wO_-MtWejRM
10. <https://wricitieshub.org/online-publications/71-costs-and-revenues-understanding-bus-operations>
11. <http://bca.transportationeconomics.org/setup/project-schedule>
12. <https://www.westminster.ac.uk/courses/professional-and-short-courses/air-transport/introduction-to-air-transport-economics-and-planning>
13. <https://kalyan-city.blogspot.com/2011/12/what-is-production-management-meaning.html>
14. <https://www.britannica.com/technology/production-management>
15. <https://www.purchasing-procurement-center.com/materials-management-system.html>
16. <https://www.class-central.com/subject/>
<https://www.communionmarketing.com/index.php/marketing/market-research-and-feasibility-studies>

CO- PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching Periods
CO1	Identify the various types of motor transport	R/U	1,2,6	08
CO2	Explain the types of operations.	R	1,2,10	10
CO3	Describe the various costs and fare methods.	R/U	1,2	12
CO4	Describe ABC analysis	A	1,2,5	08
CO5	Demonstrate the various fare collection systems.	A	1,2,6	10
CO6	Explain the organisational structure.	R	1,2,10	12

R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.

Guidelines for Continuous Evaluation:

MID SEM-I EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Internal Assessment

Max.Marks: 20

Type of test	Unit	Marks allotted	Remarks
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions/ Objective type
Assignment	Any one Unit / Course	5	Different group assignments of Higher order Questions that develop problem solving skills, critical thinking and that promote lifelong learning should be given.
Seminar		5	Any topic approved by the faculty

MID SEM –I
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: TRANSPORT AND INDUSTRIAL MANAGEMENT
Subject Code: 18A-501C

Time: 1hr

Max Marks: 20

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed $\frac{1}{4}$ page.

Marks: 4 X 1M = 4M

1. State the importance of Motor Transport Organization.
2. Write about passenger transport
3. State the factors of utility.
4. State the factors of dependability.

PART – B

i. Answer the following.

ii. Each question carries Three marks and answer should not exceed 1 page. 2x3= 6 Marks

5. a) differentiate between public transport and private transport.

OR

- b). State the need of staff training Programs.

6. a) Define ‘trip sheet’

OR

- b) What the factors to be considered in bus scheduling.

PART – C

i. Answer the following.

ii. Each question carries Three marks and answer should not exceed 2 pages. 2x3= 6 Marks

7. a). Explain the different types of ownership of motor transport organization.

OR

- b). Draw the Organizational charts for the transport organization

8. a). Explain the factors to be considered for trip generation.

OR

- b). What are the different causes for accidents and write remedial measures.

MID SEM –II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: TRANSPORT AND INDUSTRIAL MANAGEMENT
Subject Code: 18A-501C

Time: 1hr

Max Marks: 20

PART – A

**Answer ALL questions and each question carries ONE mark.
and answer should not exceed ¼ page.**

4x1 = 4Marks

1. Explain the fare structure
2. Write the requirements of good fare system.
3. Explain routing methods.
4. Write any two advantages of planning and control.

PART – B

i. Answer the following.

ii. Each question carries Three marks and answer should not exceed 1 page. 2x3= 6 Marks

5. a). Explain the fare collection system.

OR

- b). How to design a fare stage.

6. a) Explain dispatching.

OR

- b) Differentiate the integrate production & planning and control

PART – C

ii. Answer the following.

iii. Each question carries Three marks and answer should not exceed 2 pages. 2x3= 6 Marks

7. a). Explain the productivity can be increased by scheduling.

OR

- b). State the types of ticketing system.

- 8.a). Explain purchasing procedures.

OR

- b). Explain the stages of Production

SEMESTER END EXAMINATION
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: TRANSPORT AND INDUSTRIAL MANAGEMENT
Subject Code: 18A-501C

Time: 2hrs

Max Marks: 40

PART-A

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

1. State the importance of Motor Transport Organization.
2. State the factors to be considered in crew scheduling.
3. Explain marketing functions.
4. State the types of operation.
5. Explain the role of the materials in Industry.
6. Define safety stock.
7. Explain Sales function.
8. List the market conditions.

PART-B

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.

4x3 = 12

9. (a) Explain the different types of ownership of motor transport organization.
(or)
9. (b) Explain the Bin card.
10. (a) State the incentive schemes for accident prevention.
(or)
10. (b) differentiate Sellers and Buyers market.
11. (a) Describe 'Cardex' method
(or)
11. (b) Explain purchasing procedures.
12. (a) Explain the concept of contribution.
(or)
12. (b) Explain break-even analysis.

PART-C

04X5=20

- Instructions** : 1. Answer any **FOUR** questions.
2. Each question carries **FIVE** marks.

13. (a) Differentiate between passenger transport and goods transport.
(or)

13. (b) Describe the stores equipment

14. (a) Explain the factors to be considered for trip generation.
(or)

14. (b) Differentiate monopoly, oligopoly and perfect competition.

15. (a) Explain purchasing procedures.
(or)

15. (b) Explain ABC analysis.

16. (a) Explain the elements of cost.
(or)

16. (b) Explain the concept of contribution.

Department of Technical Education, Telangana
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Course Title :	Design of Machine Elements	Course Code	18A-502C
Semester	V	Course Group	: Core
Teaching Scheme in Periods (L:T:P)	35:15:0	Credits	: 3
Methodology	Lecture + Practicals	Total Contact Periods	: 60Periods
CIE	60 Marks	SEE	: 40 Marks

Course Content and Blue Print of Marks for SEE

Semester End Examination							
Sl. No.	Unit No.	Questions to be set for SEE					Periods
		R		U	A		
1	I- Bolts and Nuts	4	1		9(a)	13(a)	08
2	II- Shafts						12
3	III- Keys and couplings		2		10(a)	14(a)	10
4	IV- Cams						10
5	V- Governors and Flywheels		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	VI- Bearings						7,8
Total Questions		8		8	8	60	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

Pre requisites:

Knowledge of engineering Physics, Engineering Mechanics, Strength of Materials, Machine drawing.

Course Outcomes:**On successful completion of the course student should able to:**

CO1 :	Analyze the concept of Machine design and demonstrate the design procedures.
CO2 :	Design the components like Bolts, Nuts and Shafts subjected to different stresses induced under different load conditions.
CO3 :	Design keys and couplings to transmit complete torque.
CO4 :	Draw the cam profile using CAD for a given follower motion.
CO5 :	Design the Governors and Flywheels subjected to different load conditions for various engineering applications.
CO6 :	Design the given mechanical components with the basic concepts of sustainable development.

Course Content:**UNIT- 1: Bolts and Nuts****Duration: 08 periods (L: 4.8 – T: 3.2)**

Definition of terms related to Bolts and Nuts – Pitch, Lead and Lead angle, Thread angle, Nominal diameter, Crest, Root, Depth of thread etc. – Classification of bolts – loads acting on the bolts and the consequent failures – Calculation of various dimensions of a bolt and nut for a given diameter using empirical proportions (Hexagonal only).

UNIT-2: Shafts**Duration: 12 periods (L: 7.2 – T: 4.8)**

Introduction-function of shafts-classification-shaft materials – Torque (torsion) equation (No Derivation) – assumptions made – Power transmitted by Solid and Hollow circular shafts – Design of Solid and Hollow shafts (i) subjected to Torsion (ii) subjected to Bending , and iii) subjected to combined Torsion and Bending-Guest's theory (max. Shear stress theory) – Rankine's theory (max. Normal stress theory) – Design of shafts based on Rigidity.

UNIT-3: Keys and Couplings**Duration: 10 periods (L: 6.0 – T: 4.0)**

Functions of Keys and Splines – Materials used – Nature of failure of key – Types of keys – Saddle, Flat, Round and Sunk keys-Design of a Rectangular sunk key – Proportions of Splines – Function of Couplings – Classification of Couplings – Design of Muff coupling and Flange coupling

UNIT-4: Cams**Duration: 10 periods (L: 6.0 – T: 4.0)**

Types of Cams and Followers – applications – Explanation of terms Cam Profile, Base circle, Cam angle, Trace point and Lift – Explanation of displacement diagrams of 1) Uniform velocity 2) Uniform acceleration and retardation, and 3) Simple Harmonic motion. Draw Cam profiles for above three cases for Knife edge, Flat plate and Roller follower (No offset).

UNIT-5: Governors and Flywheels**Duration: 10 periods (L: 7.2 – T: 4.8)**

Functions of Governor – Classification of Governors – Application – working of Porter Governor and simple problems – Flywheel types – purpose and application – Comparison between Governors and Flywheels – Turning moment diagram – Design of Flywheel – simple problems.

UNIT-6: Bearings

Duration: 10 periods (L: 4.8 – T: 3.2)

Functions – Types of bearings – Lubrication types – Journal bearing – Terminology – Performance-McKee's equation-Bearing Modulus, power lost in friction and heat generated.

Thrust bearing – Power lost in friction, flat pivot and flat collar under conditions of uniform intensity of pressure and wear – Rolling contact bearings—advantages and disadvantages—Components of Rolling contact bearing – Ball and Roller bearings – Rating life of antifriction bearing, Static load carrying capacity, Dynamic load carrying capacity, Equivalent radial load – Load-life relationship, Market or commercial specifications of Ball and Roller bearings as per BIS standards. (No derivations required Simple numerical problems only).

Recommended Books

- | | |
|------------------------------------|------------|
| 1. Auto Design | R.B Guptha |
| 2. Machine Design | R.S Khurmi |
| 3. Design of Automobile components | Agarwal |
| 4. Auto Design | R B Gupta |

Suggested Learning Outcomes:

Upon completion of the course the student shall able to:

1.0 Bolts and Nuts

- 1.1 Define the terminology used in Bolts and Nuts.
- 1.2 Classify the Bolts.
- 1.3 Analyze the effect of forces involved when the nut is tightened.
- 1.4 Understand causes of failures of Bolts and Nuts.
- 1.5 Calculate the various dimensions of bolt and nut by using empirical formula.

2.0 Shafts

- 2.1 Know the concept of Torsion.
- 2.2 Understand the functions of a Shaft.
- 2.3 Identify the various materials used for manufacturing of shafts.
- 2.4 Explain the Torque equation with notations.
- 2.5 Calculate the diameters of solid and hollow shafts by considering both strength and stiffness.
- 2.6 Design the shafts subjected to Torsion.
- 2.7 Describe the Power transmitted by Solid and Hollow circular shafts.
- 2.8 Design the shafts subjected to pure bending (Design of Axle).
- 2.9 Design the shafts subjected to combined Torsion and Bending (Guest's theory and Rankine's theory).
- 2.10 Design of shafts based on Rigidity.

3.0 Keys and Couplings

- 3.1 Know the functions Keys, Couplings and Splines.
- 3.2 Identify the various materials used for Keys and Couplings.
- 3.3 Know the types of Keys, Couplings and their applications.
- 3.4 Design the Rectangular sunk key.
- 3.5 Recognize various proportions of Splines for different applications.
- 3.6 Design the Muff coupling.
- 3.7 Design the Flange coupling.

4.0 Cams

- 4.1 List out various types of Cams and Followers.
- 4.2 Know the applications of Cams and Followers.
- 4.3 Define the terms Cam profile, Base circle, Cam angle, Trace point and Lift.
- 4.4 Illustrate the displacement diagrams for (i) Uniform velocity (ii) Uniform acceleration, and (iii) Simple harmonic motion.
- 4.5 Design cam profiles for a Knife edge, Flat plate and Roller follower.

5.0 Governors and Flywheel

- 5.1 Understand the function of Governor.
- 5.2 Know the types of Governors and their applications.
- 5.3 Explain the working of Porter governor.
- 5.4 Solve the simple problems on Porter governor.
- 5.5 Identify the types of Flywheels.
- 5.6 Understand the function of Flywheel and its applications
- 5.7 Identify the differences between the Governor and a Flywheel.
- 5.8 Illustrate the Turning moment diagram of flywheel.
- 5.9 Design the Flywheel.
- 5.10 Solve the simple problems on Flywheel.

6.0 Bearings

- 6.1 State the function of bearing.
- 6.2 Classify the bearings–Sliding and Rolling contact.
- 6.3 State the advantages and disadvantages of Sliding contact bearings.
- 6.4 Identify the types of bearing Lubrication.
- 6.5 Explain the construction and working principle of Journal bearing.
- 6.6 Explain friction in Journal bearing and give McKee's equation.
- 6.7 Write the terms in McKee's equation.
- 6.8 Design a simple Journal bearing.
- 6.9 Calculate heat generated and dissipated in Journal bearing.
- 6.10 Calculate heat generated and dissipated in Collar bearing based on uniform pressure and uniform wear conditions.
- 6.11 Write the expressions for the load and torque carried by Thrust and Collar bearings under uniform pressure and wear conditions (without proof).
- 6.12 Solve the numerical problems.
- 6.13 Illustrate the nomenclature of rolling contact bearing.
- 6.14 Explain the different types of ball and roller bearings.
- 6.15 List the Advantages and disadvantages of anti-friction bearings.
- 6.16 Write the differences between Sliding contact and Roller bearings.
- 6.17 Identify the various bearing material.
- 6.18 Define the terms- Rating life, Bearing load, Basic load rating and equivalent radial load.
- 6.19 Explain the load – life relation for rolling contact bearings (problems omitted).

Suggested E-Learning references:

1. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Machine%20design1/left_home.html
2. www.learnengineering.org
3. www.sae.org
4. www.nptel.ac.in

CO-PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching Periods
CO1	Analyze the concept of Machine design and demonstrate the design procedures.	2,7,9	R/U	08
CO2	Design the components like Bolts, Nuts and Shafts subjected to different stresses induced under different load conditions.	1,2,3,7,9	R/U/A	12
CO3	Design keys and couplings to transmit complete torque.	1,2,3,7,9	U/A	10
CO4	Draw the cam profile using CAD for a given follower motion.	1,2,3,4,7,9	R/U/A	10
CO5	Design the Governors and Flywheels subjected to different load conditions for various engineering applications.	1,2,3,7,9	U/A	10
CO6	Design the given mechanical components with the basic concepts of sustainable development.	1,2,3,4,5,7,10	R/U/A	10
		Total		60

MID SEM-I EXAM

Sl. No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

Sl. No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –I
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Design of Machine elements
Subject Code: 18A-502C

Time: 1hr

Max Marks: 20

PART – A

Answer all Questions. Each question carries 1 marks

4 X 1M = 04 marks

- 1) For transmitting the power, square threads are preferable to V-threads. What is the reason?
- 2) What is the use of Eye-bolt? Where it is used?
- 3) Write any four requirements while selecting the Shaft materials?
- 4) Define the term 'Axle'.

PART – B

Answer any two Questions. Each question carries 3 marks

2 X 3M = 06 Marks

5. a) How a Screw thread is designated? Give an example.
(OR)
b) Draw any three forms (types) of Screw threads and name it.
6. a) Write the Torsion equation and explain the terms in it.
(OR)
b) The shaft material has an allowable bending stress of 80 N/mm^2 and allowable shear stress of 60 N/mm^2 . Find the maximum shear stress in the shaft applying Guest theory.

PART – C

Answer any two Questions. Each question carries 5 marks

5 X 2M = 10 Marks

7. a) List out different forms of screw threads and explain any two with sketches.
(OR)
b) Compute the safe tensile load for a bolt of M20 if the safe tensile stress is 80 N/mm^2 .
8. a) A solid shaft is required to transmit torque 20 kNm . Find the necessary diameter of the shaft, if the allowable shear stress is 60 N/mm^2 .
(OR)
b) Calculate the power that can be transmitted through a solid shaft 380 mm diameter when driven by a reciprocating engine at 110 rpm if the stress is not to exceed 40 MN/m^2 and the ratio of maximum to mean torque is 1.4 .

MID SEM –II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Design of Machine elements
Subject Code: 18A-502C

Time: 1hr

Max Marks: 20

PART – A

Answer all Questions. Each question carries 1 marks

4 X 1M = 04 marks

1. State the function of a 'Key'.
2. Write any four uses of Couplings.
3. List out any four types of Followers.
4. Define the term 'Dwell'.

PART – B

Answer any two Questions. Each question carries 3 marks

2 X 3M = 06 Marks

5. a) State any three advantages and disadvantages of Flexible couplings over a Rigid couplings. (OR)
b) What is the use of coupling? Write any three applications of couplings.
6. a) Draw a neat sketch of Radial cam and write their application. (OR)
b) List any three types of Cam follower and write their specific use.

PART – C

Answer any two Questions. Each question carries 5 marks

5 X 2M = 10 Marks

7. a) Draw a neat sketch of a Gib-head key showing all proportionate dimensions. (OR)
b) Briefly explain about Flexible coupling and write any four advantages of Flexible couplings over Rigid couplings.
8. a) Explain the terms relating to cam a) Base circle, and b) Cam profile. (OR)
b) A cam of minimum radius of 30 mm drives a follower with a stroke of 35 mm. The out stroke and the return stroke are performed with S.H.M. The follower has flat surface. The follower moves out stroke during 120° of the cam rotation followed by a dwell for 30° . The return stroke during next 120° with dwell for the remaining part of a evolution. Draw time Vs displacement curve.

C18-A-502C

BOARD DIPLOMA EXAMINATION, (C-18)
SEMESTER END EXAMINATION
DAE - FIFTH SEMESTER EXAMINATION
DESIGN OF MACHINE ELEMENTS

Time :2 Hours]

[Total Marks: 40

PART-A

Answer all Questions. Each question carries 1 marks 8 x 1M = 08 Marks

1. Write any four characteristics of Shaft materials.
2. What is 'Rigid coupling'?
3. Define the term 'Effort' of governor.
4. Write any four applications of Couplings.
5. Define the term Co-efficient of Fluctuation of energy of Flywheel.
6. State the function of Governor?
7. Write any four important properties of bearing materials.
8. State the function of Bearing.

PART-B

Answer any Four Questions. Each question carries 5 marks 4 x 3M = 12 Marks

9. a) Compute safe tensile load for a bolt of M20 if the safe tensile stress is
80 N/mm². (OR)
b) Define the terms i) Isochronism and ii) Hunting of governor.
10. a) Draw a neat sketch of Wedge cam and write their application.
(OR)
b) Briefly explain about Sliding contact bearing.
11. a) Illustrate the Turning moment diagram of Flywheel.
(OR)
b) Write any six differences between Flywheel and Governor.
12. a) State the McKnee's equation and elaborate the terms.
(OR)
b) List any five advantages of anti-friction bearing and where it is used?

PART-C

Answer any four Questions. Each question carries 10 marks

4 x 5M = 20 Marks

13. a) Explain the following forms of screw threads with neat sketches:

i) Indian Standard thread (ISO metric thread) and ii) Square thread.

(OR)

b) Describe the working of Porter governor with neat sketch.

14. a) A cam of minimum radius of 30 mm drives a follower with a stroke of 35 mm. The out stroke and the return stroke are performed with S.H.M. The follower has flat surface. The follower moves out stroke during 120° of the cam rotation followed by a dwell for 30° . The return stroke during next 120° with dwell for the remaining part of a revolution. Draw time Vs displacement curve.

(OR)

b) Explain the construction and working of Journal bearing.

15. a) Briefly explain the i) Sensitiveness and ii) Stability of governor.

(OR)

b) In a porter governor two balls of weight 26 N each are joined by four equal links of length 300 mm each. A dead weight of 320 N is used on the sleeve at the centre. If the radius of rotation is 240 mm, find the equilibrium speed.

16. a) Explain about the Thrust and Collar bearing with neat sketch.

(OR)

b) Explain about the Rolling contact bearing with neat sketch and state its advantages.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title	AUTOTRONICS	Course Code	18A-503C
Semester	V	Course Group	CORE
Teaching Scheme in Hrs(L:T:P)	35:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact periods	60Pds
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE								
S.No	Unit	Questions to be set for SEE				Periods		
		R		U	A			
1	Automobile Electronics	4	1		9(a)	13(a)	10	
2	Sensors						10	
3	Actuators		2		10(a)	14(a)	08	
4	Electronically controlled fuel supply system						12	
5	Electronically controlled steering, Brakes and suspension systems		3	5, 6		9(b)	13(b)	10
						11(a)	15(a)	
			7,8		11(b)	15(b)		
6	Safety systems and Instrumentation				10(b)	14(b)	10	
			12(a)	16(a)				
			12(b)	16(b)				
Total Questions		8		8	8			

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

Pre requisites:

This course requires the basic knowledge of Automobile Chassis at fourth semester level

Course outcomes:

At the end of course student should be

CO1 :	Identify the various sensors suitable for efficient vehicle operation and control.
CO2 :	Explain the applications of various actuators in vehicle systems.
CO3 :	Interpret impact of engineering solution for economic, environmental context.
CO4 :	Explain the applications of electronics in vehicle safety systems
CO5 :	Demonstrate/submit presentation on assigned topics related to course
CO6:	Relate and respond regarding contemporary issues in the field of autotronics.

COURSE CONTENT:**1.0 Fundamentals of Automobile Electronics :****Duration : Periods 10 (L: 6 – T: 4)**

Use of electronics in Automobiles - Electronic systems - Types-Block diagrams - Analog system- Digital system - Components of electronic system – Sensor – Actuator – Display - Signal processing - Digital signal processing - Sampling - Sample time- Quantization- Semiconductor devices – Diodes - Diode in rectifier circuit – Transistors – Types - Use of transistor as switch and amplifier - Binary number system - Decimal number system - Numerical problems on number system conversion - Logic circuits - NOT gate - AND gate - OR gate - Integrated circuits – Types - Block diagram of micro controller (8051) - Types of micro controllers – Applications - CAN bus – Types – Applications – Multiplexing – MUX - DEMUX.

2.0 Sensors :**Duration: Periods 10 (L: 6 – T: 4)**

Vehicle electronic control system description with block diagram - Engine control unit description with block diagram – Sensors – Definition - Classification of sensors - Construction and working of throttle position sensor – Types - Crankshaft sensor – Types - Combustion knock sensor - Temperature sensor - MAP sensor - MAF sensor -Types- Ride height sensor – Types - EGO sensor.

3.0 Actuators :**Duration: Periods 8 (L:4.8 – T:3.2)**

Actuators used in engine control system - Pulse width modulation and duty cycle - Applications – solenoid - ON/OFF solenoid – Applications - Proportional solenoid – Applications - Stepper motor – Types - Working – Advantages and disadvantages - Servo motor - Working principle of D.C. servo motor - Servo motor control - Servo mechanism – Applications – Relay - Construction and working.

4.0 Electronically controlled fuel supply system :**Duration: Periods 12(L: 7.2 – T: 4.8)**

Advantages of electronic petrol injection system – Classification of fuel injection systems - MPFI system description with block diagram – Operation - Types of MPFI system - Petrol injectors - Construction and working - Petrol direct injection system – Types - Working.
Need for electronic diesel injection system – Advantages and disadvantages – Diesel electronic control injection description with block diagram - Operation- CRDI description with block diagram - electronic CRDI injector – Working - Electronic distributor pump – Working - Description with block diagram.

5.0 Electronically controlled steering, braking and suspension systems :

Duration: Periods 10 (L: 6 – T: 4)

Draw backs of conventional steering - Merits of electronic power steering - Components of electronic power steering – Sensor - Motor- Working of electronic rack and pinion power steering - Purpose of Antilock braking system - Classification of ABS - Working of ABS components - Working of ABS description with block diagram - Advantages of ABS - Components of electronically controlled suspension system - Working of electronically controlled suspension system description with block diagram – Advantages - Electronic solenoid controlled shock absorber – Working - Types.

6.0 Safety systems and Instrumentation :

Duration: Periods 10 (L: 6 – T: 4)

Airbag system – Components - Principle of operation of airbag system - Low tyre pressure warning system description with a block diagram - Cruise control system - Need and operation with a block diagram - Traction control system – Operation - Electronic stability program – Operation - Description with a block diagram.

Recommended Books

- | | | |
|--|----|----------------|
| 1. Automotive Electrical systems equipment | by | N.R. Khatawate |
| 2. Electrical Equipment of Automobiles | by | Parker Smith |
| 3. Automobile Electrical Equipment | by | P.L. Kohli |
| 4. Automobile Electrical Engineering | by | Arora&Dass |
| 5. Microcontroller & application (8051) | by | Mazdi&Mazdi |
| 6. Digital Electronics | by | Morris Mano |
| 7. Instrumentation | by | A.K.Sawhaney |
| 8. Automotive Mechanics | by | S.Srinivasan |

Suggested Learning Outcomes:

Student will be able to

- 1.0 Distinguish between analog and digital signals
- 1.1 Perform conversion of decimal to binary and binary to decimal number systems
- 1.2 List types of Analog & Digital IC's
- 1.3 Draw the block diagram of Micro controller 8051 & explain each component
- 1.4 List types of microcontroller IC's
- 1.5 State the function of CAN in Automobile application
- 2.0 Draw the block diagram of and explain the function of ECU.
- 2.1 Classify sensors.
- 2.2 Mention various sensors used in automobile systems.
- 2.3 List out the sensors used in Automobiles.
- 2.4 Explain in brief the working of sensors used in Automobiles.
- 3.0 List out the different actuators used in Automobiles.
- 3.1 Explain the working of Actuators used in Automobiles.
- 3.2 List out the applications of various Actuators.
- 4.0 List the advantages of electronic petrol injection system over carburettor
- 4.1 Classify electronic petrol injection system

- 4.2 State the need for electronic diesel injection system
- 4.3 Explain working of electronic controlled diesel supply system with a block diagram.
- 5.0 List the drawbacks of conventional steering system.
- 5.1 List the advantages of electronic power steering
- 5.2 Describe the construction & working of electronic rack and pinion Power steering
- 5.3 State the need for Anti lock braking System (ABS)
- 5.4 Explain the components and working of ABS with block diagram.
- 5.5 List the advantages of ABS
- 5.6 Describe electronic suspension control system
- 6.0 Explain working principle of air bags
- 6.1 Draw the block diagram of low tyre pressure warning system
- 6.2 Describe operation of traction control system.
- 6.3 Describe cruise control system.

Suggested Student Activities

1. Student visits Library to refer to Manual of Automobile components to find the various electronic components used in automobile for efficient operation.
2. Student inspects the available equipment in the Laboratory to identify sensors and actuators used in engines.
3. Visit nearby workshop / service station to familiarize with type of sensors used in vehicles.
4. Prepare a presentation on latest trends in automobile electronics.
5. Record data / specifications of various components of vehicle safety systems.
6. Prepare a report by visiting the service stations on electronic fuel supply system for petrol / diesel vehicles.
7. Prepare working models of various sensors and actuators.
8. Visit electronic shops and collect various fundamental electronic components such as relay, diode etc.,
9. Prepare small electronic circuits to demonstrate function of various electronic components.
10. Quiz
11. Group discussion on role of electronics in automobiles.
12. Surprise test

Suggested E-Learning references:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching periods
CO1	Identify the various sensors suitable for efficient vehicle operation and control.	R/U	1,2,6	7.2
CO2	Explain the applications of various actuators in vehicle systems.	R	1,2,10	4.8
CO3	Interpret impact of engineering solution for economic, environmental context.	A	1,2,5,6	6.0
CO4	Explain the applications of electronics in vehicle safety systems	R/U	1,2,5	6.0
CO5	Demonstrate/submit presentation on assigned topics related to course	A	1,2,6,8,9	7.2
CO6	Relate and respond regarding contemporary issues in the field of autotronics.	A	1,2,6,10	6.0
TOTAL				37

Mid Semester Examination Blueprint of Questions and Marks:**MID SEM-I EXAM**

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively

Max Marks: 20

4 x1 = 4 Marks

2 x 3 = 6 Marks

2 x 5 = 10 Marks

7. a). Explain the CAN bus system used in automobiles?
OR
b). Explain the applications of microcontrollers?
8. a). Explain working of any one type of sensors used in engine?
OR
b). Explain working of any one type of sensor used in vehicle safety systems?

