

6.1 TRACTORS AND HEAVY EARTH MOVING MACHINERY

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RATIONALE

Diploma holders in Automobile Engineering may have to deal with repair and maintenance of tractors and earth moving machinery. This subject provides knowledge about such vehicles and equipment

DETAILED CONTENTS

1. Tractor (12 hrs)

Classification of tractors, main tractor assemblies, functions of farm tractors, types of engine used, power requirement, human factor in tractor design, applications of tractors, Basics trends in tractor design, forces acting on a tractor on move, parallel pull and rolling resistance, tractor stability and weight distribution
2. Hydraulic System (8 hrs)

Functions of hydraulic system, hydraulic components, method of attaching implements, classification of hydraulic controls for hitches, integral hitch system, draft control system. Position control and Mixed control
3. Tractor Chassis (8 hrs)

Salient features of engine, clutch, power transmission, final drive, brakes and steering of Indian tractors.
4. Supplementary System (6 hrs)

Power take off shaft, draw bar working, belt pull traction control unit, three point linkages
5. Tractor Wheels and Tyres (10 hrs)

Salient features of wheels, tyres and wheel base/wheel tracks. Specifications of wheels and tyres, dual versus tendum tyres, tread design, effect of tyre inflation. Prominent make of Indian – Tractors. Selection criteria, maintenance