- ### **PART-C** **Application type questions**

SEMESTER END EXAMINATION
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: AUTOTRONICS
Subject Code: 18A-503C

Time: 2hrs

Max Marks: 40

PART-A

08X01=08

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.
9. List out two sensors used in control system of vehicle?
 10. Mention two advantages of electronic petrol injection system over carburettor?
 11. Mention two drawbacks of conventional steering?
 12. Mention two applications of Microcontrollers in automobile industry?
 13. List two advantages of ABS?
 14. State the need for Anti lock braking System?
 15. Write the advantages of airbags?
 16. State the need of cruise control system?

PART-B

04X03=12

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.
9. (a) Explain CAN bus system ?
(or)
9. (b) Explain the components of ABS ?
 10. (a) Draw the block diagram of electronic diesel injection system ?
(or)
10. (b) Draw the block diagram of computer based instrumentation system ?
 11. (a) Draw the block diagram of electronic rack and pinion power steering ?
(or)
11. (b) List out five advantages of electronic power steering ?
 12. (a) Explain traction control system used in Automobiles ?
(or)
12. (b) Explain electronic stability program ?

PART-C

4x5=20

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **FIVE** marks.

13. (a) Draw the block diagram of Electronic Control Unit (ECU) and explain the function of ECU ?

(or)

13. (b) Describe electronic suspension control system e ?

14. (a) State the need for Stepper motor & list the types of motors?

(or)

14. (b) Draw the block diagram of electronic speed measurement system and explain?

15. (a) Classify the Antilock braking System (ABS) ?

(or)

15. (b) Explain electronic rack and pinion power steering system with a diagram ?

16. (a) Explain working of low tyre pressure warning system with a diagram ?

(or)

16. (b) Explain working of air bag system with a diagram ?

State Board of Technical Education & Training (TS)

Course Title :	Special Purpose Vehicles	Course Code	:18A-504EA
Semester	V	Course Group	: Elective
Teaching Scheme in hours (L:T:P)	35:15:0	Credits	: 3
Methodology	Lecture + Tutorials	Total Contact Periods	: 60
CIE	20+20+20=60 Marks	SEE	: 40 Marks

Course Content and Blue Print of Questions for SEE

Semester End Examination

Sl No	Unit No. and Name	Questions to be set for SEE					Periods
		R		U	A		
1	I- Introduction to Special purpose vehicles	4	1		9(a)	13(a)	08
2	II- Earth moving vehicles						10
3	III- Cranes		2		10(a)	14(a)	08
4	IV- Under carriage and suspension						12
5	V- Farm tractors		3	5, 6	9(b)	13(b)	12
					11(a)	15(a)	
		11(b)		15(b)			
6	VI- Special features in tractors		7,8	10(b)	14(b)	10	
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8	60	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

Pre requisites

This course requires the basic knowledge of Automobile systems and basics of engineering drawing.

Course Outcomes:

On successful completion of the course student should able to

CO1 :	Identify the various types and applications of special purpose vehicles.
CO2 :	Describe the specifications of various types of earth moving vehicles.
CO3 :	Demonstrate the constructional details of cranes, under carriage and suspension.
CO4 :	Acquire the knowledge on contemporary issues in the field of Special purpose vehicles.
CO5 :	Identify the various types of tractors and explain the transmission system of tractor.
CO6 :	Demonstrate construction details of Special features used in Tractors.

COURSE CONTENT:

UNIT 1: Introduction to Special purpose vehicles

Duration: 08 periods (L: 4.8 – T:3.2)

Uses of special purpose vehicles – Classification of special purpose vehicles according to their application -Different types of special purpose vehicles- applications

UNIT 2: Earth moving vehicles

Duration: 10 periods (L: 6– T:4)

Different types of Earthmovers like Dumpers, Bull Dozers, shovels, Excavators, Tippers, and graders – functions – Specifications

UNIT 3 : Cranes

Duration: 08 periods (L: 4.8 – T:3.2)

Classification -Derrick crane, mobile cranes, traveler crane, overhead cranes and Tower cranes - constructional features.

UNIT 4: Under carriage and suspension

Duration: 12 periods (L: 7.2 – T:4.8)

Tyre and tracked vehicles - advantages and disadvantages, under carriage components like tracks, roller frames, drive sprockets, track rollers, track chains and track shoes. Suspension – Rubber spring suspension and air spring suspension

UNIT 5: Farm Tractors:**Duration: 12 periods (L: 7.2 – T:4.8)**

Introduction – Types of tractors like Wheel type and Track type – Types of drives -
Classification of tractor chassis – Tractor manufactured in India – Transmission system of
Tractor - Differential – Differential lock and types – Steering and braking system of tractors.

UNIT 6: Special features in Tractors:**Duration: 10 periods (L: 10 – T: 4)**

P.T.O. shaft – Types of drive for P.T.O. shafts – Belt pulley drive – Precautions to be taken while
using belt pulley and P.T.O. shaft-General layout of hydraulic system used in tractor– Lift
mechanism for tractor -Trouble shooting of hydraulic system. Draw bar – Types (two point
linkages, three point linkages.)- Types of hitches- Depth control – Draft control

Reference Books

Farm Machinery	by C.P.Nakra
Automobile Engineering	by K.K. Ramalingam
Truck Cranes	by A.Astakhov(MIR)
Motor Graders	by E.G.Ronioson(MIR)
Construction equipment operation & maintenance	by Y.Pokras & M.Tushnyakov (MIR)
Hand book of Earth moving Machinery	by Central water and Power Commission (Govt.of INDIA)

Suggested Learning Outcomes

the student will able to

1.0 Introduction to Special Purpose Vehicles:

- 1.1 To know the meaning of Special Purpose Vehicles.
- 1.2 To classify different types of Special Purpose Vehicles.
- 1.3 To State the applications of Special Purpose vehicles in different places.

2.0 Earth Movers

- 2.1 To list the function of various types earth moving vehicles
- 2.2 To explain different types of Bulldozers
- 2.3 To explain different types of Dumpers
- 2.4 To explain different types of Shovels
- 2.5 To explain different types of Excavators
- 2.6 To explain different types of Graders
- 2.7 To state specifications of above earth moving Vehicles

3.0 Cranes

- 3.1 To state the classification of cranes
- 3.2 To explain the construction and working of Derrick crane
- 3.3 To explain the construction and working of mobile crane
- 3.4 To explain the construction and working of traveler crane
- 3.5 To explain the construction and working of overhead cranes
- 3.6 To explain the construction and working of Tower cranes

4.0 Under carriage and suspension

- 4.1 State advantages and disadvantages of tyre type vehicles
- 4.2 State advantages and disadvantages of track type vehicles
- 4.3 To explain the construction of under carriage components like tracks, roller frames, drive sprockets, track rollers, track chains and track shoes
- 4.4 To know about the construction of Rubber spring suspension
- 4.5 To explain the construction of air spring suspension

5.0 Farm Tractors

- 5.1 State the types of tractors, types of drives.
- 5.2 Describe wheel type tractors.
- 5.3 Describe briefly the about various tractors classified based on purposes for which they are used viz. utility tractor, row crop tractor, orchard, Industrial type tractor, garden tractor, Rotary tiller, implement carrier, earth moving tractors.etc.
- 5.3 List out Indian tractor manufacturing concerns and their details.
- 5.4 Identify the elements in transmission system of tractor.
- 5.5 To know about the transmission system of tractors.
- 5.6 To explain the differential assembly, Differential lock and types Differential locks.
- 5.7 To know about steering and braking system of tractors.

6.0 Special features in tractors:

- 6.1 To know about P.T.O shaft.
- 6.2 State the types of drives used for P.T.O. shafts and briefly explain each drive.
- 6.3 State safety precautions to be taken for various P.T.O. drives.
- 6.4 Write about the belt pulley drive and precaution to be taken while using belt pulley.
- 6.5 Draw the general layout of Hydraulic system in tractor.
- 6.6 Describe the lift mechanism for tractor.
- 6.7 Demonstrate the trouble shooting of Hydraulic system.
- 6.8 To know about the types of Draw bars and hitches.
- 6.9 To discuss about draft and depth controls

Suggested E-Learning references

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. <http://www.resolute-equipment.com/53-6-types-of-earth-moving-equipment/>
5. <https://www.thebalancesmb.com/must-have-earth-moving-construction-heavy-equipment-844586>
6. https://www.lkdfacility.org/wp-content/uploads/2016-06-30-BASIC-MECHANICS6_EM-Equipments-FINAL-WEB.pdf
7. https://en.wikipedia.org/wiki/Heavy_equipment
8. <https://careertrend.com/about-5583871-types-construction-vehicles.html>
9. <https://www.fueloyal.com/14-popular-types-construction-vehicles/3/>
10. https://en.wikipedia.org/wiki/Power_shovel
11. <https://www.explainthatstuff.com/tractors.html>
12. <https://www.tractoragriculture.com/types-of-tractors/>
13. <https://www.hobbyfarms.com/4-tractor-types-to-consider-for-your-farm/>
14. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2274>
15. <https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=17335&context=rtd>
16. <https://compactequip.com/track-loaders/whats-in-an-undercarriage-learn-the-differences-between-rigid-roller-and-torsion-axle-systems/>
17. <https://www.bobcat.com/loaders/features/torsion-suspension-undercarriage>

CO- PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching periods
CO1	Identify the various types and applications of special purpose vehicles.	R/U/A	2,5,7	8
CO2	Describe the applications and specifications of various types of earth moving vehicles.	R/U	2,4	10
CO3	Demonstrate the constructional details of cranes, under carriage and suspension.	U/A	1,2	8
CO4	Acquire the knowledge on contemporary issues in the field of Special purpose vehicles.	A	1,2,10	12
CO5	Identify the various types of tractors. Describe the transmission system of tractor.	R/U	1,2,10	12
CO6	Demonstrate the Special features used in Tractors.	R/U	1,2,10	10

Mid Semester Examination Blueprint of Questions and Marks:

MID SEM –I EXAM					
S.No	Unit Name	R	U	A	Marks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	10
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	10
Total Questions		4	4	4	20
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Marks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	10
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	10
Total Questions		4	4	4	20

R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.

MID SEM –I
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Special Purpose Vehicles
Subject Code: 18A-504EA

Time: 1hr

Max Marks: 20

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed ¼ page.

Marks: 4 X 1M = 4M

1. What is a special purpose vehicle?
2. List any four types of special purpose vehicles?
3. State any two functions of Tipper?
4. State any two uses of Motor grader?

PART – B

Answer the following. Each question carries **Three** marks
and answer should not exceed 1 page.

Marks: 2 X 3M= 6 M

5. a). Write the applications of fire fighting vehicles?

OR

- b). State the application of cess gully pool water removal vehicle?

6. a) State the application of bulldozer?

OR

- b) Write the specifications of Shovel?

PART – C

Answer the following. Each question carries **five** marks
and answer should not exceed 2 pages.

Marks: 2 X 5M = 10 M

7. a). Describe the classification of special purpose vehicles?

OR

- b). Describe the importance of special purpose vehicles?

8. a) Explain different types dumpers with line diagrams.

OR

- b). Explain about excavator with line diagram?

MID SEM –II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Special Purpose Vehicles
Subject Code: 18A-504EA

Time: 1hr

Max Marks: 20

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed ¼ page.

Marks: 4 X 1M = 4M

1. State purpose of crane?
2. List the parts of mobile crane?
3. Write any two advantages of tyre type vehicles?
4. Write any two disadvantages of tyre type vehicles?

PART – B

Answer the following. Each question carries **Three** marks
and answer should not exceed 1 page.

Marks: 2 X 3M = 6 M

5. a). Describe simple harmonic motion?

OR

- b). Define the Law of conservation of momentum?

6. a) Explain the briefly the construction of air spring suspension system?

OR

- b) Write the advantages and disadvantages of track type vehicles?.

PART – C

Answer the following. Each question carries **five** marks
and answer should not exceed 2 pages.

Marks: 2 X 5M = 10 M

7. a) Explain the Construction and working of derrick crane?

OR

- b) Explain the Construction and working of mobile crane?

8. a) Explain the Construction of Rubber spring suspension system ?

OR

- b) Explain the construction details of under carriage components?

C18-A-504EA

BOARD DIPLOMA EXAMINATION, (C-18)
SEMESTER END EXAMINATION
MODEL QUESTION PAPER
DAE - FIFTH SEMESTER
SPECIAL PURPOSE VEHICLES

Time :2 Hours]

[Total Marks: 40

PART-A

Marks: 08X01=08

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

17. Write any two applications of ambulance?
18. State any two uses crane?
19. State uses of orchard tractor?
20. What is a draw bar?
21. List types of tractor chassis?
22. Name any two Tractor manufacturing companies in India?
23. State purpose hydraulic pump?
24. List different types of hitches?

PART-B

Marks: 04X03=12

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.

9. (a) Write the specifications of Tipper?
(or)
9. (b) Describe briefly the different types of drives used in tractor?

10. (a) State advantages of track fitted vehicles?
(or)
10. (b) Describe briefly the draft and depth control?

11. (a) What are parts parking system tractor?
(or)
11. (b) State the purpose differential lock ?

12. (a) State the Lift mechanism for tractor?

(or)

12. (b) Describe briefly two point linkage draw bar with a sketch ?

PART-C

Marks: 04X5=20

- Instructions** : 1. Answer any **FOUR** questions.
2. Each question carries **FIVE** marks.

13. (a) Explain different types dumpers with line diagrams?

(or)

13. (b) Explain Transmission system of tractor with sketch?

14. (a) Explain the constructional features Derrick crane?

(or)

14. (b) Draw general layout of hydraulic system used in tractor and label the parts?

15. (a) Explain Non-slip differential lock with a neat sketch?

(or)

15. (b) Explain braking system of tractor with sketch?

16. (a) Describe three point linkage draw bar with a sketch ?

(or)

16. (b) Explain different types of hitches with sketches?

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title	: Automobile Components Design	Course Code	18A-504EB
Semester	: V	Course Group	: Elective
Teaching Scheme in Periods (L:T:P)	: 40:20:0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE	: 20+ 20+ 20 = 60 Marks	SEE	: 40 Marks

Course Content and Blue Print of Marks for SEE

Sl No	Unit No.	Questions to be set for SEE				Periods	
		R		U	A		
1	I- Riveted Joints	4	1		9(a)	13(a)	10
2	II- Welded Joints						08
3	III- Gears and Gear Trains		2		10(a)	14(a)	10
4	IV- Design of Springs						10
5	V- Brakes and Clutches		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	VI- Design of Engine Components				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total Questions		8		8	8	60	

R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.

Pre requisites

This course requires the basic knowledge of Strength of materials and Mathematics.

Course Outcomes

At the end of course student should be able to

CO1 :	Identify the criteria of design and to solve simple problems on Riveted and Welded joints.
CO2 :	Design a gear, gear ratios and number of teeth for a gear box.
CO3 :	Design a spring used in Automobile.
CO4 :	Analyze the data, able to identify the design criteria, solve simple problems in brakes and clutches.
CO5 :	Solve some simple design problems of engine components.

Course Content:**UNIT- 1: Riveted joints****Duration: 10 Periods (L: 7 – T: 3)**

Types of Riveted joints - Caulking and Fullering - Types of failures - Terms related to joints - Modes of failure of riveted joint - Strength equations - Efficiency of joints - Simple problems on lap joints and butt joints - Concept of Diamond or Lozenge joint: Simple problems.

UNIT-2: Welded Joints**Duration: 08 Periods (L: 6 – T: 2)**

Types of Welded joints - Advantages and disadvantages over other joints - Terms related to weld - strength equation - Calculation of strength of welded joints (problems on eccentric loading are omitted) Numerical problems.

UNIT-3: Gears and Gear drives**Duration: 10 Periods (L: 6 – T: 4)**

Gear tooth terminology – Types of gear teeth profiles: Involute and Cycloidal profiles - Simple, compound, reverted & Epi cyclic gear trains. Gear material - Law of gearing-Design of number of teeth for simple, compound and reverted gear trains for a given speed ratio and sketching the arrangement- Applications of gear trains –Design of spur gear based on Lewis equation- 3- Speed gear box of an automobile, Calculation of velocity ratio-Description and application of epi-cyclic gear trains (Problems on epi-cyclic gear trains not included).

UNIT – 4: Design of Springs**Duration: 10 Periods (L:7 – T: 3)**

Definition of spring – Glossary of spring terms – Design of Open Coiled and Close coiled helical springs subjected to axial load (with circular wire only) - Design of leaf spring – Design of Belleville Spring– Simple Problems.

UNIT -5: Brakes and clutches**Duration: 10 Periods (L:7 – T: 3)**

Function of brakes – Classification of brakes-Brake materials - Working of simple shoe brake and band brakes only - Simple problems on shoe brake and band brakes only - Function of clutch – Classification of clutches- Clutch material - Working of single plate and multi-plate clutches, Difference between Brake and clutch - Simple problems on single plate and multi-plate clutches based on uniform pressure and uniform wear

UNIT 6: Design of Engine Components**Duration: 12 Periods (L: 8 – T: 4)**

Design of Engine Cylinder – Piston – Connecting Rod – Crank Shaft – Poppet Valve.

Reference Books:

- | | | |
|----|----------------------------|-------------------------------------|
| 1. | Machine Design | - R.S.Khurmi. |
| 2. | Design of Machine Elements | - Pandya and Shah. |
| 3. | Theory of machines | - Thomas Bevan. |
| 4. | Design of Machine Elements | – V B Bhandari [Tata Mc Graw Hill] |

Suggested Learning Outcomes

Student should be able to:

1.0 Riveted joints

- 1. 1 List the basic types of riveted joints with legible sketch
- 1. 2 Explain the terms used in riveted joints
- 1. 3 List the types of failures in riveted joints
- 1. 4 Evaluate the strength of a riveted joint
- 1. 5 Design a riveted joint under the given conditions (Ex: Direct loading)
- 1. 6 Explain the concept of Diamond or Lozenge joint
- 1. 7 Design the diamond (structural) joint

2.0 Welded Joints

- 2. 1 List the types of welded joints
- 2. 2 List the welded symbols with legible sketch
- 2. 3 Explain the terms related to welded joints
- 2. 4 List the merits and demerits of welded joints
- 2. 5 Explain the lap and butt joints with legible sketch
- 2. 6 Design the welded joints subjected to simple loading
- 2. 7 Solve the numerical problems related to the above cases

3.0 Gears and Gear Drive

- 3. 1 Explain the nomenclature of spur gear tooth.
- 3. 2 State the law of gearing (Derivation is excluded)
- 3. 3 Identify various tooth profiles of gear.
- 3. 4 Explain the terminology related to gear drive
- 3. 5 List the gear material
- 3. 6 List different types of gear trains
- 3. 7 List all the advantages and disadvantages of gear drives
- 3. 8 Classify the gear drives based on different criteria
- 3. 9 Write the Lewis bending equation
- 3. 10 Design the gear based on Lewis equation
- 3. 11 Design different types of gear trains for given velocity ratios
- 3. 12 Explain the applications of gear trains
- 3. 13 Solve the problems related to simple, compound and reverted gear trains

4.0 Design of Springs

- 4. 1 Explain the basics of a spring.
- 4. 2 Classification of springs.
- 4. 3 Nomenclature of closed coil helical spring.
- 4. 4 Explain about stiffness of spring.
- 4. 5 Deflection formula for closed coil helical spring (without derivation).
- 4. 6 Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils. (With circular wire only)
- 4. 7 Nomenclature of a leaf spring

4. 8 Types of leaf springs
4. 9 Formulae or empirical relations for Stresses, Length of spring, Length of Master leaf, Length of n^{th} leaf, Inside diameter of eye and Deflection of leaf spring (Without derivations)
4. 10 Simple numerical problems on leaf springs.
4. 11 Nomenclature and notations used for Conic disc spring/Belleville Spring.
4. 12 Formulae for Maximum load, deflection and Maximum stress for a Conic disc spring/Belleville Spring. (Without derivation)
4. 13 Simple numerical problems on Conic disc spring/Belleville Spring.
5. 0 **Design of Brakes and Clutches**
5. 1 Explain working principle of a brake
5. 2 State the function of brake.
5. 3 Classify the brakes.
5. 4 List all the brake materials.
5. 5 Explain the working of shoe brake with the help of legible sketch.
5. 6 Derive an expression for the braking torque.
5. 7 Solve simple problems related to brakes.
5. 8 Explain the Function of clutch.
5. 9 Classify the clutches.
5. 10 List all the clutch materials.
5. 11 Explain the working of single and multi-plate clutches.
5. 12 Design single plate and multi-plate clutches based on uniform pressure and uniform wear.
5. 13 Solve simple problems related to clutches.
6. 0 **Design of components of an Internal Combustion Engine**
6. 1 Functions of Cylinder, Piston, Connecting Rod, Crank Shaft and Poppet Valve.
6. 2 List the materials used for each of the components.
6. 3 Data required and factors considered for design of these components.
6. 4 Formulae and empirical relations used in design of these components (Without Derivations)
6. 5 Design of Engine Cylinder.
6. 6 Design of Piston.
6. 7 Design of Connecting Rod.
6. 8 Design of Crank Shaft.
6. 9 Design of poppet valve.
6. 10 Simple numerical problems in the design of the above components of the engine.

Suggested Student Activities

1. Assignments in the design of one automobile component.
2. Quiz on Criteria for design of components.
3. Debate on Energy saving techniques used in design.
4. Assignment on modern materials used for each component.
5. Group discussion on selection of materials for each component.
6. Surprise objective type test.
7. Visit to Industries manufacturing automobile components.

8. Download and present various presentations related to design of machine elements.
9. Download and present various presentations related to failure of Machine elements

Suggested E-Learning references

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. https://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/left_home.html

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO	Lecture Periods
CO1	Identify the criteria of design and to solve simple problems on Riveted and Welded joints.	R/U/A	1,2	18
CO2	Design a gear, gear ratios and number of teeth for a gear box.	R/U/A	1,2	10
CO3	Design a spring used in Automobile.	R/U/A	2,5,6	10
CO4	Explain the basis of design of Brakes and Clutches. Solving simple problems in brakes and clutches.	R/U/A	2,5,6	10
CO5	Solve some simple problems on design of engine components.	R/U	2,3,5,6	12
Total				60

Mid Semester Examination Blueprint of Questions and Marks:

MID SEM-I EXAM Max.Marks: 20					
S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM Max.Marks: 20					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

R-Remembering, U-Understanding, A- Application type questions each carrying 1, 3 and 5 Marks respectively.

MID SEM –I
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Automobile Components Design
Subject Code: 18A-504EB

Time: 1hr

Max Marks: 20

PART-A

Short answers questions

Answer All Questions. Each question carries ONE mark

4 x 1 = 4 Marks

1. List any four types of Riveted Joints?
2. What are the modes of failure of Riveted joints?
3. Enumerate the types of welded joints?
4. Sketch any two types of symbols used to represent welded joints?

PART-B

Essay type questions

**Answer any TWO Questions choosing either (a) or (b) from each question.
Each question carries THREE marks**

2 x 3 = 6 Marks

5. (a) List any three possible failures of a riveted joint?
5. (b) What is efficiency of a Riveted joint and write the formula calculating efficiency?
6. (a) Define any three terms in the nomenclature of a welded joint with the aid of a sketch?
6. (b) State any six advantages and disadvantages of using a welded joint over riveted joint?

PART-C

Application type questions

**Answer any TWO Questions choosing either (a) or (b) from each question.
Each question carries FIVE Marks**

2 x 5 = 10 Marks

7. (a) Design a double riveted lap joint with zigzag riveting for 13 mm thick plates. Assume allowable tensile stress in the plate 80 MPa; compressive stress 120 MPa; and shear stress in the rivet 60 MPa. State how the joint will fail and find the efficiency of the joint?
7. (b) Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm². Assume joint efficiency as 75%, allowable tensile stress in the plate 90 MPa; compressive stress 140 MPa; and shear stress in the rivet 56 MPa?
8. (a) A plate 150 mm wide and 12.5 mm thick is lapped over and welded to a gusset plate. Determine the minimum length of a 8 mm side fillet weld that will be necessary if the plate is subjected to an axial stress of 160 N/mm². Take allowable shear stress through the throat of weld has 120 N/mm². ?
8. (b) Two steel plates 100 mm wide and 12.5 mm thick are to be joined by double lap welded joint. Find the length of weld, if the maximum tensile stress is not to exceed 75 N/mm² and the maximum tensile load carried by the plates is 100 kN.

MID SEM –II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Automobile Components Design
Subject Code: 18A-504EB

Time: 1hr

Max Marks: 20

PART-A

Short answers questions

Answer All Questions. Each question carries ONE marks

4 x 1 = 4 Marks

1. Define 'Addendum' and 'Dedendum' with respect to a spur gear?
2. State 'Law of gearing'?
3. List the types of coil springs?
4. What is helix angle with respect to a helical spring?

PART-B

Essay type questions

Answer any TWO Questions choosing either (a) or (b) from each question.

Each question carries THREE marks

2 x 3 = 6 Marks

5. (a) What is 'Velocity ratio' and state the formula for calculating it for a gear train?
5. (b) Compare a Compound gear train and Reverted gear train?
6. (a) A closed coil helical spring is to carry a load of 120 N and the mean coil diameter is ten times the diameter of the wire. Find the diameter of the wire, if the maximum shear stress is to be 90 N/mm²?
6. (b) Define Spring Index, Spring stiffness and Free length with respect to a helical spring?

PART-C

Application type questions

Answer any TWO Questions choosing either (a) or (b) from each question.

Each question carries FIVE Marks

2 x 5 = 10 Marks

7. (a) Design a reverted gear train of four gears to give a speed reduction of 8. All gears are to be of the same pitch. No gear is to have less than 14 teeth?
7. (b) A three speed sliding mesh gear box of a motor car is required to give speed ratio of 4:1, 2.5:1 and 1.5:1 for the first, second and third gears respectively. Diametral pitch of all gears is 0.3 and the central distance between the mating gears is 70 mm. Find suitable number of teeth for various gears, if the number of teeth on pinion is 14.
8. (a) A helical spring 150 mm mean diameter is required to absorb 30 kJ of energy with a maximum shear stress of 470 N/mm². Determine the diameter of steel rod and the number of coils, if maximum compression is to be 150 mm. Take $G = 84 \text{ kN/mm}^2$. efficiency of the cycle?
8. (b) A weight of 260 N is dropped on a closed coil helical spring consisting of 20 coils. The diameter of wire is 16 mm and mean diameter of the coil is 150 mm. Find the height of drop, so that the spring may be compressed by 120 mm. Take $G = 0.8 \times 10^5 \text{ N/mm}^2$

SEMESTER END EXAMINATION
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Automobile Components Design
Subject Code: 18A-504EB

Time: 2hrs

Max Marks: 40

PART-A

Answer all Questions. Each question carries 2 marks

8 x 1 = 8 marks

10. List any four types of Riveted Joints?
11. Define 'Addendum' and 'Dedendum' with respect to a spur gear?
12. What is the working principle of a brake?
13. State 'Law of gearing'?
14. Classify 'Brakes'?
15. List the clutch materials?
16. Name the materials used for Piston?
17. What types of sections are used for a connecting rod?

PART-B

Answer any FOUR questions choosing either (a) or (b) from each question.

4 x 3 = 12 Marks

9. (a) Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm². Assume joint efficiency as 75%, allowable tensile stress in the plate 90 MPa; compressive stress 140 MPa; and shear stress in the rivet 56 MPa?
9. (b) Classify Clutches?
10. (a) A closed coil helical spring is to carry a load of 120 N and the mean coil diameter is ten times the diameter of the wire. Find the diameter of the wire, if the maximum shear stress is to be 90 N/mm²?
10. (b) What are the design criteria for a 'Crank shaft'?
11. (a) List the properties required of a clutch friction material?
11. (b) Differentiate between the functions of brake and clutch?
12. (a) State the characteristics that a piston material should possess?
12. (b) Name the materials used for a poppet valve?

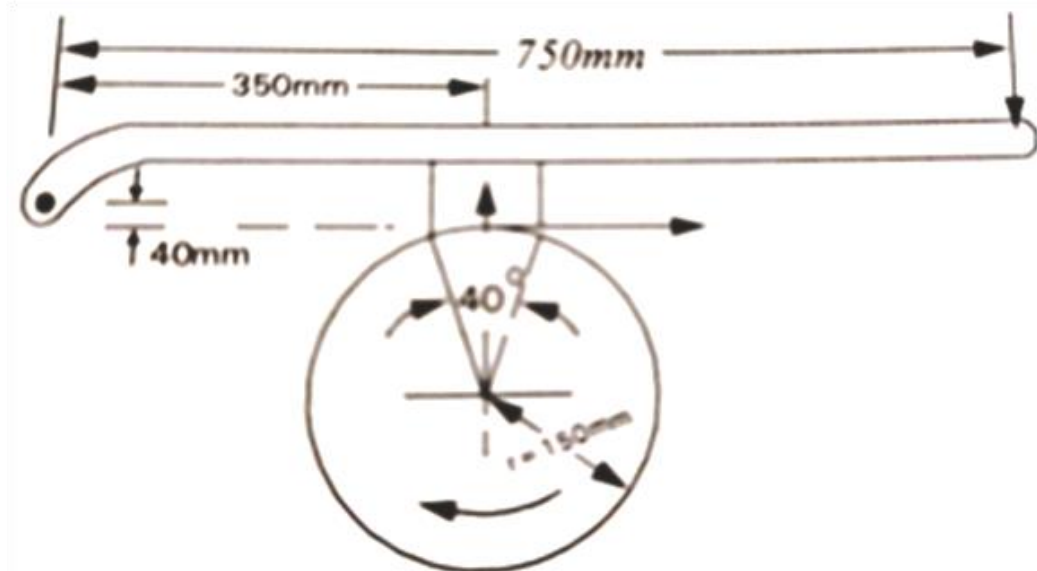
PART-C

Answer any FOUR questions by choosing either (a) or (b) from each question.

4 x 5 = 20 Marks

13. (a) A plate 150 mm wide and 12.5 mm thick is lapped over and welded to a gusset plate. Determine the minimum length of a 8 mm side fillet weld that will be necessary if the plate is subjected to an axial stress of 160 N/mm². Take allowable shear stress through the throat of weld has 120 N/mm²?

13. (b) A single plate clutch transmits a torque of 840 Nm. The outer diameter of contact surface is to be 300 mm. The co-efficient of friction is 0.4. Assuming uniform pressure of 0.17 N/mm^2 determine the inner diameter of the friction surface?
14. (a) A weight of 260 N is dropped on a closed coil helical spring consisting of 20 coils. The diameter of wire is 16 mm and mean diameter of the coil is 150 mm. Find the height of drop, so that the spring may be compressed by 120 mm. Take $G = 0.8 \times 10^5 \text{ N/mm}^2$
14. (b) The valve of an I.C Engine is 60 mm in diameter and is subjected to a maximum gas pressure of 4 N/mm^2 . The safe bending stress in valve material is 45 N/mm^2 . Determine
- Thickness of the valve head
 - Diameter of the valve rod
 - Maximum lift of the valve
 - Width of seat
 - Diameter of valve head
15. (a) A single shoe brake is shown in figure. The co-efficient of friction between the brake lining and the drum is 0.3. If the drum rotates clock wise, find the braking torque due to operation force of 600 N?



15. (b) A Multi plate clutch four pairs of contact surfaces, whose outer diameter is 300 mm and inner diameter is 200 mm are used. If co-efficient of friction is 0.2 and axial pressure is not to exceed 0.13 N/mm^2 . Calculate the following
- Axial force
 - Power transmitted at 500 rpm.
16. (a) Find the diameter of a connecting rod for a slow speed diesel engine, which is 2500 mm long. The diameter of the cylinder is 1000 mm and has a stroke length of 1250 mm. The maximum combustion pressure is 4.9 N/mm^2 . Assume factor of safety of 20 and take $E = 2.06 \times 10^5 \text{ N/mm}^2$
16. (b) Design a piston for I.C.Engine using the following data
- The diameter of cylinder bore = 300 mm
 - Maximum Explosion pressure = 5 N/mm^2
 - Number of Rings = 4 (Compression Rings) + 1 (Oil Ring)

- IV. Permissible stress for Piston = 27 N/mm^2
- V. Permissible stress for Piston rings = 80 N/mm^2
- VI. Radial Wall Pressure = 0.04 N/mm^2
- VII. Permissible bearing pressure for Pin = 15 N/mm^2
- VIII. Permissible bending stress in Pin = 85 N/mm^2
- IX. Permissible pressure in Piston barrel = 0.4 N/mm^2

Department of Technical Education - Telangana
State Board of Technical Education & Training (TS) - Hyderabad

Course Title :	Alternative Fuels & Emission Control	Course Code:	18A-504EC
Semester:	IV	Course Group:	Elective
Teaching Scheme in Hrs(L:T:P):	45:15:00	Credits:	3
Methodology:	Lecture + Tutorials +Assignments	Total Contact Hours:	50Hrs / 60Pds
CIE:	60 Marks	SEE:	40 Marks

Course Content and Blue Print of Marks for SEE

S.No	Unit No.	Questions to be set for SEE				Periods	
		R		U	A		
1	Introduction to Alternative Fuels	4	1		9(a)	13(a)	10
2	Automotive Emissions						08
3	Gaseous Fuels		2		10(a)	14(a)	10
4	Non Polluting Energy Systems						08
5	Alcohols and Bio Diesel		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	12
6	Emission Control Systems and Devices				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total Questions		8		8	8	60	

Prerequisite:

This course requires the basic knowledge of chemistry at Secondary school level

Course outcomes

At the end of course student should be able to

CO1 :	Distinguish between the fossil fuels and alternative fuels
CO2 :	Classify the different types of Alternative fuels
CO3 :	Identify the blends used to decrease the emission
CO4 :	Identify the environmental changes due to vehicular pollution
CO5 :	Study the different emissions came from Vehicles
CO6:	Describe the different types of Emission controlling devices

COURSE CONTENT:

1. INTRODUCTION TO ALTERNATIVE FUELS

Duration: Periods 10 (L: 6 – T: 4)

Definition of fuel, alternative fuel – Necessity for developing alternative fuels – Definition of renewable and non renewable fuels – Existing alternative fuels like Alcohols, vegetable oils, Bio diesel, LPG, CNG, LNG, Hydrogen, Bio gas, Ammonia, availability of these fuels - Properties – alternative fuels that can be used in automobiles – Merits and demerits of these alternative fuels - Introduction to alternative energy sources like Electric, solar, fuel cells – Merits and demerits of these alternative energy sources.

2. AUTOMOTIVE EMISSIONS

Duration: Periods 8 (L: 4.8 – T:3.2)

List the types of automotive emissions – Sources of H.C emissions – Constituents of Tail pipe emissions – Types of S.I engine emissions and their effects on human health and on the environment – Types of C.I engine emissions and their effects on human health and on the environment.

3. GASEOUS FUELS

Duration: Periods 10 (L: 6 – T: 4)

Definition of Gaseous fuels – Types of gaseous fuels – Short listing of gaseous fuels used in automobiles – Properties of CNG, LPG, Hydrogen, and Biogas –Modifications required in the fuel system of the engine – Working of fuel system of a gas engine with a block diagram – Advantages and limitations of using gaseous fuels as automobile fuels.

4. NON POLLUTING ENERGY SYSTEMS

Duration: Periods 8 (L: 4.8 – T: 3.2)

Types of Non polluting energy systems used in automobiles – Layout of an Electric vehicle – function of each component in the layout of Electric vehicle – Specifications of Electric vehicle –Type of batteries used for Electric vehicles – Various charging methods adopted - Advantages and limitations of Electric vehicle – Layout of a Hybrid vehicle and explain the function of components – Advantages and limitations of Hybrid vehicles – Layout of Solar powered cars and explain the function of components – Advantages and limitations of Solar powered vehicles.

5. ALCOHOLS AND BIO DIESEL

Duration: Periods 12 (L: 7.2 – T: 4.8)

General properties of alcohols – types of alcohols – alcohols that can be used in automobiles – effects of using alcohols as fuel in SI and CI engines – Blending of methanol or ethanol with gasoline and diesel – Emission characteristics of these blends – Advantages and limitations of alcohol blends as automobile fuels.

Definition of Bio diesel – General properties of bio diesel – Feed stocks used for manufacturing of Bio diesel – Comparison with petroleum diesel – Material compatibility of Bio diesel – Basic structure of vegetable oils – List of general fatty acids in a vegetable oils – Methods of manufacturing Bio diesel – Chemical equation for Transesterification reaction – Manufacturing Bio diesel using Batch production process with a block diagram – Effects of using B100 – Modifications required in the engine to use B100 – Use of B 20 – Emission characteristics of B20 – Advantages and limitations of using Bio diesel blends as CI engine fuel.

6. EMISSION CONTROL SYSTEMS AND DEVICES

Duration: Periods 12 (L: 7.2 – T: 4.8)

Need for control the emissions – Pollution norms as per motor vehicle act 1989 – Bharat – III, IV and VI – Types of emission control systems generally used – Working of crankcase ventilation, Positive

crankcase ventilation, Thermal reactors and Secondary air injection systems with diagrams – Function of Catalytic converter – Chemicals used in catalytic converter and their functions – Working of two way and three way catalytic converters – EGR and the method of control with line diagram – Evaporative HC control systems like Charcoal canister, stand pipe assembly and domed fuel tank systems – working of ELCD (Evaporative Loss Control Device).

Reference Books:

- | | |
|---------------------------------------|---|
| 1. Maheswar Dayal | -Energy today and tomorrow -I&B Horishr India -1982 |
| 2. G.D.Rai | -Non Conventional Energy Sources |
| 3. Sharma & Chandramohan | -Fuels & Combustion – Tata McGraw Hill Co. |
| 4. Mathur and Sharma | -Internal Combustion Engines. |
| 5. Ganesan | -Internal Combustion Engines |
| 6. Obert.E.F | -Internal Combustion Engines – 1988 |
| 7. Richard .L. Bechfold | -Alternative Fuel Guide Book – SAE-1987. |
| 8. Use and Handling of Biodiesel 2004 | – US Department of energy. |
| 9. Biodiesel Production Technology | – Iowa University - US Department of energy. |

Suggested Student Activities:

1. Quiz on the Alternative fuels.
2. Browse data online and submit a report on any one type of renewable energy.
3. Give a seminar on the need of developing alternative fuels.
4. Submit a report on the non conventional fuels that can be used in automobiles.
5. Visit an automobile emission testing center near to you and submit a report on your observations on the pollutants of various vehicles.
6. Write a Slip test (Objective type)
7. Prepare a chart of pollutants emitting from an automobiles and their effects on human health.
8. Study a specific model of automobile and submit the report about the variations in the emission with age.
9. Procure the components used for emission control and share your knowledge with your classmates.
10. Prepare a chart of pollutants emitting from an automobiles and their effects on environment.
11. Give a seminar on our responsibility on Conservation of water, Preservation of quality of soil and air, Noise pollution.
12. Share your views on sustainable development.

Suggested E Learning References:

1. Alternative fuels and Renewable energy sources
https://www.youtube.com/watch?v=4Hp_SyUht4I
<https://www.youtube.com/watch?v=zBHI9rTEcRE>
<https://www.youtube.com/watch?v=OIQRPkZhxHc>
<http://vikaspedia.in/energy/energy-basics/sources-of-energy>
2. Emission Norms

<https://www.youtube.com/watch?v=QDn-jiNjhWg&list=PL6kB4KeyhXc6Y7BkWKt76956BcUoBRGHv>

3. Gaseous fuels

<https://www.youtube.com/watch?v=wmPjdK3F2iE>

https://www.diffen.com/difference/CNG_vs_LPG

<https://www.youtube.com/watch?v=DtorjQQVnaQ>

Fuel conversion kit installation to LPG gas

<https://www.youtube.com/watch?v=jDp6lEA8ETs>

<https://www.youtube.com/watch?v=VOWjjGaYbGk>

Fuel conversion kit installation to CNG gas

<https://www.youtube.com/watch?v=11cgTziUizU>

<https://www.youtube.com/watch?v=sHCYxJNZ7Tk>

4. Alcohols and Biodiesels

<https://www.youtube.com/watch?v=-lO0fFoHa7w>

<https://www.youtube.com/watch?v=xLa83KIaEyw>

<https://www.youtube.com/watch?v=eGYcZ2UyHMc>

5. Non polluting energy systems

https://onlinecourses.nptel.ac.in/noc19_ee18/preview

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Specific Learning Outcome:

At the end of the lesson the learner shall be able to

- 1.1 Define a fuel and an alternative fuel
- 1.2 State the necessity of alternate fuels.
- 1.3 Understand about their availability and their properties.
- 1.4 List the types of alternate fuels that can be used for propulsion of automobile.

- 1.5 Identify the type of these alternative energy sources.
- 1.6 State the merit and demerits of these alternative fuels.
- 2.0 List the types of emissions
- 2.1 Sources of H.C emissions
- 2.2 List the constituents of Tail pipe emissions
- 2.3 List the types of S.I engine emissions and their effects on human health and on the environment
- 2.4 List the types of C.I engine emissions and their effects on human health and on the environment
- 3.1 Define a Gaseous fuel
- 3.2 List out at least eight types of Gaseous fuels
- 3.3 Short list the gaseous fuels to use in an automobile.
- 3.4 State the properties of CNG, LPG, Hydrogen and Biogas
- 3.5 Explain the modifications required in the fuel system of the engine.
- 3.6 Describe the working of the fuel system of a gas engine
- 3.7 Advantages and Limitations of gaseous fuels as automobile fuels.
- 4.1 List the types of Non polluting energy systems used in automobiles.
- 4.2 Draw the layout of an Electric vehicle
- 4.3 Explain the function of each component in the layout of Electric vehicle
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- 4.5 Understand the need for difference in the type of batteries used
- 4.6 Advantages and limitations of Electric vehicle
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- 5.1 List out the various types of alcohols that can be used as fuel in automobiles
- 5.2 Understand the effects if directly used as fuel in S.I engine.
- 5.3 Explain the effects of blending of methanol or ethanol with gasoline or diesel.
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- 5.6 Define a Biodiesel
- 5.7 List the properties of Biodiesel
- 5.8 List the feed stocks used for manufacturing of Biodiesel
- 5.9 Compare the characteristics with diesel
- 5.10 List the materials compatible to Biodiesel
- 5.11 Write the basic structure of a Vegetable Oil
- 5.12 List the general fatty acids in a Vegetable oils
- 5.13 List the methods of manufacturing Biodiesel
- 5.14 State the Chemical equation for Transesterification reaction
- 5.15 Explain Batch Production Process for manufacturing of Biodiesel with a block diagram
- 5.16 Effects of using B 100 and modifications required in the engine
- 5.17 Justify the use of B20
- 5.18 Understand the emission characteristics of Biodiesel blends in C.I engines.
- 5.19 Advantages and Limitations of Biodiesel blends as automobile fuels.

- 6.1 Explain need to control the emissions
- 6.2 State the Pollution norms (Bharat – II , III and IV)
- 6.3 List the types of control systems generally used
- 6.4 Explain the working of Positive Crankcase Ventilation, Thermal reactors and Secondary air injection systems
- 6.5 List the types of Catalytic Converters
- 6.6 State the Catalysts used in Catalytic Converters and their functions
- 6.7 Explain the working of Two way and Three way Catalytic converters.
- 6.8 Draw the layout of EGR and explain the method of control
- 6.9 Explain the working of ELCD (Evaporative Loss Control Device) with Charcoal canister, Stand pipe assembly and domed fuel tank systems.

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching Periods
CO1 :	Distinguish between the fossil fuels and alternative fuels	R,U	1,5	10
CO2 :	Classify the different types of Alternative fuels	R,U	1,5	12
CO3 :	Identify the blends used to decrease the emission	R,U	1,5	10
CO4 :	Identify the environmental changes due to vehicular pollution	R,U	1,5	08
CO5 :	Study the different emissions came from Vehicles	R,U	1,5	08
CO6 :	Describe the different types of Emission controlling devices	R,U	1,5	12

OVER VIEW OF STUDENT EVALUATION

Mid Semester Examination-1

Max. Marks: 20

S.No	Unit	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Mid Semester Examination-2

Max.Marks: 20

S.No	Unit	R	U	A	Remarks
1	Unit-III	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Internal Assessment

Max.Marks: 20

Type of test	Unit	Marks allotted	Remarks
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions
Assignment	Any one Unit	5	Different group assignments of Higher order Questions that develop problem solving skills and critical thinking should be given
Seminar		5	Any topic approved by the faculty

(Model Question Paper)

Mid Sem -I

Subject Name: **Alternative Fuels and Emission Control**

Subject Code: **18A-504 EC**

Time: 1 Hour

Total Marks: 20 M

PART – A

Answer **ALL** questions and each question carries **ONE** Mark

4 x1 = 4 Marks

1. Define an 'Alternative fuel'?
2. Distinguish between 'Alternative fuel' and 'Alternative energy'?
3. State the sources of HC emissions in a vehicle?
4. What are the constituents of tail pipe emissions of S.I Engine?

PART – B

Answer the following. Each question carries **THREE** marks

2x3= 6 Marks

5. a). State the necessity of developing alternative fuels?
OR
b). Brief about the alternative fuels that can be used in automobiles?
6. a) What are the effects of C.I engine tail pipe emissions on environment?
OR
b) What are the effects of S.I engine tail pipe emissions on environment?

PART – C

Answer the following. Each question carries **FIVE** marks

2x5 = 10 Marks

7. a). State and explain the merits and demerits of alternative energy sources?
OR
b). Write the notes on Renewable and Non Renewable fuels?
8. a). What are the effects of C.I engine tail pipe emissions on human health?
OR
b). What are the effects of S.I engine tail pipe emissions on human health?

(Model Question Paper)

Mid Sem -II

Subject Name: **Alternative Fuels and Emission Control**

Subject Code: **18A-504 EC**

Time: 1 Hour

Total Marks: 20 M

PART – A

Answer **ALL** questions and each question carries **ONE** Mark

4 x1 = 4 Marks

1. Name any two gaseous fuels used in automobiles?
2. Define ‘Gaseous fuel’?
3. List the Non polluting energy systems used in automobiles?
4. What is a Hybrid vehicle?

PART – B

Answer the following. Each question carries **THREE** marks

2x3= 6 Marks

5. a). Shortlist the gaseous fuels used in automobiles and explain about these fuels?
OR
b). List any six advantages/limitations of using gaseous fuels as automobile fuels?
6. a) State the advantages and limitations of hybrid vehicles?
OR
b) State the advantages and limitations of solar powered vehicles?

PART – C

Answer the following. Each question carries **FIVE** marks

2x5 = 10 Marks

7. a). With the aid of a block diagram explain the working of gas engine?
OR
b). List and explain the modifications required in fuel system of conventional engine to use gaseous fuels?
8. a). Draw the layout of a Hybrid vehicle and explain its working?
OR
b). Draw the layout of a Solar powered vehicle and explain its working?

(Model Question Paper)
SEMESTER END EXAM
Subject Name: **Alternative Fuels and Emission Control**
Subject Code: **18A-504EC**

Time: 2 Hour

Total Marks: 40M

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed $\frac{1}{4}$ page.

8x1 = 8Marks

1. Define an 'Alternative fuel'?
2. What is a 'Hybrid vehicle'?
3. Define 'Biodiesel'?
4. List the types of Alcohols used as fuel?
5. Name the methods used for manufacturing biodiesel?
6. List the feed stocks used for biodiesel?
7. State the emission norms for a two wheeler as on the day?
8. Expand 'ELCD'?

PART – B

Answer the following. Each question carries **Three** marks
and answer should not exceed one page.

4x3=12 Marks

9. a). Brief about the alternative fuels that can be used in automobiles

OR

b). List the general properties of Biodiesel?

10. a) List any six advantages and limitations of using gaseous fuels as automobile fuels?

OR

b) What is Crank case ventilation, why it is ventilated?

11. a) State the effects of using B100 in a conventional diesel engine?

OR

b) Explain batch production process of manufacturing of Biodiesel?

12. a) What is the need of control the emissions of an automobile?

OR

b) Explain EGR method of control with the aid of a line diagram?

PART – C

Answer the following. Each question carries **FIVE** marks
and answer should not exceed two pages.

4x5 = 20 Marks

13. a) What are the effects of tail pipe emissions of a C.I engine on human health and on environment?

OR

b) Explain about the modifications required for use of B100 in a conventional CI engine?

14. a). List and explain the modifications required in fuel system of conventional engine to use gaseous fuels?

OR

b). With the help of a block diagram explain the working of two way and three way catalytic converters?

15. a). Discuss about the compatible materials for biodiesel?

OR

b). Explain about various advantages and limitations of using biodiesel as C.I engine fuel?

16. a). With the help of necessary sketches explain various types of Evaporative HC control systems?

OR

b) . Write a short note in the following

- i. Thermal Reactors
- ii. Secondary air injection system

Department of Technical Education - Telangana
State Board of Technical Education & Training (TS) - Hyderabad

Course Title :	Alternative Fuels & Emission Control	Course Code:	18A-504EC
Semester:	IV	Course Group:	Elective
Teaching Scheme in Hrs(L:T:P):	45:15:00	Credits:	3
Methodology:	Lecture + Tutorials + Assignments	Total Contact Hours:	50Hrs / 60Pds
CIE:	60 Marks	SEE:	40 Marks

Course Content and Blue Print of Marks for SEE

S.No	Unit No.	Questions to be set for SEE				Periods	
		R		U	A		
1	Introduction to Alternative Fuels	4	1		9(a)	13(a)	10
2	Automotive Emissions						08
3	Gaseous Fuels		2		10(a)	14(a)	10
4	Non Polluting Energy Systems						08
5	Alcohols and Bio Diesel		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	12
6	Emission Control Systems and Devices				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total Questions		8		8	8	60	

Prerequisite:

This course requires the basic knowledge of chemistry at Secondary school level

Course outcomes

At the end of course student should be able to

CO1 :	Distinguish between the fossil fuels and alternative fuels
CO2 :	Classify the different types of Alternative fuels
CO3 :	Identify the blends used to decrease the emission
CO4 :	Identify the environmental changes due to vehicular pollution
CO5 :	Study the different emissions came from Vehicles
CO6:	Describe the different types of Emission controlling devices

COURSE CONTENT:

1. INTRODUCTION TO ALTERNATIVE FUELS

Duration: Periods 10 (L: 6 – T: 4)

Definition of fuel, alternative fuel – Necessity for developing alternative fuels – Definition of renewable and non renewable fuels – Existing alternative fuels like Alcohols, vegetable oils, Bio diesel, LPG, CNG, LNG, Hydrogen, Bio gas, Ammonia, availability of these fuels - Properties – alternative fuels that can be used in automobiles – Merits and demerits of these alternative fuels - Introduction to alternative energy sources like Electric, solar, fuel cells – Merits and demerits of these alternative energy sources.

2. AUTOMOTIVE EMISSIONS

Duration: Periods 8 (L: 4.8 – T:3.2)

List the types of automotive emissions – Sources of H.C emissions – Constituents of Tail pipe emissions – Types of S.I engine emissions and their effects on human health and on the environment – Types of C.I engine emissions and their effects on human health and on the environment.

3. GASEOUS FUELS

Duration: Periods 10 (L: 6 – T: 4)

Definition of Gaseous fuels – Types of gaseous fuels – Short listing of gaseous fuels used in automobiles – Properties of CNG, LPG, Hydrogen, and Biogas –Modifications required in the fuel system of the engine – Working of fuel system of a gas engine with a block diagram – Advantages and limitations of using gaseous fuels as automobile fuels.

4. NON POLLUTING ENERGY SYSTEMS

Duration: Periods 8 (L: 4.8 – T: 3.2)

Types of Non polluting energy systems used in automobiles – Layout of an Electric vehicle – function of each component in the layout of Electric vehicle – Specifications of Electric vehicle –Type of batteries used for Electric vehicles – Various charging methods adopted - Advantages and limitations of Electric vehicle – Layout of a Hybrid vehicle and explain the function of components – Advantages and limitations of Hybrid vehicles – Layout of Solar powered cars and explain the function of components – Advantages and limitations of Solar powered vehicles.

5. ALCOHOLS AND BIO DIESEL

Duration: Periods 12 (L: 7.2 – T: 4.8)

General properties of alcohols – types of alcohols – alcohols that can be used in automobiles – effects of using alcohols as fuel in SI and CI engines – Blending of methanol or ethanol with gasoline and diesel – Emission characteristics of these blends – Advantages and limitations of alcohol blends as automobile fuels.

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<http://vikaspedia.in/energy/energy-basics/sources-of-energy>

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1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Mid Semester Examination-2

Max.Marks: 20

S.No	Unit	R	U	A	Remarks
1	Unit-III	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Internal Assessment**Max.Marks: 20**

Type of test	Unit	Marks allotted	Remarks
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions
Assignment	Any one Unit	5	Different group assignments of Higher order Questions that develop problem solving skills and critical thinking should be given
Seminar		5	Any topic approved by the faculty

(Model Question Paper)

Mid Sem -I

Subject Name: **Alternative Fuels and Emission Control**

Subject Code: **18A-504 EC**

Time: 1 Hour

Total Marks: 20 M

PART – A

Answer **ALL** questions and each question carries **ONE** Mark

4 x1 = 4 Marks

1. Define an 'Alternative fuel'?
2. Distinguish between 'Alternative fuel' and 'Alternative energy'?
3. State the sources of HC emissions in a vehicle?
4. What are the constituents of tail pipe emissions of S.I Engine?

PART – B

Answer the following. Each question carries **THREE** marks

2x3= 6 Marks

5. a). State the necessity of developing alternative fuels?
OR
b). Brief about the alternative fuels that can be used in automobiles?
6. a) What are the effects of C.I engine tail pipe emissions on environment?
OR
b) What are the effects of S.I engine tail pipe emissions on environment?

PART – C

Answer the following. Each question carries **FIVE** marks

2x5 = 10 Marks

7. a). State and explain the merits and demerits of alternative energy sources?
OR
b). Write the notes on Renewable and Non Renewable fuels?
8. a). What are the effects of C.I engine tail pipe emissions on human health?
OR
b). What are the effects of S.I engine tail pipe emissions on human health?

(Model Question Paper)

Mid Sem -II

Subject Name: **Alternative Fuels and Emission Control**

Subject Code: **18A-504 EC**

Time: 1 Hour

Total Marks: 20 M

PART – A

Answer **ALL** questions and each question carries **ONE** Mark

4 x1 = 4 Marks

1. Name any two gaseous fuels used in automobiles?
2. Define ‘Gaseous fuel’?
3. List the Non polluting energy systems used in automobiles?
4. What is a Hybrid vehicle?

PART – B

Answer the following. Each question carries **THREE** marks

2x3= 6 Marks

5. a). Shortlist the gaseous fuels used in automobiles and explain about these fuels?
OR
b). List any six advantages/limitations of using gaseous fuels as automobile fuels?
6. a) State the advantages and limitations of hybrid vehicles?
OR
b) State the advantages and limitations of solar powered vehicles?

PART – C

Answer the following. Each question carries **FIVE** marks

2x5 = 10 Marks

7. a). With the aid of a block diagram explain the working of gas engine?
OR
b). List and explain the modifications required in fuel system of conventional engine to use gaseous fuels?
8. a). Draw the layout of a Hybrid vehicle and explain its working?
OR
b). Draw the layout of a Solar powered vehicle and explain its working?

(Model Question Paper)
SEMESTER END EXAM
Subject Name: **Alternative Fuels and Emission Control**
Subject Code: **18A-504EC**

Time: 2 Hour

Total Marks: 40M

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed ¼ page.

8x1 = 8Marks

9. Define an 'Alternative fuel'?
10. What is a 'Hybrid vehicle'?
11. Define 'Biodiesel'?
12. List the types of Alcohols used as fuel?
13. Name the methods used for manufacturing biodiesel?
14. List the feed stocks used for biodiesel?
15. State the emission norms for a two wheeler as on the day?
16. Expand 'ELCD'?

PART – B

Answer the following. Each question carries **Three** marks
and answer should not exceed one page.

4x3=12 Marks

9. a). Brief about the alternative fuels that can be used in automobiles
OR
b). List the general properties of Biodiesel?
10. a) List any six advantages and limitations of using gaseous fuels as automobile fuels?
OR
b) What is Crank case ventilation, why it is ventilated?
11. a) State the effects of using B100 in a conventional diesel engine?
OR
b) Explain batch production process of manufacturing of Biodiesel?
12. a) What is the need of control the emissions of an automobile?
OR
b) Explain EGR method of control with the aid of a line diagram?

PART – C

Answer the following. Each question carries **FIVE** marks
and answer should not exceed two pages.

4x5 = 20 Marks

13. a) What are the effects of tail pipe emissions of a C.I engine on human health and on environment?
OR
b) Explain about the modifications required for use of B100 in a conventional CI engine?

14. a). List and explain the modifications required in fuel system of conventional engine to use gaseous fuels?

OR

b). With the help of a block diagram explain the working of two way and three way catalytic converters?

15. a). Discuss about the compatible materials for biodiesel?

OR

b). Explain about various advantages and limitations of using biodiesel as C.I engine fuel?

16. a). With the help of necessary sketches explain various types of Evaporative HC control systems?

OR

b) . Write a short note in the following

iii. Thermal Reactors

iv. Secondary air injection system

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title	PROFESSIONAL ETHICS & INDIAN CONSTITUTION	Course Code	: 18A-504ED
Semester	: VI	Course Group	: Elective
Teaching Scheme in periods (L : T :P)	: 45 : 15 : 0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE	: 60 Marks	SEE	: 40 Marks

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE					
			R		U	A		
1	Human Values	10	4	1		9(a)	13(a)	
2	Engineering Ethics	10						
3	Safety, responsibilities of engineers	10		2		10(a)	14(a)	
4	Ethical issues in engineering practice	10						
5	Human Rights	10		3	5,6		9(b) 11(a) 11(b)	14(b) 15(a) 15(b)
6	Indian Constitution	10						
Total		60	8		8	8		

Pre requisites

This course requires ethics and the basic knowledge of civil sense.

Course Outcomes

CO1 :	Explain the Significance of Human values in society
CO2 :	Appreciate the need for Engineering ethics
CO3 :	Outline the safety and responsibilities of engineers
CO4 :	Appreciate the Ethical issues and the code of ethics adopted in various professional body's and industries
CO5 :	Justify the need for protection of human rights and women empowerment
CO6 :	Recognize the successful functioning of democracy in India

Course Content:

Unit: 1: HUMAN VALUES

Duration: 10 Periods (L:7.5-T:2.5)

Professional Ethics-Objectives of study of professional ethics-Human values- Definition of Morals and Ethics-Difference between Morality and Ethics-Values-Definition-Types of values- Definition of Integrity- Concept of Work Ethic- Service Learning- Definition Virtues-Definition- Civic Virtue-Duties and Rights - Respect for Others – Attitude and values, opinions-changing attitude-beliefs-Reliability-Living Peacefully-Means to be adopted for leaving peacefully-Caring-Sharing-Honesty-Valuing Time-Co-operation-Commitment- Empathy-Self-Confidence-Spirituality.

Unit: 2: ENGINEERING ETHICS

Duration: 10 Periods (L:7.5-T: 2.5)

Engineering ethics-Definition-Approach-Senses of Engineering Ethics-variety of moral issues– Inquiry-Types-Moral dilemmas-Steps to solve dilemma-Moral autonomy –Definition- consensus & controversy –Profession-Definition–Ethical theories-Theories about right action Personality– Self control- Self-interest –Self respect.

Unit: 3: SAFETY, RESPONSIBILITIES OF ENGINEERS

Duration: 10 Periods (L:7.5-T: 2.5)

Safety and risk-definition- - assessment of safety and risk - risk benefit analysis and reducing risk – Personal risk-Public risk-Reducing risk-Voluntary Risk-Collegiality and loyalty– Authority-Types-collective bargaining -occupational crime –Responsibility of engineers– Types-Social responsibility- Professional responsibility-confidentiality-conflicts of interest- liability

Unit: 4: ETHICAL ISSUES IN ENGINEERING PRACTICE

Duration: 10 Periods

Ethical issues–Industrial standards-Environmental ethics –Plastic waste disposal-E-Waste Disposal-Semi conductor waste Disposal-Industrial waste disposal-Human centred environmental ethics- computer ethics –Types of issues-Computer as the Instrument and Object of Unethical Acts -Engineers as managers-Codes of ethics-Sample code of Ethics like -Institution of Engineers (India)-Institute of Electrical & Electronics engineers- Institute of Electronics & Telecommunication Engineers - Indian Institute of Materials Management.

Unit: 5: HUMAN RIGHTS

Duration: 10 Periods (L:7.5-T: 2.5)

Human Rights-Definition-constitutional provisions-right to life and liberty-Human Rights of Women-Discrimination against women- steps that are to be taken to eliminate discrimination against women in Education, employment, health care, Economic and social life, Women in rural areas- Status of Women in India - Constitutional Safeguards - Dowry Prohibition act 1961- Domestic violence act 2005- Sexual harassment at work place bill 2006-Human Rights of Children- Who is a child- list the Rights of the Child- Right to education--Protection of Children from Sexual Offences Act(POCSO)-2012- National Human Rights Commission- Constitution-Powers and function of the Commission-Employee rights- Provisions made- Contractual-Non contractual employee rights-Whistle blowing-definition-Aspects-Intellectual Property Rights (IPR)–Meaning-Need for protection- Briefly description of concept of patents, Copy right, Trade mark.

Unit: 6: INDIAN CONSTITUTION

Duration: 10 Periods (L:7.5-T: 2.5)

Introduction to constitution of India-Formation and Composition of the Constituent Assembly-Salient features of the Constitution-Preamble to the Indian Constitution Fundamental Rights-Fundamental Duties-Directive principles of state policy. Parliamentary system of governance- Structure of Parliament- Loksabha and Rajyasabha - Functions of parliament- Legislative ,Executive, Financial Function, Powers of Loksabha and Rajyasabha- Procedure followed in parliament in making law-Structure of union executive-Power and position of President, Vice President, Prime minister and council of ministers.

Structure of the judiciary: Jurisdiction and functions of Supreme Court, high court, and subordinate courts

Federalism in the Indian constitution, Division of Powers- Union list, State list and concurrent list, Structure of state legislation, Legislative assembly and Legislative council, Functions of state legislature, Structure of state executive-Powers and positions of Governor, Speaker, Deputy Speaker, Chief Minister and council of minister.

Recommended References:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics- Concepts and Cases", Wadsworth Thompson Learning, United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001
5. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 1996.
6. Introduction to the Constitution of India- Dr. Durga Das Basu
7. Empowerment of rural women in India- Hemalatha H.M and Rameshwari Varma, Hema Prakashana.

Suggested Learning Outcomes:

1. 1 Define Professional Ethics
1. 2 State the Objectives of professional ethics
1. 3 Define Human values
1. 4 Define Morals
1. 5 Define Ethics
1. 6 Mention the Differences between Morality and Ethics
1. 7 State the Types of value
1. 8 Explain Human values
1. 9 Define Integrity
1. 10 Give the Concept of Work Ethic and Service Learning
1. 11 Define Virtues
1. 12 Explain the terms Duties and Rights
1. 13 State the importance of Respect for Others
1. 14 Mention the differences between Attitude and values,
1. 15 State opinions-changing attitude
1. 16 Explain the importance of Beliefs-
1. 17 Define Reliability
1. 18 State the need for Living Peacefully

1. 19 Outline the Means to be adopted for leaving peacefully
1. 20 Explain the following human values
 - i. Caring-Sharing
 - ii. Honesty
 - iii. Valuing Time
 - iv. Co-operation
1. 21 Define i) Commitment ii) Empathy iii) Self-Confidence & iv) Spirituality.

2. 0 Define Engineering ethics
2. 1 Underline the Senses of Engineering Ethics
2. 2 Discuss the variety of moral issues
2. 3 Name the types of Inquiry
2. 4 Define the term Moral dilemmas
2. 5 Outline the Steps to solve dilemma-
2. 6 Define Moral autonomy
2. 7 Differentiate between consensus & controversy
2. 8 Define Profession
2. 9 Describe the following ethical theories
 - a. Utilitarian Ethical theory
 - b. Golden mean ethics
 - c. Duty based ethics
 - d. Right based ethics
2. 10 Define i) Self control ii) Self-interest & iii) Self respect.

3. 0 Define Safety and risk
3. 1 Explain assessment of safety and risk
3. 2 Explain risk benefit analysis and reducing risk
3. 3 Define Personal risk
3. 4 Define Public risk
3. 5 Define Voluntary Risk
3. 6 Differentiate between Collegiality and loyalty
3. 7 Name the types of Authority
3. 8 Explain collective bargaining
3. 9 State occupational crime
3. 10 Mention the types of Responsibilities of engineers
3. 11 Define Social responsibility
3. 12 Define Professional responsibility-
3. 13 State confidentiality

3. 14 Explain conflicts of interest and liability

4. 0 Define Ethical issues

4. 1 Describe the Industrial standards

4. 2 State the need for Environmental ethics

4. 3 List the methods of Plastic waste disposal

4. 4 Explain E-Waste Disposal, Semi conductor waste Disposal, Industrial waste disposal

4. 5 Describe the Human entered environmental ethics, computer ethics

4. 6 Classify the Types of issues

4. 7 Computer as the Instrument and Object of Unethical Acts

4. 8 Engineers as managers

4. 9 Explain the Codes of ethics and Sample code of Ethics

4. 10 Explain the Codes of ethics of Institution of Engineers(India)

4. 11 Explain the Codes of ethics -Institute of Electrical & Electronics engineers

4. 12 Explain the Codes of ethics - Institute of Electronics & Telecommunication Engineers

4. 13 Explain the Codes of ethics - Indian Institute of Materials Management.

5. 0 Define Human Rights

5. 1 Outline the constitutional provisions for human rights

5. 2 State the importance of right to life and liberty

5. 3 Enumerate the Human Rights of Women

5. 4 State the steps that are to be taken to eliminate discrimination against women in Education,

5. 5 State the steps that are to be taken to eliminate discrimination against women in employment

5. 6 State the steps that are to be taken to eliminate discrimination against women in health care,

5. 7 State the steps that are to be taken to eliminate discrimination against women in Economic and social life

5. 8 State the steps that are to be taken to eliminate discrimination against women in, Women in rural areas

5. 9 Identify the Status of Women in India

5. 10 Write about Constitutional Safeguards of Women in India

5. 11 Explain Dowry Prohibition act 1961

5. 12 Describe the Domestic violence act 2005
 5. 13 Describe Sexual harassment at work place bill 2006
 5. 14 List the Human Rights of Children
 5. 15 Define a child
 5. 16 Explain various Rights of the Child-i) Right to education ii) Protection of Children from Sexual Offences Act (POCSO) -2012
 5. 17 Explain the need for National Human Rights Commission.
 5. 18 Describe the Powers and function of the National Human Rights Commission-
 5. 19 State Employee rights
 5. 20 List the rights of Contractual-Non contractual employee
 5. 21 Define Whistle blowing
 5. 22 Define Intellectual Property Rights (IPR)
-
6. 0 Give the Introduction to constitution of India
 6. 1 Explain Formation and Composition of the Constituent Assembly
 6. 2 Mention the Salient features of the Constitution
 6. 3 Outline the Preamble to the Indian Constitution
 6. 4 List the Fundamental Rights provided in the constitution of India
 6. 5 List the Fundamental Duties defined in the constitution of India
 6. 6 State the Directive principles of state policy.
 6. 7 Define Parliamentary system of governance-
 6. 8 Explain the Structure of Parliament
 6. 9 Describe the Various Functions of parliament (Legislative ,Executive, Financial Function, Powers of Lok sabha and Rajya Sabha)
 6. 10 Explain the Procedure followed in parliament in making law.
 6. 11 Explain the Structure of union executive
 6. 12 Describe the Power and position of i) President, ii) Vice President, iii)Prime minister and iv) Council of ministers.
 6. 13 Explain the Structure of the judiciary
 6. 14 Describe the Jurisdiction and functions of Supreme Court, high court, and subordinate courts
 6. 15 Define Federalism in the Indian constitution,
 6. 16 Compare the Powers of Union list, State list and concurrent list,
 6. 17 Explain the Structure of state legislation i) Legislative assembly and ii) Legislative council,
 6. 18 State the Functions of state legislature
 6. 19 Give the Structure of state executive
 6. 20 List the powers and positions of i) Governor ii) Speaker iii) Deputy Speaker iv) Chief Minister v) council of minister.

Suggested student's activities / Recommended Case Studies for Student Evaluation:

1	Teacher form the group of 5- 6 students, Ask to think by each student, about an important value acquired from their child hood and the value still retained with them and value they rejected. Ask to share the values retained and explore what has made to reject some values. Make report
2	The construction company wants to make a feasibility study of a proposed ring road near your city. It hires Civil engineer for this purpose. The engineer learns that the project would have a very negative impact in term of pollution, economy, and lives of low income rural population. The Engineer had no intention of divulge the information during public hearings. What should the Engineer as Adviser to do? Make report
3	The computer engineer develops a computer program used as a tool in developing other programs assigned to him. He uses the facilities of the company to develop the program. He changes jobs and takes the only copy of the first program with him for use in his new job. Will it be a violation of the employer's right? Does he require Previous employer's permission before using it on the new job? Make report
4	<p>A manufacturing enterprise pays their Technicians Trainees overtime salary and a handsome bonus to work during a strike period. The strike was organized by the union against the unsafe working conditions of the plant. You, considered as a Technician trainee, believe that the conditions may be unsafe even though no government regulations apply. What will you do? Make report</p> <p>Options:</p> <ol style="list-style-type: none">1. Refuse to work, because thinking that the allegations of the union have merit2. Refuse to work because believing that breaking the strike is unethical.3. Continue to work, because he feels this is an obligation to the employees4. Continue to work because it will help clear some of his pending commitments5. Work, because otherwise Management is likely to be fired and cannot get alternate job.
5	<p>A woman who was driving a car was involved in an accident. The vehicle dashed against the divider. She had fallen unconscious. You are passing by your vehicle. She is known to you, alive and stable. You are going to appear for an interview for Air Force recruitment.</p> <p>Is it (or) is it not your duty to save her from suffering? You are likely to fulfil a duty of protecting the country. What you will do .Apply Ethical theory on this situation. Make report</p>
6	Teacher form the group of 5- 6 students, Ask to Visit local general hospital/leading Nursing homes. Ask them to observe how their hospital wastes being disposed. Will they follow the safe disposable measures? Assess how it will violate their environmental ethics. Make report

Suggested E-Learning References:

1. www.academia.edu
2. www.asianvu.com

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1							3	2		3	7,8,10
CO2							3	2		3	7,8,10
CO3							3	2		3	7,8,10
CO4						3	3	2		3	6,7,8,10
CO5							3	2		3	7,8,10
CO6							3	2		3	7,8,10

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

**The length of answer for each question framed in respect of Part-A, B&C shall not exceed
¼ of a page side, 1 page side and 2page sides respectively**

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

State Board of Technical Education and Training, Telangana
Model Question paper
Mid Semester-I Examination

Corse Code: 18A-504ED
Course Name: Professional Ethics & Indian constitution

Duration: 1 hour
Max.Marks:20

PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

- 1) Define ethics
- 2) Define integrity
- 3) Name the types of inquiry
- 4) State the difference between public risk and private risk

PART-B

Answer two questions. Each question carries three marks

2x 3 = 6 Marks

5(a) Differentiate between morality and ethics

OR

5(b) State the importance of beliefs

6(a) Define moral autonomy

OR

6(b) Differentiate between consensus & controversy

PART-C

Answer two questions. Each question carries five marks

2x 5 = 10 Marks

7(a) Explain i) Work Ethic ii) Service Learning

OR

7(b) Describe the human values i) caring-sharing ii) honesty

8(a) What is moral integrity? Write on its significance?

OR

8(b) Explain Utilitarian Ethical theory

State Board of Technical Education and Training, Telangana
Model Question paper
Mid Semester-II Examination

Corse Code: 18A-504ED
Course Name: Professional Ethics & Indian constitution

Duration: 1 hour
Max.Marks:20

PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

- 1) Define risk
- 2) Name the types of authority
- 3) Define ethics
- 4) Name the types of issues

PART-B

Answer two questions. Each question carries three marks

2x 3 = 6 Marks

5(a) Differentiate between Collegiality and loyalty

OR

5(b) Define professional responsibility

6(a) State the need for Environmental ethics

OR

6(b) classify the types of issues

PART-C

Answer two questions. Each question carries five marks

2x 5 = 10 Marks

7(a) Explain collective responsibility

OR

7(b) Describe occupational crime

8(a) Explain e waste disposal

OR

8(b) Justify the role of engineer as managers

State Board of Technical Education and Training, Telangana
Model Question paper
Semester End Examination

Corse Code: 18A-504ED
Course Name: Professional ethics and Indian constitution

Duration: 2 hours
Max.Marks:40

PART-A

Answer **all** questions, Each Question carries one mark **4x1 = 4 Marks**

- 1) Define ethics
- 2) Name the types of authority
- 3) State the importance of right to life
- 4) Mention ant two salient features of constitution
- 5) List any two human rights of children
- 6) Define child
- 7) Give the structure of parliament
- 8) Define Federalism in the Indian constitution

PART-B

Answer four questions. Each question carries three marks

4x 3 = 12 Marks

9(a) Define self respect

OR

9(b) Outline the constitutional provisions for human rights

10(a) Differentiate between social responsibility and professional responsibility

OR

10(b) List the Fundamental Duties defined in the constitution of India

11(a) State the steps that are to be taken to eliminate discrimination against women in Education

OR

11(b) Define whistle blowing

12(a) Mention any three Salient features of the Constitution

OR

12(b) State any three functions of state legislature

PART-C

Answer four questions. Each question carries five marks

4x 5 = 20 Marks

13 (a) Explain the right based ethical theory

OR

13(b) Enumerate the Human Rights of Women

14(a) Explain e waste disposal

OR

14(b) Describe the Jurisdiction and functions of Supreme Court

15(a) Explain Dowry Prohibition act 1961

OR

15(b) Describe the Powers and function of the National Human Rights Commission

16(a) Describe the Power and position of i) President, ii) Vice President

OR

16(b) Explain the Structure of i) Legislative assembly and ii) Legislative council

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title :	Thermal Engineering -II	Course Code	18A-505EA
Semester	IV	Course Group	:Core
Teaching Scheme in Hrs(L:T:P)	36:24:0	Credits	: 3
Methodology	Lecture + Assignments	Total Contact Periods :	: 60
CIE	60 Marks	SEE	40 Marks

Prerequisites

This course requires the basic knowledge of Basic Thermodynamics and Mathematics.

Pre Course Content and Blue Print of Marks for SEE

Unit no	Unit name	Questions to be set for SEE				Periods	
		R		U	A		
1	Air Compressors, Gas Turbines & Jet Propulsion	4	1		9(a)	13(a)	10
2	Properties of Steam						10
3	Steam Boilers		2		10(a)	14(a)	10
4	Steam Nozzles						10
5	Steam Turbines		3	5,6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	Steam Condensers				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total questions		8		8	8	60	

Legend: R; Remembering, U: Understanding A: Applying

Course outcomes

At the end of course student should be able to

CO1 :	Comprehend the construction and working of air compressor and gas turbine
CO2 :	Compare the working of gas turbine and jet propulsion
CO3 :	Illustrate the generation of steam and its property analysis
CO4 :	Explain the construction and working of boiler , its mountings and accessories.
CO5 :	Identify the need of nozzle , its working and design nozzle to given conditions
CO6	Classify and explain working Boiler and draw heat balance sheet
CO7	Illustrate the working of a turbine and interpret blade parameters using velocity triangles

COURSE CONTENT

UNIT-1

Duration: Periods 10 (L: 06 – T: 04)

Air compressors, Gas Turbines & Jet Propulsion

Functions of air compressor – uses of compressed air – types of air compressors - Single stage reciprocating air compressor its construction and working (with line diagram) using P.V. diagram Formulae for work done and power required- simple problems on calculation of work done and power required.

Multi stage compressors – advantages over single stage compressors. Use of air cooler – conditions for minimum work in two stage compressor (without proof) Formulae for work done and power required in two stage compressors – simple problems.

Gas turbines – Classification – open cycle gas turbines and closed cycle gas turbines – comparison of gas turbine with reciprocating I.C. engines and steam turbines. Applications, advantages and limitations of gas turbines - Open cycle constant pressure gas turbine – Closed cycle gas turbine – general lay-out. P.V. and T.S diagram and working of gas turbine.

Principle of operation and applications of Ram – jet engine, turbojet engines and rocket engines – fuels used in jet propulsion.

UNIT-2

Duration: Periods 10 (L: 06 – T: 04)

Properties of steam

Formation of steam under constant pressure- dryness fraction and degree of superheat - Determination of enthalpy, entropy and specific volume of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart.

Vapour processes – simple problems on enthalpy, entropy and specific volume- internal energy, internal latent heat, of wet, dry and superheated steam using tables.

UNIT-3

Duration: Periods 10 (L:06 – T:04)

Steam Boilers

Function and use of steam boilers – construction - Classification of steam boiler- Comparison of water tube and fire tube boilers - Cochran and Babcock Wilcox Boilers - modern high pressure boilers Lamont and Benson boilers - Boiler mountings - Boiler accessories - Actual evaporation - equivalent evaporation - factor of evaporation - boiler horse power - boiler efficiency - Formula for the above terms without proof - Simple direct problems on the above - draught systems.

UNIT-4

Duration: Periods 10 (L: 06 – T:04)

Steam Nozzles

Function – types- Flow of steam through nozzle - Velocity of steam at the exit of nozzle Discharge of steam through nozzles - Critical pressure ratio - calculation of cross – sectional areas at throat and discharge - Effect of friction in nozzles.

UNIT-5

Duration: Periods 10(L: 06 – T: 04)

Steam Turbines

Steam turbines - Classification - impulse & reaction turbines - working of a simple De-lavel turbine - Velocity diagrams of impulse turbines - Expression for work done, axial thrust, tangential force, blade and diagram efficiency, stage efficiency, nozzle efficiency - Methods of reducing rotor speed compounding for velocity, for pressure or both pressure and velocity. Simple problems on single stage impulse turbines.

Working of Parson's Reaction turbine - Bleeding, re-heating and re-heating factors (Problems omitted) - Governing of steam turbines

UNIT-6

Duration: Periods 10 (L: 06– T:04)

Steam Condensers

Steam condenser-its functions - Classifications – surface and jet condensers- Low level - High level Jet condenser and Ejector condenser - Shell and Tube Surface condenser - down flow - Central flow Surface - Evaporative condenser -Advantages and Disadvantages - Formulae for calculation cooling water required, Condenser efficiency - corrected vacuum, Absolute pressure and Vacuum efficiency - Simple problems on Steam condensers - Air Extraction, Types of Air Extraction systems, Dry-air Extraction and Wet-air Extraction systems, Air pump and Steam –Jet Air Ejector

REFERENCE BOOKS

- | | | |
|------------------------|----|-----------------------|
| 1. Thermodynamics | by | Ballaney |
| 2. Thermal Engineering | by | Arora & S. Domkundwar |
| 3. Thermal Engineering | by | Roy & Sarao |
| 4. Thermal Engineering | by | Vasandani & Kumar |
| 5. Thermal Engineering | by | R.S.Khurmi. |

Suggested student activity

1. Students are advised to visit a nearby industry involving use of boiler and students are advised to conduct energy auditing.
2. Analyze the data and identify the areas of wastage of energy and suggest suitable methods for improvement of performance.
3. Velocity triangles of turbine may be solved using CAD software.

Suggested E-learning Resources:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

SUGGESTED SPECIFIC LEARNING OUTCOMES

**Up on completion of the course the student shall be able to
Comprehend the construction and working of air compressor.**

- State the functions of air compressors.
- Enumerate the uses of compressed air.
- Name the different types of compressors.
- Explain with line diagram the working of a single reciprocating air compressor.
- Write the formula for work done and power required by a single stage compressor.
- State the advantages of multi- stage compressors over single stage compressor.
- Explain the use of inter cooler.
- State the conditions for minimum work done in two stage compression.
- Solve simple problems on single acting reciprocating air compressors only.
- Write the formula for work done and power required in two stage compressor.
- Solve simple problems in two stage air compressor.

Understand the working and applications of gas turbines & Jet Propulsion.

- Classify gas turbines.
- Compare Gas turbines with Steam turbines.
- Compare gas turbines with reciprocating I.C. engines.
- Mention the applications with limitations of gas turbine.
- Explain with line diagrams the working of an open cycle constant pressure type gas turbine.
- Explain with line diagram the working of a closed cycle type gas turbine.
- Represent cycle of operation for the above type on P-V and T-s diagrams.
- Explain with line diagram the principles of operation of Ramjet engine and turbo- jet and rocket engines.
- Identify the fuels used in jet propulsion.

Understand the Properties of Steam

- Define the various properties and types of steam
- Practice the use of steam tables and interpret the data for given pressure
- Compute the enthalpy, specific volume and entropy at given pressure for wet, dry and superheated steam using steam tables.
- Identify the various thermodynamic vapour processes isochoric, isobaric, isothermal, adiabatic and polytropic.
- Compute the work done, internal energy, enthalpy, specific volume and entropy in each of the above processes under wet, dry and superheated steam condition.
- Represent the above process on T-S and H-S diagrams

Understand the Working of Steam Boilers.

- State the function and construction of boiler
- List all the uses of boilers.
- Classify steam boilers
- Distinguish between water tube and fire-tube boilers

- Explain the working of Cochran Boiler with a legible sketch
- Explain the working of Babcock Wilcox Boiler with a legible sketch
- Recognise the need of high-pressure modern boilers
- Explain the working principle of Lamont and Benson Boilers with a legible sketch
- List all the boiler mountings
- Explain the function of all the mountings with a legible sketch such as pressure gauge, water level indicator, safety valve and fusible plug.
- List all the boiler accessories.
- Illustrate the function of all the accessories with a legible sketch such as economiser, Super Heater, Steam traps & Separators.
- Explain the terms actual/equivalent evaporation and factor of evaporation.
- Define the boiler Power
- Define the boiler efficiency
- Write the formula for the above.
- Compute the equivalent and actual evaporation from given data.
- Solve problems on Boiler Power & efficiency
- Explain draught systems (without problems)

Understand the Working of Steam Nozzles

- Explain the Flow of steam through nozzle
- Derive the expression for Velocity of steam at the exit of nozzle in terms of heat drop.
- Calculate Velocity of steam at the exit of nozzle by using steam tables or Mollier chart.
- Write the expression for Discharge of steam through nozzles
- Write the formula for Critical pressure ratio (without proof)
- Explain the Effect of friction in nozzles.
- Solve problems of nozzles to calculate cross section area and discharge.

Understand the Working of Steam Turbines

- Explain the working principle and construction of a turbine
- Classify the Turbines with examples.
- Differentiate the impulse turbines from reaction turbine
- Explain the Principle of working of simple De-Laval turbine with a line diagram.
- Draw velocity triangles for impulse turbine.
- List various blade angles
- Write formula for tangential force, work done, axial thrust, power and efficiencies.
- State the necessity of compounding a turbine.
- Describe the methods of reducing rotor speeds by velocity, pressure and pressure-velocity compounding with the help of pressure, velocity variation chart
- Explain the working principle of Parson's Reaction Turbine with a line diagram.
- Simple problems on Single Stage Impulse turbines (Velocity triangles and problems on reaction turbine omitted)
- Define the terms bleeding & reheating.
- State the necessity of governing a turbine
- Explain the methods of turbine governing

Understand the Working of Steam Condensers

- Define the Steam condenser
- State the functions of steam condenser
- Classify the condensers
- Explain the working principle of Low level counter – Flow and Parallel flow jet Condensers with legible sketch
- Explain the working principle of High level Jet condenser with legible sketch
- List the Advantages and Disadvantages of High- Level Jet condenser
- Explain the working principle of Ejector condenser with legible sketch
- Explain the working principle of Shell and Tube Surface condenser with sketch
- Distinguish between down flow and central flow surface condenser
- Explain the working principle of Evaporative condenser with legible sketch
- List Advantages and Disadvantages of Surface condenser
- Distinguish between Jet Condenser and Surface Condenser
- Write the Formulae for cooling water required, Condenser efficiency, corrected Vacuum, absolute pressure and Vacuum efficiency
- Solve Simple problems on Steam condensers to Estimate the Cooling water required, Condenser efficiency and Vacuum efficiency
- Define Air Extraction
- List the types of Air Extraction systems
- Distinguish between Dry-air Extraction and Wet-air Extraction systems
- Explain the working of Air pump and Steam –Jet Air Ejector with legible sketch

Course Outcome		CL	Linked PO	Teaching periods
CO1 :	Comprehend the construction and working of air compressor and gas turbine. Compare the working of gas turbine and jet propulsion	R/U	1,2,5,10	10
CO2 :	Illustrate the generation of steam and its property analysis	R/U	1,2,5	10
CO3 :	Explain the construction and working of boiler , its mountings and accessories.	R/U	1,2,5	10
CO4 :	Identify the need of nozzle , its working and design nozzle to given conditions		1,2	10
CO5 :	Classify and explain working Boiler and draw heat balance sheet		1,2,4	10
CO6	Illustrate the working of a turbine and interpret blade parameters using velocity triangles		1,2,4	10

Question Paper Blue Print for CIE (MID I)

Course: Thermal Engineering - II

CODE: 18A-602A

Unit no	Unit name	Questions to be set for MID-I			Remarks
		R	U	A	
1	Air Compressors, Gas Turbines & Jet Propulsion	1,2	5(a) 5(b)	7(a) 7(b)	
2	Properties of Steam	3,4	6(a) 6(b)	8(a) 8(b)	
Total questions		4	4	4	

Question Paper Blue Print for CIE (MID II)

Course: Thermal Engineering - II

CODE: 18A- 602A

Unit no	Unit name	Questions to be set for MID-II			Remarks
		R	U	A	
3	Steam Boilers	1,2	5(a) 5(b)	7(a) 7(b)	
4	Steam Nozzles	3,4	6(a) 6(b)	8(a) 8(b)	
Total questions		4	4	4	

State Board of Technical Education, Telangana State
Model Paper 18A-505EA
THERMAL ENGINEERING - II
Mid Sem-I (CIE)

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4M

*NOTE: 1) Answer **ALL** questions and each question carries **One** mark.*

*2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. Define air compressor.
2. Write the classification of gas turbines.
3. Define dryness fraction of steam.
4. Write the formula to find the enthalpy of wet steam.

PART – B

Marks : 2 X 3M= 6 M

*NOTE: 1) Answer **any two** questions and each question carries **Three** marks*

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5.(a) Explain why volumetric efficiency decreases with increase in delivery pressure .
(or)

5.(b) differentiate between open cycle and closed cycle gas turbines.

6.(a) Calculate enthalpy, entropy of a steam at 2bar and 130°C temperature.
(or)

6.(b) represent a constant entropy process on mollier diagram.

PART – C

Marks : 2 X 5M = 10 M

NOTE :

*1) Answer any **Two** questions and each question carries **Five** marks.*

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer

7.(a) explain the working of a two stage air compressor with the help of P-V diagram.
(or)

7.(b) explain the working of Ramjet with the help of a neat sketch.

8.(a) explain in detail the formation of steam under constant pressure.
(or)

8.(b) calculate the change in enthalpy of one kg of steam at 200°C and 3 bar pressure expanded to 0.3 bar pressure adiabatically.

State Board of Technical Education, Telangana State
Model Paper 18A-505EA
THERMAL ENGINEERING - II
Mid Sem-II (CIE)

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4M

*NOTE: 1) Answer **ALL** questions and each question carries **One** mark.*

*2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. Mention any two boiler mountings.
2. Define equivalent evaporation.
3. Define nozzle.
4. List out different types of nozzles.

PART – B

Marks : 2 X 3M= 6 M

*NOTE: 1) Answer **any two** questions and each question carries **Three** marks*

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5. (a) Write any three differences between fire tube and water tube boilers.
(or)
5. (b) write any three uses of steam boiler.
6. (a) Compute the critical pressure ratio in a nozzle when the steam is initially dry & saturated.
(or)
6. (b) Write down the effect of friction in nozzles.

PART – C

Marks : 2 X 5M = 10 M

NOTE :

1. Answer any **Two** questions and each question carries **Five** marks.
2. The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer
7. (a) Explain the working of any water tube boiler with a neat sketch.
(or)
- 7 (b) Define draught. Explain various methods of producing draught in steam boilers.
8. (a) Derive the equation for exit velocity of steam passing through a nozzle without friction.
(or)
- 8 (b) Explain supersaturated flow of steam in nozzle.

State Board of Technical Education, Telangana
Model Paper 18A-505EA
DAE – VI SEMESTER END EXAMINATION

THERMAL ENGINEERING - II

Time : 2 Hours]

[Total Marks: 40

PART-A

8x1= 8 Marks

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

1. Mention different fuels used in jet propulsion.
2. List out the types of steam nozzles.
3. Define condenser.
4. Define dryness fraction of steam.
5. Write the expression for work done in an impulse turbine.
6. Define stage efficiency.
7. Write the classification of condensers.
8. Define vacuum efficiency with respect to a condenser.

PART-B

4x3 = 12 Marks

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.

9. (a) Write down the advantages of multi stage compression over single stage.
(or)
9. (b) Write the differences between impulse and reaction turbines.

10. (a) List out the classification of steam boilers.
(or)
10. (b) Differentiate between surface and jet condensers.

11. (a) Define the terms bleeding & reheating
(or)
11. (b) Explain the working of a simple De-Laval turbine with a neat sketch.

12. (a) Write a short note on shell and tube surface condensers.
(or)
12. (b) List out the functions of a condenser.

PART-C

4x5 = 20 Marks

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **FIVE** marks.

13. (a) Explain the working of an open cycle constant pressure type gas turbine with the help of a neat sketch.

(or)

13. (b) Explain different types of governing of steam turbines.

14. (a) Explain the working of Cochran boiler with a neat sketch.

(or)

14. (b) Distinguish between dry air extraction and wet air extraction.

15. (a) Explain pressure compounding with the help of a neat sketch.

(or)

15. (b) Numerical example

16. (a) Numerical example

(or)

16. (b) explain the working of steam jet air ejector with the help of a neat sketch.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title:	CAD / CAM	Course Code:	18A-505EB
Semester:	VI	Course Group:	Elective
Teaching Scheme in Periods (L:T:P):	36:24:0	Credits:	3
Methodology:	Lecture + Tutorials	Total Contact Hours:	60 Periods
CIE:	60 Marks	SEE:	40 Marks

Prerequisites

The student should have the basic knowledge of Computers.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit no	Unit name	Questions to be set for SEE				Periods	
		R		U	A		
1	Computer Aided Design	4	1		9(a)	13(a)	10
2	Computer Aided Manufacturing						10
3	Introduction to Numeric control Machines		2		10(a)	14(a)	10
4	CNC Machines & their Components						10
5	CNC Part Programming		3	5,6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	CIMS, Flexible Manufacturing Systems & Robotics				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total questions		8		8	8	60	

Legend: R; Remembering, U: Understanding A: Applying

COURSE OUTCOMES:

At the end of the course the students will be able to:

1	Define computer aided Design (CAD)
2	Define Computer aided Manufacturing systems (CAM)
3	Illustrate Numeric Control Machines

4	Illustrate CNC machines and their Components.
5	Apply codes and Prepare CNC part programming.
6	Illustrate CIMS, FMS and Robots, Explain and identify Applications

COURSE CONTENTS:

UNIT-I

1. COMPUTER AIDED DESIGN AND MANUFACTURING

Introduction to CAD- Benefits of CAD-Stages of CAD-CAD input output devices- CAD Output devices- CAD display devices-Types of CAD systems-Types of CAD soft ware-Features of different CAD software- Computer communications-Types of computer communications networks

UNIT-II

2. COMPUTER AIDED MANUFACTURING

Introduction to CAM- Functions of CAM-Benefits of CAM-Integrated CAD / CAM Organization – concept- Necessity of CAD/CAM integration- Computer integrated production system – features- Computer integrated production system –advantages- Introductory treatment to MRP I- Introductory treatment to MRP-II

UNIT-III

3. INTRODUCTION TO NUMERIC CONTROL MACHINES

Introduction to numerical control-Features of NC system-Advantages of NC system-Limitations of NC system in comparison to conventional systems-Layout of NC system- Functions of each component of NC system Manufacturing methodology on NC system-Development of CNC and DNC systems comparative treatment of features for NC, CNC, DN Block diagram of CNC system Functions of each component of a CNC system-Working principle of CNC system – advantages over NC systems

UNIT-IV

4. CNC MACHINES AND THEIR COMPONENTS

Machining centres –Types-Specifications of CNC machines.-Care and maintenance of CNC machines- Spindle drives – DC drive – AC drive and linear induction motors-Slide ways – types with illustrations- Bearings – linear motion bearings – recirculatory ball screws- Automatic tool change – working of tool magazine-. Feedback devices – encoders – linear transducers.

UNIT-V

5. CNC PART PROGRAMMING

Steps involved in CNC part programming-CNC coordinate system- zero points-types- Co-ordinates referencing methods-Preparatory functions (G codes)- Miscellaneous functions (M codes)-Manual part programming –format- APT programming-Tool nose radius compensation-linear interpolation-coding-

Circular interpolation methods-coding- Macros-subroutines-mirror image-Thread cutting cycles-Taper turning cycles-Peck drilling cycles-Programming Practice problems on Plain turning- Step turning-Taper turning.

UNIT-VI

6. CIMS, FLEXIBLE MANUFACTURING SYSTEMS & ROBOTICS

Computer integrated manufacturing system – features-Necessity of CIMS, Flexible manufacturing system – features- Necessity of FMS-Components of FMS –illustration- Functions of each component-Advantages and limitations of FMS-Introduction to CMM- CNC CMM – features-Advantages of CNC- CMM-Definition of robot – classification – features – necessity-Components of robot – illustration – functions of each component- Manipulator – illustration – degrees of freedom-End effectors - types with illustration – necessity and application-Industrial application of robots – advantages and limitations

SUGGESTED REFERENCE BOOKS:

- | | |
|---|-----------------------------|
| 1.Computer Integrated Design And Manufacturing, McGraw Hill | – Bedworth David. D |
| 2.Computer Integrated Manufacturing, PHI | – Paul G. Ranky |
| 3.Industrial Robotics, PHI | – Gordon. N. Mair |
| 4.Numerical Control And Computer Aided Manufacturing, TMH | – T. K. Kundra, P N Rao |
| 5.Computer Aided Manufacturing, TMH | – T. K. Kundra, P N Rao |
| 6.CNC Machines, New Age | – B.S. Pabla and M. Adithan |
| 7.CAD, CAM, CIM | - Radha Krishnan. |

SUGGESTED LEARNING OUTCOMES:

On completion of the course the student should be able to

Computer Aided Design

- Define CAD
- Identify advantages of CAD
- Identify CAD software and hardware
- Appreciate importance of Auto CAD as a CAD software
- Familiarize with Graphic Work Station.

Computer Aided Manufacturing

- Define CAM
- Identify the functions of CAM
- Appreciate the advantages of CAM
- Familiarize with the term computer integrated production system
- Familiarize with the terms material requirement planning (MRP I) and manufacturing resources planning (MRP II)

Introduction to Numeric Control machines

- Define numerical control
- Identify the components of NC & CNC system
- Differentiate between NC, CNC & DNC systems

- Manufacturing Methodology on NC system
- Illustrate the working principle of CNC system

CNC Machines and their Components

- Familiarize with the term Machining Centre.
- Identify the maintenance aspects of CNC machines
- Appreciate the role of CNC in computer integrated manufacturing environment
- Identify the various spindle drives
- Illustrate slide ways
- Familiarize with linear motion bearings, recirculatory ball screws
- Appreciate the importance of automatic tool change
- Illustrate tool magazine
- Identify the various feedback device

CNC PART PROGRAMMING

- Familiarize with structure of NC part program
- Differentiate between manual and computer aided programming methods
- Familiarize with G & M codes
- Know the method of programming tool information, feed, speed data
- Identify the various programming cycles like thread cutting cycle etc.
- Write a part program in G & M codes for a simple turning job
- Appreciate the importance of macros, sub routines, canned cycles, mirror image
- Appreciate the necessity of tool nose radius compensation in programming
- Familiarize with APT programming

CIMS, FMS & ROBOTICS

- Define CIMS
- Appreciate the necessity of CIMS
- Appreciate the advantages of CIMS
- Identify FMS as a sub set of CIMS
- Identify the components of FMS
- Illustrate the working of FMS
- Identify the benefits of FMS
- Appreciate the importance of coordinate measuring machine.
- Illustrate the main features of CNC-CMM
- Advantages of CNC-CMM
- Define a robot
- Classify robots
- Identify the various elements of a robot
- Illustrate the working of a manipulator
- Illustrate the types of end effectors
- Identify the applications of robots
- Appreciate the role of robots in CIMS

SUGGESTED STUDENT ACTIVITIES:

- A Visit to a nearest Industry working on CNC Machines.
- Identify various machine tools including CNC and write the report differentiating an ordinary machine tool with CNC machine tool

- Write a part program for producing work pieces like round rods, stepper rods and screwed fasteners etc.

SUGGESTED E- LEARNING RESOURCES:

- www.nptel.ac.in
- www.coursera.com

CO PO MAPPING MATRIX:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Mapping Pos
1	1	3	-	-	3	1	2	2	2	-	1, 2, 5, 6, 7, 8, 9
2	1	3	-	-	3	1	2	2	2	-	1, 2, 5, 6, 7, 8, 9
3	3	3	-	-	3	3	3	2	3	2	1, 2, 5, 6, 7, 8, 9, 10
4	1	3	2	1	-	3	3	3	2	2	1, 2, 3, 4, 6, 7, 8, 9, 10
5	1	1	1	1	1	1	1	1	2	2	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
6	2	2	1	-	3	2	2	1	2	2	1, 2, 3, 5, 6, 7, 8, 9, 10

QUESTION PAPER BLUE PRINT FOR CIE (MID I)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
1	Computer Aided Design	1, 2	5(a), 5(b)	7(a), 7(b)	
2	Computer Aided Manufacturing	3, 4	6(a), 6(b)	8(a), 8(b)	

QUESTION PAPER BLUE PRINT FOR CIE (MID II)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
3	Introduction to Numeric Control machines	1	5(a)	7(a)	
		2	5(b)	7(b)	
4	CNC machines & Their Components	3	6(a)	8(a)	
		4	6(b)	8(b)	

State Board of Technical Education, Telangana State
Model Paper-18A-505EB
CAD CAM
Mid Sem-I (CIE)

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4 M

*NOTE: Answer **all** questions and each question carries **one** mark.*

1. Define CAD
2. List out few Cursor Control Devices.
3. State any two functions of CAM
4. Define MRP.

PART – B

Marks : 2 X 3M = 6 M

*NOTE: Answer **all** questions and each question carries **Three** marks*

5(a) Write about the Various Output Devices.

Or

5(b) Write about Various types of LAN Networks.

6(a) Explain about the features of Computer Integrated production Systems.

Or

6(b) Explain about the features of material requirement planning (MRP-I).

PART – C

Marks : 2X 5M = 10 M

*NOTE: Answer **all** questions and each question carries **Five** marks.*

7(a) Explain in detail various stages involved in design in CAD with a neat sketch.

Or

7(b) Classify CAD software's and explain the merits and demerits of different CAD software's available in market.

8(a) Explain about Integration of CAD/CAM with a neat sketch

Or

8(b) Explain in detail about MRP-I & MRP-II.

State Board of Technical Education, Telangana State
Model Paper- 18A-505EB
CAD/ CAM
Mid Sem-II (CIE)

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4 M

*NOTE: Answer **all** questions and each question carries **one** mark.*

1. List the advantages of NC system over conventional systems
2. Define numerical control.
3. What is machining centre? What are its types
4. What is an Automatic tool changer

PART – B

Marks : 2 X 3M= 6 M

*NOTE: Answer **all** questions and each question carries **Three** marks*

5(a) Compare between NC and CNC systems.

Or

5(b) Draw the layout of DNC system and write short notes on it.

6(a) Write Short notes on Automatic Tool changer and Tool magazines.

Or

6(b) Write about the maintenance of CNC Machines.

PART – C

Marks : 2 X 5M = 10 M

*NOTE: Answer **all** questions and each question carries **Five** marks.*

7(a) Describe various types of spindle drives with neat sketches.

Or

7(b) Define numerical control and explain about the basic components of NC system

8(a) Explain about the re-circulating ball screw mechanism and state its advantages.

Or

8(b) Explain about various feedback devices.

C18-505EB

OARD DIPLOMA EXAMINATION, (C-18)
DAE –VI SEMESTER, 18A-505EB
END EXAMINATION (SEE)

CAD/CAM

Time : 2 Hours

[Total Marks: 40]

PART-A

08X01=08

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

9. Mention any three advantages of CAD.
10. Define numerical control. What are the basic components of NC system?
11. What is miscellaneous function? Give any two examples.
12. Write any three functions of CAM.
13. List few preparatory functions
14. What is tool nose radius compensation?
15. What is a robot?
16. What is FMS?

PART-B

04X03=12

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.

9. (a) Explain various stages involved in design of a component using CAD.
(or)
9. (b) Write short notes on Canned cycles and Subroutines
10. (a) Describe various types of spindle drives.
(or)
10. (b) Explain the function of each component of a robot.

11. (a) Explain briefly about linear interpolation and circular interpolation.
(or)

11. (b) Write short notes on macros and mirror image.

12. (a) Explain about types of end effectors
(or)

12. (b) Write short notes on CIMS

PART-C

04X5=20

Instructions :

1. Answer any **FOUR** questions.
2. Each question carries **FIVE** marks.

13. (a) What is MRP-II? Explain in detail various functions of MRP-II.
(or)

13. (b) List various types of statements used in APT programming? Explain them in detail.

14. (a) Explain in detail the procedure involved in computer aided part programming.
(or)

14. (b) Describe the working of CMM with the help of a legible sketch.

15. (a) Differentiate between manual and computer aided part programming.
(or)

15. (b) Write a program on manual facing to reduce into 25mm dia 70 mm length rod into 25mm dia 68mm length.

16. (a) Explain about various types of FMS and their components
(or)

16. (b) Write the advantages, limitations and applications of robots.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title:	Refrigeration and Air conditioning	Course Code:	18A-505EC
Semester:	V	Course Group:	Elective
Teaching Scheme in Periods (L:T:P):	36:24:0	Credits:	3
Methodology:	Lectures + Tutorials	Total contact periods:	60
CIE:	60 Marks	SEE:	40 Marks

Prerequisites

The student should have the basic knowledge of Thermodynamics

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit no	Unit name	Questions to be set for SEE				Periods	
		R		U	A		
1	Fundamentals of refrigeration and air refrigeration cycles	4	1		9(a)	13(a)	10
2	Vapour compression and Vapour absorption refrigeration system						10
3	Refrigerants and refrigeration equipment		2		10(a)	14(a)	10
4	Fundamentals of A/C and psychrometry						10
5	Air distribution and air conditioning equipment		3	5,6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	Applications of refrigeration and air conditioning				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total questions		8		8	8	60	

Legend: R; Remembering, U: Understanding A: Applying

COURSE OUTCOMES

On Successful completion of the course, the student will be able to

1	Outline various methods of refrigeration and analyze air refrigeration system.
2	Analyze & understand vapour compression, vapour absorption refrigeration systems.
3	Acquire knowledge on refrigerants and equipment used for refrigeration.
4	Develop knowledge on air conditioning and understand psychrometry.
5	Learn about working of air conditioning equipment.
6	Explain different applications of refrigeration, applications of air conditioning systems and able to solve simple troubles in RAC equipment.

COURSE CONTENT

Unit – 1

Duration: 10 Periods (L: 6.0 – T: 4.0)

Fundamentals of refrigeration and Air refrigeration cycles:

Introduction - Definition of refrigeration - methods of refrigeration – Basic terms involved in refrigeration – Thermodynamic analysis of air refrigeration cycles: Reversed Carnot refrigeration cycle – Bell Coleman cycle - Open air and closed air systems of refrigeration.

Unit – 2

Duration: 10 Periods (L: 6.0 – T:4.0)

Vapour compression and Vapour absorption refrigeration Systems:

VCRS:-Principle –Thermodynamic analysis of VCRS -Factors effecting performance of VCRS - Wet and dry compression –Receiver, Accumulator, strainer, drier and flash chamber.

VARs:-Principle – Refrigerant absorbent pairs-**Two fluid VARs:** Working of Ammonia water vapour absorption refrigeration system – Working of Lithium Bromide- Water vapour absorption refrigeration system-**Three fluid VARs** :Electrolux refrigeration system - Expression for COP of VARs.

Unit – 3

Duration: 10 Periods (L:6.0 – T:4.0)

Refrigerants and refrigeration equipment

Refrigerants:- Definition - Primary and secondary refrigerants — properties of good refrigerants – Commonly used refrigerants – Ozone depletion, phase out of Chlorofluro carbon refrigerants – Montreal and Kyoto protocols

Refrigeration equipment: Compressors – types of compressors: Condensers – types of condensers. Evaporators – types of evaporators. Expansion devices – types of expansion device

Unit – 4

Duration: 10 Periods (L: 6.0 – T: 4.0)

Fundamentals of A/C and psychrometry

Fundamentals of A/C :-Definition of air conditioning - Classification of air conditioning systems - Human comfort conditions – Effective temperature – Factors governing effective temperature – comfort chart.

Psychrometry :-Definition– Psychrometric terms – Carrier Equation - Psychrometric chart – Psychrometric processes

Unit – 5

Duration: 10Periods (L: 6.0 – T:4.0)

Air distribution and air conditioning equipment

Modes of heat transfer: Heating loads – cooling loads. **Air distribution:** General Air distribution (Air flow diagram for an ac system) – **Air distribution system in a Room:** Ejection system, Downward system and Upward system. - **Ducts:** -Definition, Types, material used, Duct system. Fans and blowers – Supply air outlets – Filters and dust collectors – Heating and cooling coils, AHU (Air handling units), Chillers

Unit – 6

Duration: 10 Periods (L: 6.0 – T: 4.0)

Applications of refrigeration and air conditioning

Applications of refrigeration :- Domestic refrigerator – Ice plant – Water cooler – Production of Dry Ice.

Applications of air conditioning:-Window air conditioner, Desert/air cooler(**Evaporative cooling**), Summer air conditioning system – Winter air conditioning system – year round air condition system – Central air conditioning system– Food preservation.

SUGGESTED REFERENCE BOOKS:

- | | | | |
|----|--|----|---------------------|
| 1. | Refrigeration and Air Conditioning | by | C. P Arora |
| 2. | Refrigeration and Air Conditioning | by | Domakundwar |
| 3. | Basic Refrigeration and Air conditioning | by | P N Ananthanarayana |
| 4. | Refrigeration and Air Conditioning | by | Dosatt |
| 5. | Refrigeration and Air Conditioning | by | Stoecker |
| 6. | Trouble shooting of Refrigeration | by | Ananthanarayana |

SUGGESTED LEARNING OUTCOMES:

Fundamentals of refrigeration and air refrigeration cycles

- Define refrigeration and know natural method and mechanical methods of refrigeration.
- Explain different methods of refrigeration such as ice, dry, ice, liquid nitrogen refrigeration.
- Define Refrigeration effect, Work of compression, COP, unit of refrigeration (Ton of refrigeration- TR), Evaluate power required per ton of refrigeration.
- Analyze reverseCarnot refrigeration cycle -Know its limitations.

- Know expression for COP of reverse Carnot refrigeration cycle (derivation omitted) and solve problems on it.
- Analyze Bell-Coleman air cycle.
- Know expression for COP of Bell-Coleman air refrigeration cycle (derivation omitted) and solve problems on it.
- Differentiate open air system and closed air system.

Vapour compression and Vapour absorption refrigeration systems

- Explain principle and working of vapour compression refrigeration with the help of T-S and P-h diagrams. Write the expression for its COP
- Solve problems on Vapour compression refrigeration system.
- Distinguish between wet and dry compression. State the use of receiver, accumulator, strainer, drier and flash chamber.
- Summarize the effects of evaporator pressure, condenser pressure, under cooling and super heating on COP.
- Explain principle of simple vapour absorption systems. State the desirable properties of refrigerants -absorbers and list commonly used refrigerant – absorber pairs.
- Know two fluid systems of Vapour absorption refrigeration system (VARs) – Explain the construction and working of Ammonia-Water VARs
- Explain the construction and working of Water-Lithium Bromide VARs.
- Know three fluid systems of VARS – Explain the construction and working of Electrolux VARs.
- Write expression of COP of VARs (without derivation) and solve simple problems

Refrigerants and refrigeration equipment

- Distinguish between primary and secondary refrigerants, List the desirable properties of refrigerants and Classify refrigerants.
- Write chemical formula, name and application of the following refrigerants – R 12, R 22, R 134a, R 290a, R 600a, R 401a, Cyclopentane, R 717, R 718, R 729, R 744
- Know the reasons of Ozone depletion – Need to phase out of Chlorofluoro carbons and hydro Chlorofluoro carbons – Understand Montreal protocol and Kyoto protocol. (Statements of protocol)
- Know the function of compressor, Classification of compressors
- Explain construction and working of hermetic reciprocating compressor.
- State the function of condenser and explain the working of natural draught air cooled condensers type (tube and fin condenser) –and forced draught air cooled condensers
- Explain the working of shell & tube water cooled condensers with help of a legible sketch.
- Explain the working of evaporative condenser
- Explain the functions of various types of expansion devices such as capillary tube, thermostatic expansion valves with the help of a legible sketch.
- State the function of evaporator, explain construction and working principle of flooded type evaporator and dry expansion evaporator

Fundamentals of A/C and psychrometry

- Define air conditioning and classify air conditioning systems
- Explain air conditioning as applied to human comfort, effective temperature, factors governing effective temperature and comfort chart
- Define the terms Psychrometry, dry air and moist air, DBT, WBT, DPT and adiabatic saturation temperature, humidity, absolute humidity, relative humidity, specific humidity and degree of saturation
- Know carrier's equation and solve problems involving psychrometry.
- Know different psychrometers- Laboratory, continuous recording, sling, aspirating psychrometers.
- Explain the features of psychrometric chart, plot all psychrometric processes on the chart.
- Know the concept of mixing of air streams and solve problems.

Air distribution and air conditioning equipment.

- Know the different modes of heat transfer – conduction, convection and radiation
- Draw the general air flow diagram for AC system and explain the air flow, explain different air distribution systems in a room like ejection system, downward system and upward system.
- Explain the need of duct- Know duct materials, shapes; classify ducts and explain the duct system based on arrangement of supply ducts like: loop perimeter system, radial perimeter system and extended plenum system.
- Explain duct system based upon number of ducts used like: single duct system, dual duct system and dual duct with induction system.
- Differentiate fan and blower, classify fans according to direction of air flow and know the factors governing selection of fans.
- Explain construction and working of different axial flow fans like propeller fan, tube axial fan and vane axial fan
- Know constructional features of forward curved, backward curved and radial fan blades
- Classify supply air outlets and know about grill outlets, slot diffusers, ceiling diffusers, perforated ceiling panels and their applications.
- Know different types of filters and dust collectors -Explain heating and cooling coils.
- Know the functioning of air handling units (AHU) and chiller units.

Applications of refrigeration and air conditioning

- Applications of refrigeration -explain construction and working of domestic refrigerator.
- Explain the layout of ice plant and process of production of ice
- Explain construction and working of storage type water cooler.
- Explain the process of production of dry ice
- Applications of air conditioning – Explain working of window air conditioner.
- Know the difference between unitary air conditioner, split air conditioner- Explain the working of desert type air cooler.
- Explain summer air conditioning system for hot & humid outdoor conditions and hot & dry conditions.

- Explain winter air conditioning system for cold & dry outdoor conditions- Explain year round air conditioning system.
- Explain central air conditioning system

SUGGESTED STUDENT ACTIVITIES:

1. Visit nearest outlet and list out Domestic Refrigerators manufacturers and know the capacity of the refrigerator and the refrigerant used in it.
2. Know the colour coding of refrigerant cylinders.
3. Make a report of Montreal and Kyoto protocols.
4. Assemble and disassemble the air cooler and know all the parts.
5. Clean an air cooler, replace pads of air cooler.
6. Visit a RAC workshop and watch the method of vacuumisation and charging of refrigerant.
7. Visit a duct manufacturing unit and study how fabrication is done and submit a report.
8. Visit a site where ducting is being carried out.
9. Collect data sheet to find heating and cooling loads for an air conditioning system and study its contents.
10. Visit a site where split air conditioner is being installed.
11. Visit a central air conditioning plant.

SUGGESTED E- LEARNING RESOURCES:

1. Working of domestic refrigerator
<https://www.youtube.com/watch?v=h5wQoA15OnQ&vl=en>
2. Working of window air conditioner:
<https://www.youtube.com/watch?v=0PkOEHMNOLk>
3. Working of Air handling unit (AHU)
<https://www.youtube.com/watch?v=uWwVsFqNFp4>
4. Working of chiller
<https://www.youtube.com/watch?v=0rzQhSXVq60>
5. Working of duct able air conditioning system
https://www.youtube.com/watch?v=ye_r_JY5Vyg
6. Working of tube axial fan
<https://www.youtube.com/watch?v=OvVcZrIWcF8>
7. Working of vapour compression system
https://www.youtube.com/watch?v=-Wj_MO4BqtA
8. Working of Ammonia Water VARS
<https://www.youtube.com/watch?v=xDDmlT-HK1Y>
9. Working of Water lithium bromide VARS
https://www.youtube.com/watch?v=L_wISd7bAWE
10. Working of Electrolux VARS
<https://www.youtube.com/watch?v=uHtOtgxAdRs>
11. Working of Receiver, Drier and Accumulator
<https://www.youtube.com/watch?v=7raEl5-5PEs>

CO-PO Mapping Matrix:

Unit	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Mapping Pos
1	1	3	-	-	-	-	-		-	-	1, 2
2	3	3	-	-	-	-	-		3	2	1, 2, 9, 10
3	1	3	2	-	3	2	-	3	-	2	1, 2, 3, 5, 6, 8, 10
4	1	1	1	-	-	-	-		-	-	1, 2, 3, 9
5	2	2	1	-	-	-	-	1	-	-	1, 2, 3, 8
6	1	2	1	-	-	-	-	2	-	1	1, 2, 3, 8, 10

MID SEM I EXAMINATION
DAE VI SEMESTER
REFRIGERATION AND AIR CONDITIONING

Time: 1 Hour

Total Marks: 20 M

PART – A

Marks: 4 X 1M = 4 M

*NOTE: 1) Answer **all** questions and each question carries **one** mark.*

*2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. Define the term Refrigeration effect. Write its units.
2. Find COP of a refrigerating machine working on reverse Carnot refrigerating cycle operating between -10°C and 40°C .
3. Why wet compression is preferred in VCRS.
4. Why Ammonia-water is most prominently used as refrigerant-absorbent in VARS.

PART – B

Marks: 2 X 3M = 6 M

*NOTE: 1) Answer **all** questions and each question carries **three** marks.*

2) The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

5. (a) Explain about dry ice refrigeration
OR
5. (b) Differentiate open and closed cycle refrigeration system.
6. (a) Draw the layout of water-lithium bromide VARS..
OR
6. (b) Draw layout of Electrolux refrigeration system.

PART – C

Marks: 2 X 5 M = 10 M

*NOTE: 1. Answer **all** questions and each question carries **five** marks.*

2. The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

- 7(a) Explain bell Coleman refrigeration cycle with a layout
OR

7(b) A refrigeration plant works between -15°C and 30°C . The refrigerant is dry and saturated at the end of compression. Calculate Refrigerating effect, Carnot COP and COP of VARS, if enthalpies before and after compression are 1280 kJ/kg and 1470 kJ/kg, fluid enthalpy at 30°C is 320 kJ/kg.

8 (a) Explain with help of pressure enthalpy diagram the effect of increase in condenser pressure on performance of refrigeration system

OR

8 (b) Differentiate wet compression with dry compression refrigeration system.

MID SEM II EXAMINATION
DME V SEMESTER
REFRIGERATION AND AIR CONDITIONING

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4 M

*NOTE: 1) Answer **all** questions and each question carries **one** mark.*

*2) Answers should be brief and straight to the point and shall not exceed **three** simple Sentences.*

1. What is a primary refrigerant? Give an example.
2. What is chemical formula of R22?
3. How does air conditioning differ from refrigeration?
4. Define the term 'Specific humidity'?

PART – B

Marks : 2 X 3M= 6 M

*NOTE: 1) Answer **all** questions and each question carries **three** marks.*

2) The answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

5. (a) Write short notes on Montreal protocol

OR

5. (b) Differentiate natural draught and forced draught refrigerant condensers.

6. (a) What are the factors governing effective temperature

OR

- 6 (b) Explain working of aspirating psychrometer.

PART – C

Marks: 2 X 5 M = 10 M

*NOTE: 1. Answer **all** questions and each question carries **five** marks*

2. The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer

- 7(a) Explain working of evaporative condenser.

OR

7(b) Explain working of thermostatic expansion valve.

8 (a) Draw sensible heating, sensible cooling, humidification and dehumidification process on psychrometric chart.

OR

8 (b) Explain the concept of mixing of air streams in air conditioning.

MODEL PAPER (SEE)
DME V SEMESTER
REFRIGERATION AND AIR CONDITIONING

TIME : 2 Hours

Max. Marks: 40

PART – A

Marks: 8 X 1 M = 8 M

*NOTE: 1) Answer **all** questions and each question carries **one** marks.*

*2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences*

1. Define the term Ton of Refrigeration.
2. What is function of accumulator in VCRS?
3. Write any two duct materials.
4. Write carriers equation.
5. Write two materials used for ducts in air distribution.
6. What is relative humidity of Hyderabad?
7. What are main components in indoor unit of split air conditioner?
8. What does AHU stands for?

PART – B

4x 3 M = 12M

*Answer **all** questions . Each question carries **three** marks*

9(a) Write expression for COP of refrigerator and heat pump of reverse Carnot refrigeration cycle
OR

9(b) Explain working of electronic filters.

10(a) What are secondary refrigerants give two examples.

OR

10 (b) Explain working of air cooler

11 (a) Differentiate slot diffuser and ceiling diffuser.

OR

11(b) Differentiate conduction and convection heat transfer

12(a) Draw the layout for production of dry ice.

OR

12(b) Draw the layout for storage type water cooler.

PART – C

4x 5 M = 20 M

*Answer **all** questions. Each question carries **five** marks*

13 (a) Explain bell Coleman refrigeration cycle.

OR

13 (b) Explain radial perimeter duct system with a neat sketch.

14 (a) Explain working of hermetic reciprocating compressor.

OR

14 (b) Explain working of storage type water cooler.

15 (a) Explain ejector type air distribution system.

OR

15 (b) Explain loop perimeter duct system.

16 (a) Explain summer air conditioning system for hot and humid outdoor conditions

OR

16 (b) Explain working of a window air conditioner.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title :	Production Technology	Course Code	18A-505ED
Semester	IV	Course Group	:Elective
Teaching Scheme in Hrs(L:T:P)	36:24:0	Credits	: 3
Methodology	Lecture + Assignments	Total Contact Periods :	:60Periods
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE

S. No	Unit No.	Questions to be set for SEE				Periods	
		R		U	A		
1	Grinding	4	1		9(a)	13(a)	12
2	Surface Finishing processes						08
3	Plastics processing		2		10(a)	14(a)	08
4	Milling and Gear making						12
5	Jigs and Fixtures		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	08
6	Modern machining Processes				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total Questions		8		8	8	60	

PREREQUISITES:

Basic knowledge in Work shop technology, Engineering materials and Manufacturing Processes

COURSE OUTCOMES:

CO1	Illustrate the Working of Grinding Process and apply for engineering applications.
CO 2	Define various surface finishing processes and apply for various applications
CO 3	Explain Plastic Processing methods
CO 4	Perform Milling and Grinding operations as per industrial requirements.
CO 5	Identify Special tools for Work holding and guiding for different machining processes
CO 6	Student should able to learn different Modern machining process such as USM, EDM,NC & CNC

COURSE CONTENT:

- 1.0 Grinding** **Duration: 12 periods (L: 6.8 – T: 5.2)**
Introduction – Principles of Metal Removal by Grinding – Abrasives: Natural & Artificial – Bonds and binding processes: Vitrified, Silicate, Shellac, Rubber, Bakelite – Factors effecting the selection of grind wheels – Size and Shape of wheel – Types of abrasive materials– Grain size – Grade and strength of bond – Structure of grain – Spacing – Types of binding materials – Standard marking systems – Meaning of letters & numbers –Sequence of marking – Grades of letters.
Grinding machines – Classification: Cylindrical, Surface, Tool & Cutter grinding machine – Construction details – Relative merits – Principle of Centreless grinding, Advantages & limitations of Centreless grinding – Work holding devices – Wheel maintenance – Balancing of wheels – Dressing and trimming of grind wheels – Coolants used.
- 2.0 Surface Finishing processes** **Duration: 08 periods (L: 4.8 – T: 3.2)**
Surface finishing by grinding: Honing, Lapping, Super finishing, Electroplating – Basic principles – Plating metals – applications – Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing – Metal spraying: Wire process, Powder process and applications – Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, Rubber base coating.
- 3.0 Plastics Processing** **Duration: 08 periods (L: 4.8 – T: 3.2)**
Processing of Plastics – Injection moulding – Compression moulding - Transfer moulding – Extruding – Casting – Calendaring – Applications of Plastics.
- 4.0 Milling and Gear Making** **Duration: 12 periods (L: 6.8 – T: 5.2)**
Types of Milling machines: Plain, Universal, And Vertical milling machines – Constructional details and Specifications – Milling operations– Indexing: Direct and Simple indexing.
Gear Making.
Manufacture of Gears by Casting, Moulding, Stamping, Coining, Extruding, Rolling – Gear shaping – Description of Gear shaper – Gear hobbing – Description of Gear hob – Operation of gear hobbing Machine – Gear finishing processes.
- 5.0 Jigs and Fixtures** **Duration: 08 periods (L: 4.8 – T: 3.2)**
Advantages of using Jigs and Fixtures in mass production – Design principle of jigs and fixtures – Principle of Location and Clamping – Work location – Types of Locators and Clamps – Drill jigs – Welding and Milling fixtures.
- 6.0 Modern machining Processes** **Duration: 12 periods (L: 6.8 – T: 5.2)**
Introduction – Comparison of modern machining processes with traditional machining process – Ultrasonic machining (USM): Principles, Description of equipment, applications, advantages and limitations.
Electrical Discharge Machining (EDM): Principle, description of equipment, applications, advantages and limitations – Chemical machining: Basic concepts of NC machines – Comparison with operator controlled Machine – Types of NC system: open loop and closed loop servo drives –

Elements of NC machines: Control system, machine tools, drive – unit feed back or servo components – Classification of NC systems: Point to point positioning control system, straight cut positioning system, continuous path or contouring system – Functions carried out by NC machines and types of controls – Programming for NC machines – Absolute programming, Incremental programming – Advantages and limitations of NC system over the conventional system – Basic concept of CNC and DNC systems – Definition of CAM – Applications of CAM: Application of CAM on Manufacturing planning, Application of CAM in manufacturing control – high speed machining and micro machining process.

REFERENCE BOOKS:

- | | | |
|----|---|---------------------------|
| 1. | A course on workshop Technology (Vol. II) | - Raghuvamshi. |
| 2. | Elements of workshop Technology (vol. II) | - Hazra Chowdhary. |
| 3. | Production Technology | - R.K.Jain and S.C.Gupta. |
| 4. | Workshop Technology (Vol. III) | - Chapman |
| 5. | Manufacturing Process | - B.M.L. Begeman |
| 6. | Workshop Technology (Vol. II) | - Gupta and Kaushik |
| 7. | Production Technology | - H.M.T. |
| 8. | Automation, production system and | - Micelle Groover |
| 9. | CAD / CAM | - Mikell P. Groover |
| 10 | Computer aided design and manufacturing | - W.Zimmer |

SUGGESTED LEARNING OUTCOMES:

1.0 Understand the concept of Grinding

- 1.1 Explain the principle of metal removal by grinding.
- 1.2 List the different abrasives.
- 1.3 Explain the bonds and binding processes in grinding wheel manufacturing
- 1.4 Identify the grinding wheel from the standard code (Marking system or designation of wheel).
- 1.5 State the factors for selecting the grinding wheels.
- 1.6 State the methods of grinding.
- 1.7 Classify the grinding machines.
- 1.8 Illustrate the cylindrical, surface, tool and cutter grinders.
- 1.9 List the different work holding devices.
- 1.10 State the methods of wheel maintenance.

2.0 Understand the concept of Surface Finishing Processes

- 2.1 State different finishing processes by grinding (Honing, Lapping, Super finishing).
- 2.2 Explain the principle of electro-plating with a legible sketch.
- 2.3 Explain the principle of hot dipping processes namely Galvanising, Tin coating, Parkerizing and Anodising.
- 2.4 List the various Organic coatings.

- 2.5 Describe the processes of various Organic coatings.
- 2.6 State the principles of Metal Spraying.
- 2.7 State the features of wire process and powder process.
- 2.8 Select the appropriate process for surface roughness of a given application.

3. 0.Understand the principle of manufacturing plastic products.

- 3.1 Explain the methods of injection moulding, compression moulding, transfer moulding with legible sketches.
- 3.2 Explain the principle of extruding, casting and calendaring with legible sketches.
- 3.3 State the principle of machining and welding plastics.
- 3.4 Explain the different fabrication methods – Sheet forming, Blow moulding, Laminating and Reinforcing.
- 3.5 List Engineering applications of plastics.

4 .0 Understand the concept of Milling, Gear making

- 4.1 Explain the principle of working of a Milling machine.
- 4.2 Classify the milling machines.
- 4.3 Illustrate the constructional details of milling machine
- 4.4 Explain the functions of each part of the milling machine.
- 4.5 Explain the various milling operations.
- 4.6 List the different milling cutters.
- 4.7 Explain selection of tool and work holding devices.
- 4.8 Explain the different indexing methods.
- 4.9 Explain the specifications of milling machines.
- 4.10 List the different methods of producing gears.
- 4.11 Illustrate gear shaping.
- 4.12 Draw the gear hob and label its components.
- 4.13. Describe the working of the above machines.
- 4.14. List the sequence of operations in generating gear by gear hobbing m/c.
- 4.15. Explain the different methods of finishing & checking gear teeth dimensions.
- 4.16. Specify the gear.
- 4.17. List the various gear materials.
- 4.18. State the different heat treatment processes applied to gears.

5.0. Understand the concept of Jigs and Fixtures

- 5.1 State the function of drill bush.
- 5.2 List different types of fixtures and explain their constructional details with the help of legible sketches.
- 5.3 Differentiate between jigs and fixtures.
- 5.4 List the advantages of Jigs and Fixtures
- 5.5 Explain basic principle of location.
- 5.6 Identify different locating methods and devices.
- 5.7 Explain the basic principle of clamping.

- 5.8 Identify different types of clamps and their constructional details with the help of legible sketches.

6. 0. Understand the modern machining processes

- 6.1 Compare non-conventional machining with traditional (conventional) machining.
- 6.2 State the relative advantages and limitations of non-conventional Machining.
- 6.3 State the equipment used in USM process.
- 6.4 Explain the principle of USM with a neat sketch.
- 6.5 Explain Electric Discharge Machining (EDM) with sketch.
- 6.6 Explain the principle of open loop NC machine and closed loop NC Machine.
- 6.7 List the elements of NC machine.
- 6.8 Explain the NC system-point to point positioning control system, Straight cut positioning system-Continuous path system.
- 6.9 List the operations carried out on NC machine.
- 6.10 Explain the procedure of preparing NC programming for a simple component involving only turning operation.
- 6.11 State the advantages and limitations of NC machining system over the conventional machining system.
- 6.12 Explain the principle of computerized numerical control (CNC)
- 6.13 State the difference between NC and CNC machines.
- 6.14 Explain direct numerical control (DNC) system.
- 6.15 State the application of computers in design like geometric modeling, Engineering analysis, design reviews and evaluation and automated Drafting.
- 6.16 State Definition, applications, advantages and procedure of CAD.
- 6.17 State Definition, applications, advantages and limitations of CAM in manufacturing.
- 6.18 Explain Planning and control.
- 6.19 High speed machining and micro machining process.

SUGGESTED STUDENT ACTIVITIES:

- 1. Student visits Library to refer to manual of Engineering Materials to find their properties.
- 2. Student inspects the available equipment in the Laboratory to identify the components.
- 3. The students can visit nearby workshops/Industries and collect information like which type of machines are used for particular purpose and their design features of various machine components.
- 4. The students can visit nearby workshops/Industries and collect information about various manufacturing processes by using different machine tools, observe their specifications and the recent developments.
- 5. Student should write the program for particular task to perform the particular operation by using CNC machines.
- 6. The student should Download and present various presentations related to CNC, DNC systems and modern machining methods
- 7. The student should prepare the different products as mini-project.

SUGGESTED E-LEARNING REFERENCES:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

CO PO MAPPING MATRIX:

Course Outcome		CL	Linked PO
CO1	Illustrate the Working of Grinding Process and apply for engineering applications.	R/U/A	2,3,4,9
CO2	Define various surface finishing processes and apply for various applications	R/U/A	1,2,5,9
CO3	Explain Plastic Processing methods	R/U/A	1,2,5,9
CO4	Perform Milling and Grinding operations as per industrial requirements.	R/U/A	2,3,4,5,10
CO5	Identify Special tools for Work holding and guiding for different machining processes	R/U/A	1,2, 5,9
CO6	Student should able to learn different Modern machining process	R/U/A	1,2, 5,9

MID SEM-I EXAM				
Unit Name	R	U	A	Remarks
Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions	4	4	4	
MID SEM –II EXAM				
Unit Name	R	U	A	Remarks
Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions	4	4	4	

(Model Question Paper)

Mid Sem -I

Subject Name: **Production Technology**

Subject Code: **18A-505ED**

Time : 1:00 hours

Max Marks : 20

PART – A

Remembering type questions

Answer all Questions. Each question carries 1 mark

4 X 1M = 04 marks

- 5) State any two factors to be considered for the selection of grinding wheel.
- 6) List any two work holding grinding.
- 7) What is 'Anodizing'?
- 8) List out any four methods of surface coating.

PART – B

Understanding type questions

Answer any two Questions. Each question carries 3 marks

2 X 3M = 06 Marks

5. a) List out the various methods of grinding.

(OR)

- b) State the terms a) GRIT, and b) GRADE.

6. a) What is 'Galvanizing'?

(OR)

- b) What is the necessity of Organic coating? Write any two advantages.

PART – C

Application type questions

Answer any two Questions. Each question carries 5 marks

5 X 2M = 10 Marks

7. a) Draw a neat sketch of Tool and cutter grinding machine , label the parts and explain its working.

(OR)

- b) Explain about the Centre less grinding with neat sketch.

8. a) Explain the working of Electro plating with a neat sketch.

(OR)

- b) Describe the Hot dipping process and write any three advantages of it.

(Model Question Paper)
Mid Sem-II
Subject Name: **Production Technology**
Subject Code: **18A-505ED**

Time : 1:00 hours

Max Marks : 20

PART – A

Remembering type questions

Answer all Questions. Each question carries 1 mark

4 X 1M = 04 marks

6. Define the term 'Thermo setting plastics'.
7. State any four limitation of plastics.
8. What is 'Indexing'?
9. List any four work and tool holding devices in milling.

PART – B

Understanding type questions

Answer any two Questions. Each question carries 3 marks

2 X 3M = 06 Marks

10. a) Write short notes on Blow moulding process.

(OR)

- b) Briefly explain about 'Calendaring' in plastics?

11. a) State the function of 'Arbor' in milling.

(OR)

- b) Write any three specifications of Milling machine.

PART – C

Application type questions

Answer any two Questions. Each question carries 5 marks

5 X 2M = 10 Marks

12. a) Explain the Injection moulding process in plastics.

(OR)

- b) Describe the Extrusion process with neat sketch.

13. a) Draw a neat sketch of vertical milling machine and explain its working.

(OR)

- b) Explain about Gear Hobbing process in neat sketch.

(Model Question Paper)
Semester End examination (SEE)
Subject Name: **Production Technology**
Subject Code: **18A-505ED**

Time : 2 hours

Max Marks : 40

PART-A

Remembering type questions

Answer all Questions. Each question carries 1 mark 8 x 1M = 08 Marks

18. List any four abrasives used in grinding wheels.
19. Define the term 'Thermo plastics'.
20. Write any four advantages of Non-Conventional machining process.
21. State the need of 'Wheel dressing' in grinding.
22. List any two advantages of Jigs.
23. What is 'Fixture'?
24. List any two applications of CAM.
25. Write any four advantages of CAD.

PART-B

Understanding type questions

Answer any four Questions. Each question carries 3 marks 4 x 3M = 12 Marks

14. a) Explain the procedure of Electro plating with a neat sketch.
(OR)
b) Differentiate between jigs and fixtures.
10. a) Briefly write about Transfer moulding process in plastics.
(OR)
b) State the difference between Conventional and Non-conventional machining.
11. a) Describe the general considerations in design of Drill jigs.
(OR)
b) State the basic principle if 'Location' in Jigs and Fixtures.
12. a) State the principle of open loop Numerical Control(NC) system.
(OR)
b) Briefly explain about Chemical machining process.

PART-C

Application type questions

Answer any four Questions. Each question carries 5 marks

4 x 5M = 20 Marks

13. a) Explain about Cylindrical grinding process with neat sketch.

(OR)

b) State the need of 'Drilling fixture' and explain with neat sketch.

14. a) Explain about the Universal milling machine with neat sketch.

(OR)

b) Describe the process of Electric Discharge Machining (EDM) with neat sketch.

15. a) State the basic principle of 'Clamping' and explain about any one clamp with neat sketch.

(OR)

b) Explain about Milling fixture with the help of legible sketch.

16. a) Describe the working of Direct Numerical Control (DNC) system with neat sketch.

(OR)

b) Explain the working of Ultrasonic machining (USM) with neat sketch.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title :	AUTOMOBILE ENGINEERING DRAWING	Course Code	18A-506 P
Semester:	V	Course Group	Core
Teaching Scheme in Periods(L:T:P):	7.5:00:37.5	Credits	1.5
Methodology:	Lecturer+ Practical	Total Contact periods:	45 Periods
CIE:	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of Engineering Drawing. And also have the idea about physical shape of various engine and transmission parts.

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Marks Weight age				Total Marks	Remarks
			Q.No	5M	10M	20M		
1	Automobile Engine Components	15	1,2,3,4	2	-	-	10	Answer any two
2	Chassis and Transmission Components	15	5,6	-	1	-	10	Answer any one
3	Automobile Parts assembly drawings	15	7,8	-	-	1	20	Answer any one
	Total	45	08	10	10	20	40	-

Course Outcomes:

At the end of the course the student should be able to

Course Outcomes	
CO1	Apply the drawing methods to various automobile engine components
CO2	Identify the need of chassis and transmission components
CO3	Able to draw the transmission components and their views
CO4	Acquire the knowledge and draw assembly of different engineering components

Course Contents:

I. Draw to scale, the following Automobile parts including different views of Automobile Engine Components.

1. Pistons for petrol engine.
2. Pistons for diesel engine.
3. Connecting rod for petrol engine.
4. Connecting rod for diesel engine.
5. Cylinder head for 2 stroke petrol engine.
6. Cylinder Block for 2 stroke petrol engine.
7. Crank shaft.
8. Cam shaft.
9. Valves.
10. Rocker Arms
11. Spark plugs.

II. Chassis and Transmission Components.

1. Linkage Bracket
2. Rear hub
3. Chassis Bracket
4. Gear box selector fork
5. Engine Mount
6. Bell crank
7. Steering arm
8. Track Arm

III. Automobile Parts Assembly Drawing

1. Piston assembly.
2. Connecting rod assembly.
3. Master Cylinder assembly
4. Wheel Cylinder assembly

REFERENCE BOOKS

- | | | | |
|----|--------------------------------|----|------------|
| 1. | Automobile Engineering Drawing | by | R.B Guptha |
| 2. | Machine Drawing | by | N.D Bhat |

Suggested Learning Outcomes

The key competencies to be achieved by the student:

Unit NO	Topic	Key competency
1	Automobile Engine Components.	<ul style="list-style-type: none">• Able to identify the various parts of the IC engine.• Visualize physical shape of the engine parts.• Study the dimensions of the given views.• Able to draw proportionate free hand sketches and two dimensional views of the engine parts.• Able alter the given views from one form to other form.
2	Chassis and Transmission Components.	<ul style="list-style-type: none">• Identify the various parts of the chassis and transmission components.• Able get acquaint with the physical shape of the chassis and transmission components.• Able to draw the different two dimensional views to the given isometric views.
3	Automobile Parts Assembly drawings.	<ul style="list-style-type: none">• Understand function, working principle and field of application for the automobile parts assembly.• Study the external and internal features of each part along with dimensions.• Put the overall dimensions.• Prepare the table of parts giving part number, its name, material and quantity.• Able to draw the assembled views by matching respective parts.

CO-PO MATRIX:

Course Outcome		CL	Linked PO
CO1	Apply the drawing methods to various automobile engine components	U/A	1,2,3,8,10
CO2	Identify the need of chassis and transmission components	R/U	1,2,3,8,10
CO3	Able to draw the transmission components and their views	U	1,2,3,8
CO4	Acquire the knowledge and draw assembly of different engineering components	U	1,2,3,8

Suggested Student Activities

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. <https://www.google.com/>
5. <https://en.wikipedia.org/wiki/Piston>

1. Visit automobile laboratory available in the institute to study the features of automobile components.
2. Prepare the images of automobile engine, chassis, transmission hydraulic brakes components by visiting nearby garages and service stations.
3. Watch the video lessons related to the course.
4. Participate in Quiz
5. Participate in Group discussion
6. Surprise test

Mid Semester Examination Blueprint of Questions and Marks:

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	-	4		Answer any two questions each carries four marks
2		-		2	Answer any one question each carries six marks

MID SEM-II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-II	-		4	Answer any two questions each carries 10 marks

MID SEM –I
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: AUTOMOBILE ENGINEERING DRAWING
Subject Code: 18A-505P

TIME: 1 HOUR

Max.Marks:20

PART-A

Instructions: Answer any TWO questions .Each question carries FOUR Marks

2x4=8 Marks

1. (a) Draw free hand sketch of a Petrol engine piston with symmetry.
(OR)
(b) Draw free hand sketch of crankshaft with symmetry.
2. (a) Draw free hand sketch of camshaft with symmetry.
(OR)
(b) Draw free hand sketch of I.C engine valve with symmetry.

PART-B

Instructions: Answer any ONE choosing (a) or (b) question.
Each question carries TWELVE Marks

12 Marks

- 3 (a) Reproduce the following two views of the following connecting rod

2x6 = 12 Marks

(OR)

- (b) Reproduce any two views of the following two stroke engine cylinder

2x6 = 12 Marks

MID SEM –II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: AUTOMOBILE ENGINEERING DRAWING
Subject Code: 18A-505P

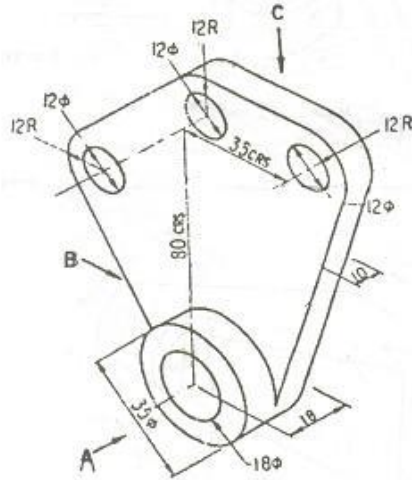
TIME: 1 HOUR

Max.Marks:20

Instructions: Answer **two** questions.
Each question carries **TEN** Marks

2x10 = 20 Marks

1. (a) Draw (i) front view (ii) Left side view for the chassis bracket shown in figure below.



OR

1. (b) Figure below shows the isometric view of 'Linkage bracket'. Draw the views directions of 'A' and 'B'.

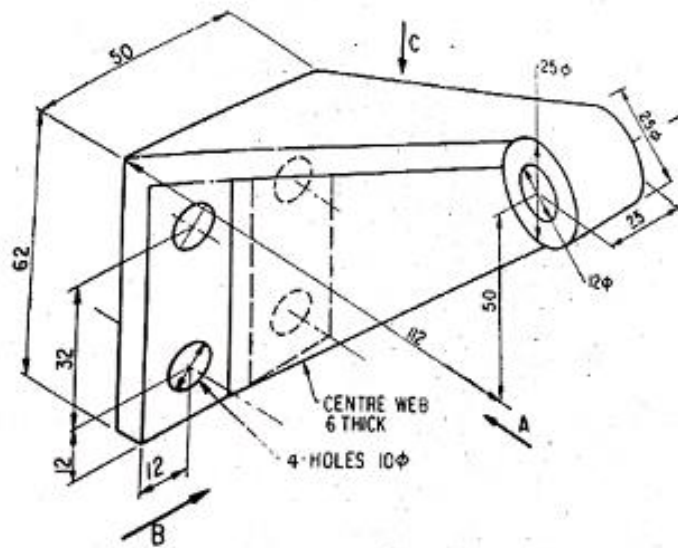


Fig. Linkage bracket.

2.(a) Draw the front view and right side view of the Engine mount given below.

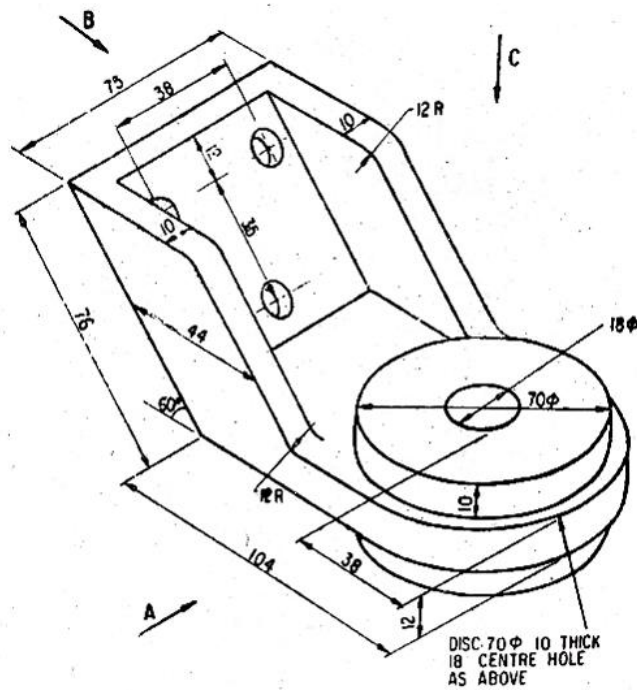


Fig. Engine mount.

OR

2(b) Draw the two orthographic views of the following selector fork in the given directions.

SEMESTER END EXAMINATION
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: Automobile Components Design
Subject Code: 18A-505P

Time: 2hrs

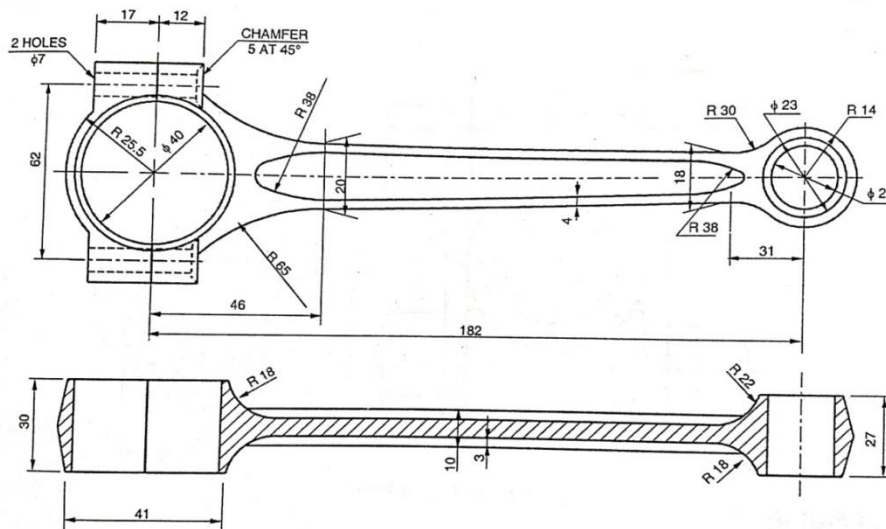
Max Marks: 40

PART -A

16 Marks

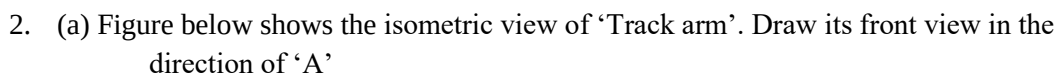
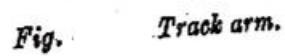
INSTRUCTIONS: (1) Answer any **TWO** question.
(2) Each question carries **Eight** Marks.
(3) All Dimensions are in mm and assume missing dimensions if any and choose suitable scale.

1 (a) Reproduce the following two views of the following connecting rod



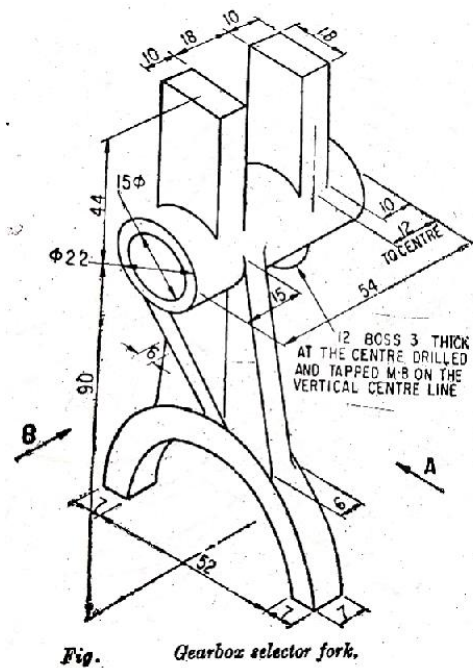
OR

(b) Reproduce any two views of the following two stroke engine cylinder



OR

- (b) Figure below shows the isometric view of 'Gear box selector fork'. Draw its view in the direction of 'A'



PART –B

1 X 24 = 24 Marks

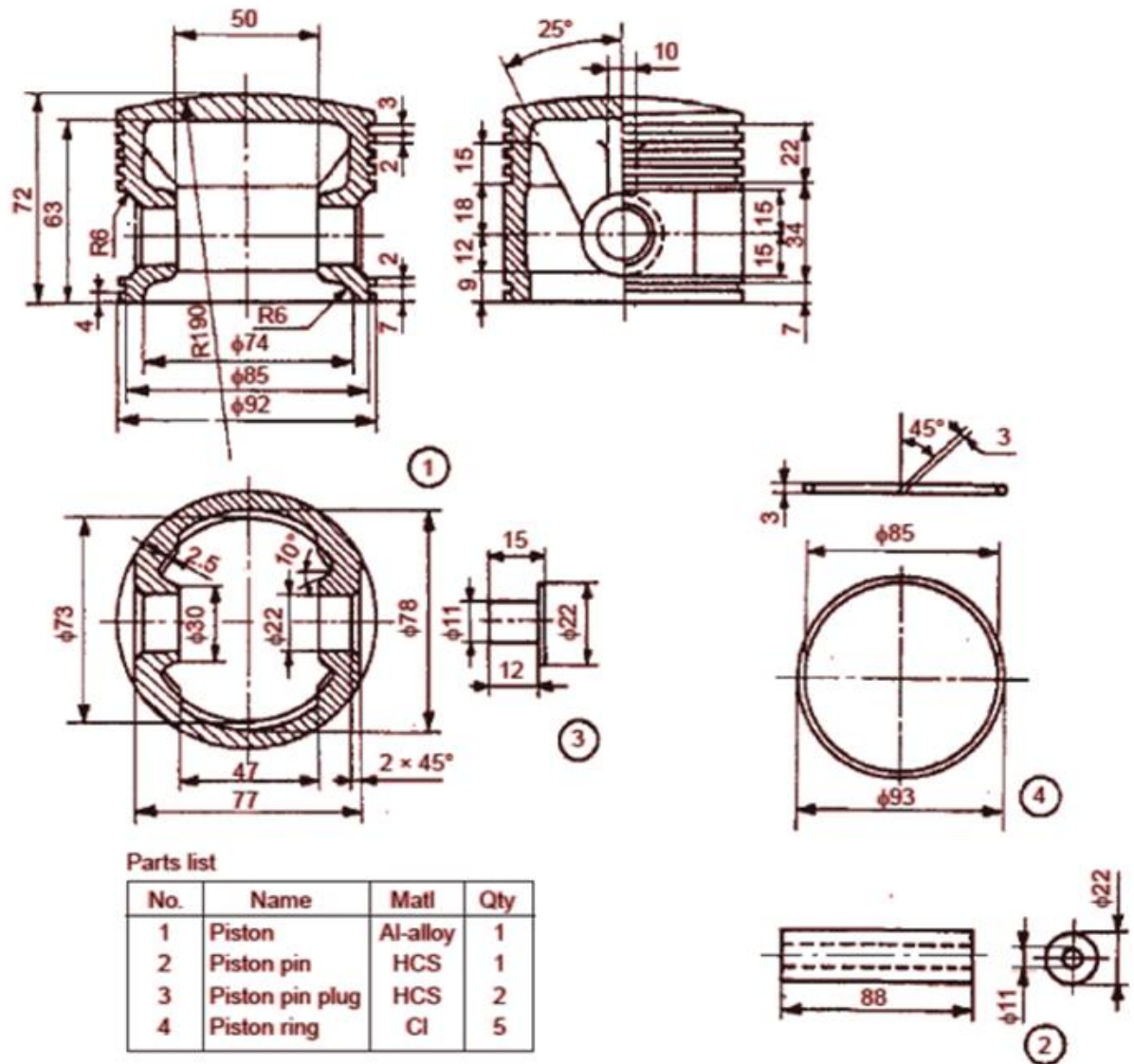
INSTRUCTIONS: (1) Answer any **ONE** question.

(2) Each question carries **TWENTY FOUR** Marks.

(3) All Dimensions are in mm and assume missing dimensions if any and choose suitable scale.

3(a).Figure below shows the components of the Piston. Draw its assembled Left half sectional front view and top view.

14+10



OR

3 (b) .Following figure shows the components of the wheel cylinder. Draw its assembled half sectional front view and side view.

14+10

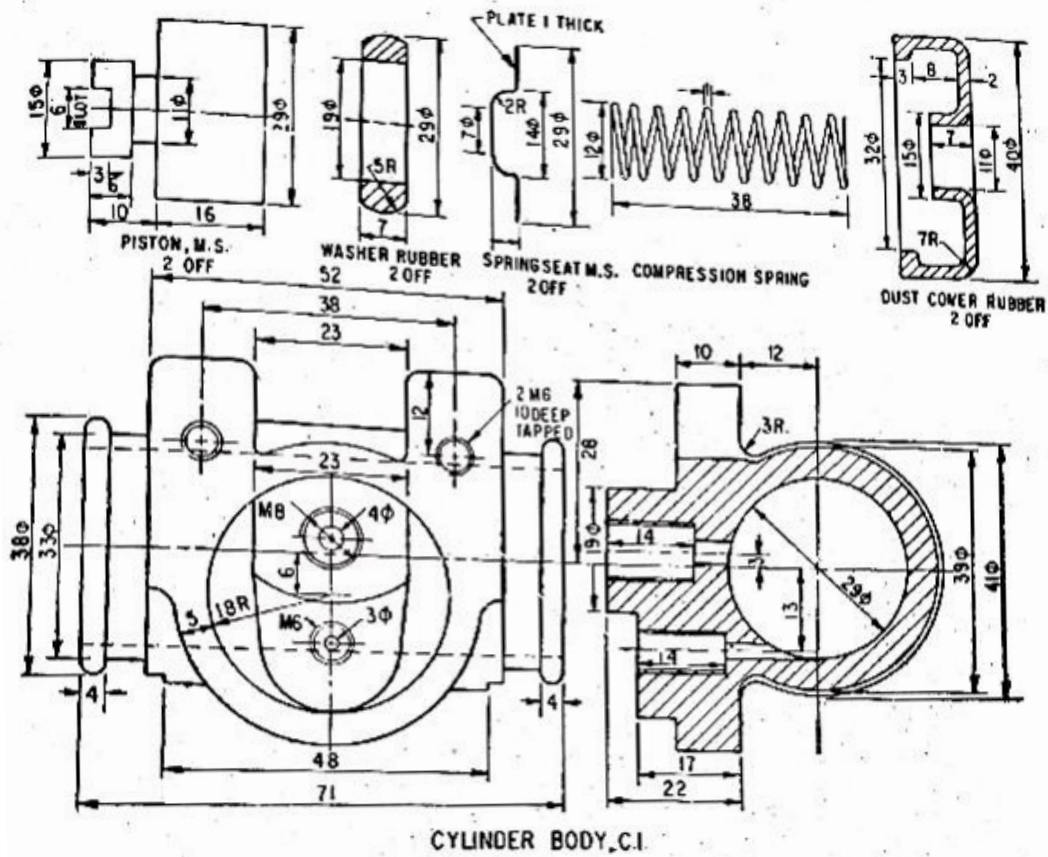


Fig. Wheel cylinder details.

List of Parts	
Part name	Quantity
Piston	2
Washer rubber	2
Spring seat	2
Compression spring	1
Rubber boot	2
Cylinder body	1

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title :	FUELS, LUBRICANTS AND I.C.ENGINES TESTING LAB.	Course Code	18A-507P
Semester	V	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact periods	:45Pds
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE

Unit No	Experiment using	Hours/ Periods	Marks for SEE			Marks	% of Weight age
			Handl ing	Manip ulation	Preci sion		
1.	Cleveland Apparatus (Open cup)	03	10	10	20	40	100
2.	Pensky Martins Apparatus (Closed cup)	03	10	10	20	40	100
3.	Able's Apparatus(Closed cup)	03	10	10	20	40	100
4.	Red wood Viscometer	03	15	15	10	40	100
5.	Copper strip test	03	15	15	10	40	100
6.	Grease penetration test	03	10	10	20	40	100
7.	Carbon residue test	03	10	10	20	40	100
8.	Say bolt Viscometer	03	15	15	10	40	100
9.	Bomb Calorimeter	03	15	15	10	40	100
10.	Junkers Gas Calorimeter	03	15	15	10	40	100
11.	Morse Test	03	15	15	10	40	100
12.	Load Test on Petrol Engine	03	15	15	10	40	100
13.	Load Test on Diesel Engine	03	15	15	10	40	100
14.	Heat balance sheet of a petrol engine	03	15	15	10	40	100
15.	Heat balance sheet of a diesel engine	03	15	15	10	40	100
Total Periods			45				

Pre requisites

This course requires the basic knowledge of physics, chemistry, fuels and lubricants.

Course outcomes

At the end of course student should be able to

CO1	Measure the Flash and Fire points of different fuels.
CO2	Evaluate the Kinematic and Absolute viscosities of the fuel and lubricating oils.

CO3	Determine the percentage of carbon in the given sample of fuel or lubricant.
CO4	Conduct the penetration test for semi solid lubricant.
CO5	Determine the Calorific values of solid and liquid fuels and gaseous fuels.
CO6	Find the degree of corrosivity of the given fuel or lubricant
CO7	Apprise the performance of the given petrol or diesel engine and to prepare heat balance sheet

Course Content:

1. Determination of flash and fire points of various fuels and lubricants using Abel's apparatus by open cup method.
2. Determination of flash and fire points of various fuels and lubricants using Pesky Martin's, apparatus by closed cup method.
3. Determination of flash and fire points of various fuels and lubricants using Cleveland's apparatus by closed cup method.
4. Determination of Kinematic and Absolute viscosities of the fuels and lubricating Oils using Redwood viscometer/Say bolt viscometer.
5. Conduct corrosion test on the given fuel or lubricant and assess the degree of corrosivity.
6. Find out the percentage of carbon in the given sample of fuel or lubricating oil.
7. Determination of Calorific values of Solid and liquid fuels using Bomb calorimeter.
8. Determination of Calorific value of gaseous fuel by using Junker's calorimeter.
9. Find the frictional power of the given multi cylinder petrol engine and calculate the mechanical efficiency at various loads.
10. Conduct load test on the given petrol engine.
11. Perform Load test on the given diesel engine.
12. Draw up Heat balance sheet for the given petrol engine.
13. Prepare Heat balance sheet for the given diesel engine.

Suggested E-Learning references

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested Student Activities

1. Case study of major liquid Lubricants in Automobiles with their specifications.
2. Conduct an identification parade of instruments and equipments available in the Laboratory.
3. Visit nearby workshop / service station to familiarize the various types of fuels and lubricants used in automobiles.
4. Collect the information regarding modern measuring instruments used for various parameters of an Engine. Compare the valve timing diagrams of different petrol and diesel engines and submit a report as a case study.

5. Visit nearby workshop / service station to identify opening and closing of I.C.engine valves.
6. List the various parameters that are recorded while conducting tests in the I.C engines Lab and their effect on performance.
7. Group discussion on selection of an engine for an automobile.
8. Group discussion on the pollution effects of I.C.Engines.
9. Quiz on fuels and lubricants.
10. Surprise test.

CO-PO MAPPING MATRIX:

COURSE OUTCOME		Linked to PO	Teaching periods
CO1	Measure the Flash and Fire points of different fuels.	1,2,3,4,5,6,10	09
CO2	Evaluate the Kinematic and Absolute viscosities of the fuel and lubricating oils.	1,2,3,4,5,6,10	06
CO3	Determine the percentage of carbon in the given sample of fuel or lubricant.	1,2,3,4,5,6,10	03
CO4	Conduct the penetration test for semi solid lubricant.	1,2,3,4,5,6,10	03
CO5	Determine the Calorific values of solid and liquid fuels and gaseous fuels.	1,2,3,4,5,6,10	06
CO6	Find the degree of corrosivity of the given fuel or lubricant	1,2,3,5,6,10	03
CO7	Apprise the performance of the given petrol or diesel engine and to prepare heat balance sheet	1,2,3,4,5,6,10	15

MID SEM –I & II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: FUELS, LUBRICANTS AND I.C.ENGINE TESTING LAB.
Subject Code: 18A-506P

Time: 3 hr

Max Marks: 20

Instructions: Answer any one question and each question carries **twenty** marks.

1. Determination of flash and fire points of various fuels and lubricants using Abel's apparatus by open cup method.
2. Determination of flash and fire points of various fuels and lubricants using Pesky Martin's, apparatus by closed cup method.
3. Determination of flash and fire points of various fuels and lubricants using Cleveland's apparatus by closed cup method.
4. Determination of Kinematic and Absolute viscosities of the fuels and lubricating Oils using Redwood viscometer/Say bolt viscometer.
5. Conduct corrosion test on the given fuel or lubricant and assess the degree of corrosivity.
6. Find out the percentage of carbon in the given sample of fuel or lubricating oil.
7. Determination of Calorific values of Solid and liquid fuels using Bomb calorimeter.
8. Determination of Calorific value of gaseous fuel by using Junker's calorimeter.
9. Find the frictional power of the given multi cylinder petrol engine and calculate the mechanical efficiency at various loads.
10. Conduct load test on the given petrol engine.
11. Perform Load test on the given diesel engine.
12. Draw up Heat balance sheet for the given petrol engine.
13. Prepare Heat balance sheet for the given diesel engine.

SEMESTER END EXAMINATION
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING
Subject Name: - FUELS, LUBRICANTS AND I.C.ENGINES TESTING LAB.
Subject Code: 18A-506P

Time: 2 hr

Max Marks: 40

Instructions: Answer any one question and each question carries **twenty** marks.

1. Determination of flash and fire points of various fuels and lubricants using Abel's apparatus by open cup method.
2. Determination of flash and fire points of various fuels and lubricants using Pesky Martin's, apparatus by closed cup method.
3. Determination of flash and fire points of various fuels and lubricants using Cleveland's apparatus by closed cup method.
4. Determination of Kinematic and Absolute viscosities of the fuels and lubricating Oils using Redwood viscometer/Say bolt viscometer.
5. Conduct corrosion test on the given fuel or lubricant and assess the degree of corrosivity.
6. Find out the percentage of carbon in the given sample of fuel or lubricating oil.
7. Determination of Calorific values of Solid and liquid fuels using Bomb calorimeter.
8. Determination of Calorific value of gaseous fuel by using Junker's calorimeter.
9. Find the frictional power of the given multi cylinder petrol engine and calculate the mechanical efficiency at various loads.
10. Conduct load test on the given petrol engine.
11. Perform Load test on the given diesel engine.
12. Draw up Heat balance sheet for the given petrol engine.
13. Prepare Heat balance sheet for the given diesel engine.

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title :	Vehicle Diagnosis Laboratory	Course Code:	18A-508P
Semester:	V	Course Group:	Core
Teaching Scheme in Periods (L:T:P):	7.5:0:37.5	Credits:	1.5
Methodology:	Lecture + Assignments	Total Contact Periods :	45 Periods
CIE:	60 Marks	SEE:	40 Marks

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Questions for SEE			Marks weight age	% Weightage
			Handl ing	Manipu lation	Preci sion		
1.	Trouble diagnosis of engine	03	10	15	15	40	100
2.	Trouble diagnosis of starting system	03	10	15	15	40	100
3.	Trouble diagnosis of fuel system	03	10	15	15	40	100
4.	Trouble diagnosis of steering system	03	10	15	15	40	100
5.	Trouble diagnosis of suspension system	03	10	10	20	40	100
6.	Trouble diagnosis of clutch	03	10	10	20	40	100
7.	Trouble diagnosis of Gear box	03	10	10	20	40	100
8.	Trouble diagnosis of differential	03	10	10	20	40	100
9.	Trouble diagnosis of wheels and tyres	03	10	15	15	40	100
10.	Trouble diagnosis of brakes	03	10	10	20	40	100
11.	Trouble diagnosis of Charging system	03	10	10	20	40	100
12.	Trouble diagnosis of Lighting system	03	10	10	20	40	100
13.	Exhaust gas analysis of Petrol engine	03	10	10	20	40	100
14.	Exhaust gas analysis of Diesel engine	03	10	10	20	40	100
15.	Test/Revision	03	-	-	-	-	-
Total		45 Periods					

Pre requisites

This course requires the basic knowledge of automobile servicing and maintenance

Course Outcomes

At the end of the course student should be able to:

CO1 :	Trouble diagnosis of the vehicle
CO2 :	Practice the usage Exhaust gas Analyzer and Smoke meter
CO3 :	

Course Content:

1. Study and Practice trouble diagnosis of various vehicle systems like:
 - a. Engine
 - b. Starting system
 - c. Fuel system
 - d. Steering system
 - e. Suspension system
 - f. Clutch
 - g. Gear box
 - h. Differential
 - i. Wheel and tyres
 - j. Braking system
 - k. Charging system
 - l. Lighting system
2. Conduct exhaust gas analysis for the given petrol engine
3. Conduct exhaust gas analysis for the given diesel engine

Suggested E-Learning references:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested Student Activities:

1. Collect the information on the various vehicle functionary systems and submit a report.
2. Visit nearby workshop / service station to familiarize the operation of exhaust gas analyser.
3. Get acquainted with checking of various engine parameters using latest engine analyser.
4. Quiz.
5. Group discussion.
6. Surprise test.

CO-PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching Hours
CO1 :	Trouble diagnosis of the vehicle	U/A	1,2,3,8,10	10
CO2 :	Practice the usage Exhaust gas Analyzer.	R/U	1,2,3,8,10	5
CO3	Measure the pollutants from petrol and diesel engines using exhaust gas analyser.	U/A	1,2,3,8,10	10

MODEL QUESTION PAPER
MID SEM –I / II / SEMESTER END EXAMINATION
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING

Subject Name: Vehicle Diagnosis Laboratory; Subject Code: 18A-508P

Time: 1Hr/ 2 Hrs _____ **Max Marks: 20 / 20 / 40**

Note:

- i. Answer any one Question by adopting lottery for allotment.
- ii. All questions carries equal marks

1. Conduct Trouble diagnosis for the engine of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the engine.
2. Conduct Trouble diagnosis for the starting system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for starting system.
3. Conduct Trouble diagnosis for the fuel system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the fuel system.
4. Conduct Trouble diagnosis for the steering system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the steering system.
5. Conduct Trouble diagnosis for the suspension system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the suspension system.
6. Conduct Trouble diagnosis for the clutch of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the clutch.
7. Conduct Trouble diagnosis for the gear box of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the gear box.
8. Conduct Trouble diagnosis for the differential of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the differential unit.
9. Conduct Trouble diagnosis for the wheels and tyres of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for wheels and tyres of the vehicle.
10. Conduct Trouble diagnosis for the braking system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the braking system of the vehicle.

11. Conduct Trouble diagnosis for the charging system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the vehicle charging system.
12. Conduct Trouble diagnosis for the lighting system of the given vehicle, report on the condition and suggest the remedial measures and also write the Trouble diagnosis chart for the lighting system of the vehicle.
13. Write the procedure for analysis of exhaust gases from a diesel engine using a smoke meter and conduct the procedure also report for the given vehicle.
14. Write the procedure for analysis of exhaust gases from a petrol engine using an exhaust gas analyzer and conduct the procedure also report for the given vehicle.

Department of Technical Education - Telangana
State Board of Technical Education & Training (TS) – Hyderabad

Course Title :	Programming in 'C' lab Practice	Course Code	18A-509 P
Semester	IV	Course Group	Core
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours :	37.5 Hrs/ 45Periods
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Marks for SEE		
			Coding	Compilation	Execution
1	Input/output statements, variables and operators	6	6	0	0
2	Decision making, branching and loop statements	13	4	4	4
3	Arrays and strings	13	4	4	4
4	Functions, Structures and Unions	13	4	4	4
	Total	45	40		

Pre requisites

Knowledge of Computer Fundamentals and Basic Mathematics.

Course outcomes

Course Outcome	
CO1	Write programs using input/output statements, variables and operators
CO2	Demonstrate decision making, branching and loop statements
CO3	Construct programs on arrays and strings
CO4	Develop programs using functions, structures and unions

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

List of Programmes:

1. Input/output statements, variables and operators

1. Exercise on structure of C program
2. Exercise on Keywords and identifiers
3. Exercise on constants and variables
4. Execution of simple C program
5. Exercise on operators and expressions
6. Exercise on special operators
7. Exercise on input and output of characters
8. Exercise on formatted input and output

2. Decision making, branching and loop statements

1. Exercise on simple if statement
- 2.. Exercise on if..else statement
- 3.. Exercise on else..if ladder statement
4. Exercise on switch statement
5. Exercise on conditional operator
6. Exercise on while statement
7. Exercise on for statement
8. Exercise on do...while statement

3. Arrays and strings

1. Exercise on one dimensional arrays
2. Exercise on two dimensional arrays
3. Exercise on strings

4. Functions, Structures and Unions

1. Exercise on user-defined function
2. Exercise on recursion
3. Exercise on structure
4. Exercise on array of structures

REFERENCE BOOKS

- | | | |
|-----------------------------|-------------------------|------------------|
| 1. Let Us C | -- Yeshwanth Kanetkar , | BPB Publications |
| 2. Programming in ANSI C | -- E. Balaguruswamy, | Tata McGraw-Hill |
| 3. C The complete Reference | -- Schildt, | Tata McGraw Hill |

E-learning links

- i. <http://www.tutorialspoint.com/cprogramming/>
- ii. [http://www.indiabix.com/online-test/c-programming Test/](http://www.indiabix.com/online-test/c-programming-Test/)
- iii. <https://fresh2refresh.com/c-programming/>
- iv. <http://www.learn-c.org/>
- v. <https://www.javatpoint.com/c-programming-language-tutorial>
- vi. <https://www.cprogramming.com/tutorial/c-tutorial.html>

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Write programs using input/output statements, variables and operators	R, U, A	1,2,3,4,8,9,10	5
CO2	Demonstrate decision making, branching and loop statements	R, U, A	1,2,3,4,8,9,10	15
CO3	Construct programs on arrays and strings	R,U, A	1,2,3,4,8,9,10	10
CO4	Develop programs using functions, structures and unions	U, A	1,2,3,4,8,9,10	15
CO5	Write programs using input/output statements, variables and operators	R, U, A	1,2,3,4,8,9,10	5
Total				45

Department of Technical Education, Telangana
State Board of Technical Education & Training (TS), Hyderabad

Course Title	: Project Work	Course Code	: 18A-510C
Semester	: V	Course Group	: Core
Teaching Scheme in Periods (L:T:P)	: 15:15:120	Credits	: 3
Methodology	: Lecture+ Tutorial+ Practical	Total Contact Hours :	: 87.5 Hours/ 105 Periods
CIE	: 40 Marks	SEE	: 60 Marks

Course Content and Blue Print of Marks for SEE

S.No	Subject	Items	Max. Marks	Remarks
1	MINI PROJECT	1.Project Work Evaluation Spell-I	25	
		2. Project Work Evaluation Spell-II	25	
		3. a) Maintenance of Log Book	15	
		b) Record work	15	
		4. a) Seminar	10	
		b) Viva-Voce	10	
Total: 100				

Note:

The pass marks are 50%, i.e the candidate has to obtain 50 Marks, failing to secure the minimum marks has to reappear for the project work with a new topic.

Course outcomes

At the end of course student should be able to

CO1 :	Apply basic and discipline knowledge for the development of project.
CO2 :	Apply the knowledge of identifying the materials.
CO3 :	Design the components required and to solve the engineering problems.
CO4 :	Use the engineering tools, where ever required.
CO5 :	Demonstrate social and ethical responsibilities in engineering practices and to exhibit environment concerns and to obtain sustainable solutions in the respective field of engineering.
CO6 :	Work individually and effectively in a team
CO7 :	Expose themselves to the recent trends, involve in lifelong learning and Present the work effectively

Guidelines for a Project Work:

Project Work helps the student to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. Project work can help to boost the skills and widen the horizon of thinking. It acts like a beginners guide to do larger projects later in their career. Here are some tips, which help a student to come out with a successful Project.

1. Selection of Topic:

Selection of topic is an important task in a Project work. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition. Always select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. The project must play its role towards a positive growth/development in that specific field.

2. Research about the selected topic online:

Do some online search about the selected topic. Go through the research papers from different researchers around the world on the topics related to Project. Find some websites containing the information about the materials used for Project.

3. Suggestions from subject experts:

Consults the subject experts in the Institution and interact with them about the Mini Project topic. The student can also meet many subject experts from various parts of India through social media and some discussion forums. This helps the student in getting suggestions in different possible ways, through which gives a clear idea on the topic selected for Project.

4. Planning:

After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation and fabrication along with the teammates. Make a rough schedule, adapt to it and distribute the work among the teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Project rather than any individual (leader) taking full responsibilities.

5. Execution of plans:

Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.

6. Presentation:

Experimentation/Fabrication does not make a Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of the Project.

Guidelines for Preparation of Report:

The mini project report should follow the following format:

I. Abstract:

Give a brief overview of the project in not more than one page.

II. Introduction:

- Discuss briefly an overview of the sector/industry/background to the topic/problem.
- State the objectives of the research.
- Summary of the project/case scenario.

III. Literature Review (one and half pages)

Give the brief outline of the findings given in the Technical Papers/Books, journals etc related

to the topic i.e. what other scholars have written about the topic (citations).

IV. Search/Research Methodology

The plan/methodology of carrying out the project-interviews/questionnaires/secondary data.

V. Discussion of the findings

The use of graphs, tables, pictures etc., is essential.

VI. Conclusions and Recommendations

Give the conclusions/ Remarks/ Recommendations.

VII. References

Minimum requirements: A minimum number of references should be at least five (5)

The project should have a maximum of 50 pages of 12 font size in Times New Roman format.

Seminar / Presentation (20 Marks):

Criteria for evaluating presentation.

Structure: Is the structure evident, understandable, and appropriate? Is transition from point to point smooth?

Slides / transparencies: Are slides well designed (not too busy, right font)? Are graphic and visual appropriate? Any spelling, grammar, word use slips?

Timing: Is presentation timed properly, rehearsed?

Style: Is the level of treatment appropriate (not too detailed or too general)? Is the presentation energetic, enthusiastic, and clear? Is the volume good?

Appearance: Students are expected to present in formal attire.

Handling of Questions: How the students respond to the question and answer session.

Viva Voice: (20 Marks)

The lecturer/Head of section/External Examiner will ask students individual questions one – one based on the report and the presentation submitted. All the questions should be related to the courses covered and the project work done by the students.

Important Points:

The Project work has to be done in groups and the suggested group size is 6 to 10 students in each group.

Students are needed to visit companies and interact with the employees there and gather information the various aspects of Operations Management.

The students should have to submit the progress report on the project work and present a seminar during Mid Semester assessments I and II for evaluation.

The Viva Voice marks will awarded to the students on their individual performance, while the Report and the Presentation will be common.

Department of Technical Education - Telangana
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Course Title :	Skill Up gradation	Course Code:	SKD
Semester:	V	Course Group:	Core
Teaching Scheme in Hrs:	15:90 (Instructions and Activity)	Credits:	2.5
Methodology:	Seminar+ G.D+ Activity	Total Contact Periods:	105 Periods
CIE:	By Rubrics (Pass or Fail)	SEE	Rubrics

Course Content and Blue Print of Marks for SEE

The performance of the candidate is ascertained using rubrics in every skill development activity, No marks are awarded only the Pass or Fail is indicated in the final evaluation.

Pre requisites:

This course requires basic communication skills in English and general awareness of all the courses of the discipline.

Course Outcomes

At the end of course student should be able to:

CO1 :	Ability to apply basic and discipline specific knowledge to solve core and/or applied engineering problems.
CO2 :	Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
CO3 :	Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.
CO4:	Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
CO5:	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
CO6:	An ability to communicate effectively.
CO7:	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.
CO8:	Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

Suggested Student Activities in Transport and Industrial Management (18A-501C):

1. Visit library to refer TSRTC, APSRTC, NAVATA and other transport organization manuals.
2. Collect the data about various ticketing methods to collect the fares.
3. Visit nearby bus depots to familiarize with field survey.
4. Assignment on how production planning and control takes place in the industry.
5. Group discussion on Marketing and Sales.
6. Visit the manufacturing industry to know materials management techniques.
7. Quiz.
8. Surprise test.

Suggested E-Learning references in Transport and Industrial Management (18A-501C):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. <http://transport.telangana.gov.in/>
5. <https://www.youtube.com/watch?v=OqmRZXfVoE4>
6. <https://www.toolshero.com/management/five-functions-of-management/>
7. <https://www.mooc-list.com/course/sales-marketing-alignment-coursera>
8. <https://www.investopedia.com/terms/o/organizational-structure.asp>
9. <https://www.youtube.com/watch?v=wO-MtWejRM>
10. <https://wricitieshub.org/online-publications/71-costs-and-revenues-understanding-bus-operations>
11. <http://bca.transportationeconomics.org/setup/project-schedule>
12. <https://www.westminster.ac.uk/courses/professional-and-short-courses/air-transport/introduction-to-air-transport-economics-and-planning>
13. <https://kalyan-city.blogspot.com/2011/12/what-is-production-management-meaning.html>
14. <https://www.britannica.com/technology/production-management>

Suggested Student Activities in Design of Machine Elements (18A-502C):

1. The students should identify at least five machine components. He should select the materials for identified machine components by using design data hand book. List the mechanical properties of material selected.
2. Observe the mechanisms where transmission of power takes place through Shaft, Keys and coupling. Get the required information regarding power transmitted (power output by motor engine etc.).
3. The students can visit nearby workshops/garages and collect information like material, design features etc on different fasteners and machine components.
4. Assignments on design of Shafts, Keys and couplings, Cams and Governors and Flywheels with neat sketches.
5. The student should download and present various presentations related to stresses in Machine elements.
6. The student should download and present various presentations related to failure of Machine elements.
7. The student should download and present various presentations related to design of machine elements.
8. The student should design the small machine elements as mini-project.

Suggested E-Learning references in Design of Machine Elements (18A-502C):

1. <http://nptel.ac.in/courses/Webcoursecontents/>
2. IIT%20Kharagpur/Machine%20design1/left_home.html
3. www.learnengineering.org
4. www.sae.org
5. www.nptel.ac.in

Suggested Student Activities in Autotronics (18A-503C):

1. Student visits Library to refer to Manual of Automobile components to find the various electronic components used in automobile for efficient operation.
2. Student inspects the available equipment in the Laboratory to identify sensors and actuators used in engines.
3. Visit nearby workshop / service station to familiarize with type of sensors used in vehicles.
4. Prepare a presentation on latest trends in automobile electronics.
5. Record data / specifications of various components of vehicle safety systems.
6. Prepare a report by visiting the service stations on electronic fuel supply system for petrol / diesel vehicles.
7. Prepare working models of various sensors and actuators.
8. Visit electronic shops and collect various fundamental electronic components such as relay, diode etc.,.
9. Prepare small electronic circuits to demonstrate function of various electronic components.
10. Quiz.
11. Group discussion on role of electronics in automobiles.
12. Surprise test/

Suggested E-Learning references in Autotronics (18A-503C):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested Student Activities in Special Purpose Vehicles (18A-504EA):

1. Visit the Library to refer various reference books.
2. Debate on importance of special purpose vehicles in the development of a country.
3. Visit the nearby workshops/Industries/Market and prepare a brief report on available special purpose vehicles.
4. Inspect the available automobile laboratory to identify the special purpose vehicle.
5. Visit the nearby workshops/Industries/Market and prepare brief report on Farm tractors.
6. Give seminar on special features arrangement in farm tractors.
7. Fabricate a proto type model of any one special purpose vehicle as mini-project.
8. Prepare and submit a report on contemporary issues in the field of Special purpose vehicles.
9. Participate in Quiz.
10. Group discussion.

Suggested E-Learning references in Special Purpose Vehicles (18A-504EA):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. <http://www.resolute-equipment.com/53-6-types-of-earth-moving-equipment/>
5. <https://www.thebalancesmb.com/must-have-earth-moving-construction-heavy-equipment-844586>
6. https://www.lkdfacility.org/wp-content/uploads/2016-06-30-BASIC-MECHANICS6_EM-Equipments-FINAL-WEB.pdf

7. https://en.wikipedia.org/wiki/Heavy_equipment
8. <https://careertrend.com/about-5583871-types-construction-vehicles.html>
9. <https://www.fueloyal.com/14-popular-types-construction-vehicles/3/>
10. https://en.wikipedia.org/wiki/Power_shovel
11. <https://www.explainthatstuff.com/tractors.html>
12. <https://www.tractoragriculture.com/types-of-tractors/>
13. <https://www.hobbyfarms.com/4-tractor-types-to-consider-for-your-farm/>
14. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=2274>
15. <https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=17335&context=rtd>
16. <https://compactequip.com/track-loaders/whats-in-an-undercarriage-learn-the-differences-between-rigid-roller-and-torsion-axle-systems/>
17. <https://www.bobcat.com/loaders/features/torsion-suspension-undercarriage>

Suggested Student Activities in Automobile Components Design (18A-504EB):

1. Assignments in the design of one automobile component.
2. Quiz on Criteria for design of components.
3. Debate on Energy saving techniques used in design.
4. Assignment on modern materials used for each component.
5. Group discussion on selection of materials for each component.
6. Surprise objective type test.
7. Visit to Industries manufacturing automobile components.
8. Download and present various presentations related to design of machine elements.
9. Download and present various presentations related to failure of Machine elements

Suggested E-Learning references in Automobile Components Design (18A-504EB):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. https://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/left_home.html

Suggested Student activities in Alternative Fuels and Emission Control (18A-504EC):

1. Quiz on the Alternative fuels.
2. Browse data online and submit a report on any one type of renewable energy.
3. Give a seminar on the need of developing alternative fuels.
4. Submit a report on the non conventional fuels that can be used in automobiles.
5. Visit an automobile emission testing center near to you and submit a report on your observations on the pollutants of various vehicles.
6. Write a Slip test (Objective type)
7. Prepare a chart of pollutants emitting from an automobiles and their effects on human health.
8. Study a specific model of automobile and submit the report about the variations in the emission with age.
9. Procure the components used for emission control and share your knowledge with your classmates.

10. Prepare a chart of pollutants emitting from an automobiles and their effects on environment.
11. Give a seminar on our responsibility on Conservation of water, Preservation of quality of soil and air, Noise pollution.
12. Share your views on sustainable development.

Suggested E-Learning references in Alternative Fuels and Emission Control (18A-504EC):

1. Alternative fuels and Renewable energy sources
https://www.youtube.com/watch?v=4Hp_SyUht4I
<https://www.youtube.com/watch?v=zBHI9rTEcRE>
<https://www.youtube.com/watch?v=OIQRPkZhxHc>
<http://vikaspedia.in/energy/energy-basics/sources-of-energy>
2. Emission Norms
<https://www.youtube.com/watch?v=QDn-ijNjhWg&list=PL6kB4KeyhXc6Y7BkWKt76956BcUoBRGHv>
3. Gaseous fuels
<https://www.youtube.com/watch?v=wmPjdK3F2iE>
https://www.diffen.com/difference/CNG_vs_LPG
<https://www.youtube.com/watch?v=DtorjQQVnaQ>

Fuel conversion kit installation to LPG gas

<https://www.youtube.com/watch?v=jDp6lEA8ETs>
<https://www.youtube.com/watch?v=VOWjjGaYbGk>

Fuel conversion kit installation to CNG gas

<https://www.youtube.com/watch?v=11cgTziUizU>
<https://www.youtube.com/watch?v=sHCYxJNZ7Tk>

4. Alcohols and Biodiesels
<https://www.youtube.com/watch?v=-lO0fFoHa7w>
<https://www.youtube.com/watch?v=xLa83KIaEyw>
<https://www.youtube.com/watch?v=eGYcZ2UyHMc>
5. Non polluting energy systems
https://onlinecourses.nptel.ac.in/noc19_ee18/preview
<https://nptel.ac.in/courses/108102121/>
<https://www.youtube.com/watch?v=m2qvGJwTuBo>
<https://www.conserve-energy-future.com/advantages-and-disadvantages-of-hybrid-cars.php>
6. Emission control systems and devices
<https://www.youtube.com/watch?v=qBD2XjejCEI>
<https://www.youtube.com/watch?v=GoSby-RRZS4>
https://www.youtube.com/watch?v=X_pKyxJJBZs
<https://www.youtube.com/watch?v=nIZ4EGknw2Q>
<https://www.youtube.com/watch?v=6qmLp-cJeCk>

Suggested Student Activities in Professional Ethics and Indian Constitution (18A-504ED):

1	Teacher form the group of 5- 6 students, Ask to think by each student, about an important value acquired from their child hood and the value still retained with them and value they rejected. Ask to share the values retained and explore what has made to reject some values. Make report.
2	The construction company wants to make a feasibility study of a proposed ring road near your city. It hires Civil engineer for this purpose. The engineer learns that the project would have a very negative impact in term of pollution, economy, and lives of low income rural population. The Engineer had no intention of divulge the information during public hearings. What should the Engineer as Adviser to do? Make report.
3	The computer engineer develops a computer program used as a tool in developing other programs assigned to him. He uses the facilities of the company to develop the program. He changes jobs and takes the only copy of the first program with him for use in his new job. Will it be a violation of the employer's right? Does he/she require previous employer's permission before using it on the new job? Make report.
4	<p>A manufacturing enterprise pays their Technicians Trainees overtime salary and a handsome bonus to work during a strike period. The strike was organized by the union against the unsafe working conditions of the plant. You, considered as a Technician trainee, believe that the conditions may be unsafe even though no government regulations apply. What will you do? Make report.</p> <p>Options:</p> <ul style="list-style-type: none">6. Refuse to work, because thinking that the allegations of the union have merit7. Refuse to work because believing that breaking the strike is unethical.8. Continue to work, because he feels this is an obligation to the employees9. Continue to work because it will help clear some of his pending commitments10. Work, because otherwise Management is likely to be fired and cannot get alternate job.
5	<p>A woman who was driving a car was involved in an accident. The vehicle dashed against the divider. She had fallen unconscious. You are passing by your vehicle. She is known to you, alive and stable. You are going to appear for an interview for Air Force recruitment.</p> <p>Is it (or) is it not your duty to save her from suffering? You are likely to fulfil a duty of protecting the country. What you will do .Apply Ethical theory on this situation. Make report.</p>
6	Teacher form the group of 5- 6 students, Ask to Visit local general hospital/leading Nursing homes. Ask them to observe how their hospital wastes being disposed. Will they follow the safe disposable measures? Assess how it will violate their environmental ethics. Make report.

Suggested E-Learning References in Professional Ethics and Indian Constitution (18A-504ED):

1. www.academia.edu
2. www.asianvu.com

Suggested Student activities in Thermal Engineering-II (18A-505A):

1. The students are advised to visit a nearby industry involving use of boiler and students are advised to conduct an energy audit.
2. Analyze the data and identify the areas of wastage of energy and suggest suitable methods for improvement of performance.
3. Velocity triangles of turbine may be practiced using CAD software.

Suggested E-Learning references in Thermal Engineering-II (18A-505A):

4. www.learnengineering.org
5. www.sae.org
6. www.nptel.ac.in

Suggested Student Activities in CAD/CAM (18A-505B):

- A Visit to a nearest Industry working on CNC Machines.
- Identify various machine tools including CNC and write the report differentiating an ordinary machine tool with CNC machine tool
- Write a part program for producing work pieces like round rods, stepper rods and screwed fasteners etc.

Suggested E-Learning references in CAD/CAM (18A-505B):

1. www.nptel.ac.in
2. www.coursera.com

Suggested Student Activities in Refrigeration and Air conditioning (18A-505C):

1. Visit nearest outlet and list out Domestic Refrigerators manufacturers and know the capacity of the refrigerator and the refrigerant used in it.
2. Visit a central air conditioning plant.

Suggested E-Learning references in Refrigeration and Air conditioning (18A-505C):

12. www.wikihow.com
13. Working of domestic refrigerator
: <https://www.youtube.com/watch?v=h5wQoA15OnQ&vl=en>
14. Working of window air conditioner:
<https://www.youtube.com/watch?v=0PkOEHMNOLk>

Suggested Student Activities in Production Technology (18A-505D):

1. Student visits Library to refer to manual of Engineering Materials to find their properties.
2. Student inspects the available equipment in the Laboratory to identify the components.
3. The students can visit nearby workshops/Industries and collect information like which type of machines are used for particular purpose and their design features of various machine components.
4. The students can visit nearby workshops/Industries and collect information about various

manufacturing processes by using different machine tools, observe their specifications and the recent developments.

5. Student should write the program for particular task to perform the particular operation by using CNC machines.
6. The student should Download and present various presentations related to CNC, DNC systems and modern machining methods.
7. The student should prepare the different products as mini-project.

Suggested E-Learning References in Production Technology (18A-505D):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested Student Activities in Automobile Engineering Drawing (18A-506P):

7. Visit automobile laboratory available in the institute to study the features of automobile components.
8. Prepare the images of automobile engine, chassis, transmission hydraulic brakes components by visiting nearby garages and service stations.
9. Watch the video lessons related to the course.
10. Participate in Quiz
11. Participate in Group discussion
12. Surprise test

Suggested E-Learning references in Automobile Engineering Drawing (18A-506P):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in
4. <https://www.google.com/>
5. <https://en.wikipedia.org/wiki/Piston>

Suggested Student Activities in Fuels, Lubricant and I.C.Engines Testing Laboratory (18A-507P):

1. Collect the properties and their purpose of various alternate fuels.
2. Case study of major liquid Lubricants in Automobiles with their specifications.
3. Student inspects the available equipment in the Laboratory to identify the equipment and its purpose.
4. Visit nearby workshop / service station to familiarize the various types of fuels and lubricants used in Automobiles.
5. Quiz on fuels and lubricants.
6. Group discussion on the pollution effects of fuels or lubricants.
7. Collect the information regarding modern measuring instruments used for various parameters of an Engine. Compare the valve timing diagrams of different petrol and diesel engines and submit a report as a case study.
8. An identification parade of instruments and equipments available in the Laboratory.

9. Visit nearby workshop / service station to identify opening and closing of I.C.engine valves.
10. List the various parameters that are recorded while conducting tests in the I.C engines Lab and their effect on performance.
11. Quiz on I.C. Engines
12. Group discussion on selection of an engine for an automobile.
13. Surprise test

Suggested E-Learning references in I.C.Engines Testing Laboratory (18A-507P):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested Student Activities in Vehicle Diagnosis Laboratory (18A-508P):

1. Collect the information on the various vehicle functionary systems and submit a report.
2. Visit nearby workshop / service station to familiarize the operation of exhaust gas analyser.
3. Get acquainted with checking of various engine parameters using latest engine analyser.
4. Quiz.
5. Group discussion.
6. Surprise test.

Suggested E-Learning references in Vehicle Diagnosis Laboratory (18A-508P):

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested E-Learning references in Vehicle Diagnosis Laboratory (18A-509P):

1. <http://www.tutorialspoint.com/cprogramming/>
2. <http://www.indiabix.com/online-test/c-programming-Test/>
3. <https://fresh2refresh.com/c-programming/>
4. <http://www.learn-c.org/>
5. <https://www.javatpoint.com/c-programming-language-tutorial>
6. <https://www.cprogramming.com/tutorial/c-tutorial.html>

Suggested E-Learning references for Project ideas in Automobile Engineering (18A-510P):

(Note: The following are only some of the project ideas from the websites, but the students are advised to refer the national and International journals for better and innovated ideas and get the approval of the guide and Head of section)

1. <http://www.mechanicalengineeringprojects.net/category/automobiles-2/>
2. <https://mechanicalstudents.com/automobile-engineering-projects/>

3. <https://www.seminaronly.com/Engineering-Projects/Mechanical/Automobile-Engineering-Project-Ideas.php>
4. <http://www.technofist.com/automobiles-projects.html>
5. https://www.projecttopics.info/Mechanical/Mechanical_Projects.php
6. <https://www.projecttopics.info/automobile/simple-automobile-projects-for-diploma-students.php>
7. <https://projectabstracts.com/tag/automobiles>

RUBRICS FOR EVALUATION OF THE STUDENT:

CATEGORY	Excellent	Very Good	Good	Satisfactory
Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked / redone by other group members to ensure quality.	Provides work that usually needs to be checked / redone by others to ensure quality.
Time-management	Routinely uses time well throughout the project to ensure things get done on time. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Usually uses time well throughout the project, but may have procrastinated on one thing. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Tends to procrastinate, but always gets things done by the deadlines. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Rarely gets things done by the deadlines AND group has to adjust deadlines or work responsibilities because of this person's inadequate time management.
Problem-solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).

Focus on the task	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.
Preparedness	Brings needed materials to class and is always ready to work.	Almost always brings needed materials to class and is ready to work.	Almost always brings needed materials but sometimes needs to settle down and get to work	Often forgets needed materials or is rarely ready to get to work.
Pride	Work reflects this student's best efforts.	Work reflects a strong effort from this student.	Work reflects some effort from this student.	Work reflects very little effort on the part of this student.
Monitors Group Effectiveness	Routinely monitors the effectiveness of the group, and makes suggestions to make it more effective.	Routinely monitors the effectiveness of the group and works to make the group more effective.	Occasionally monitors the effectiveness of the group and works to make the group more effective.	Rarely monitors the effectiveness of the group and does not work to make it more effective.
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares, with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.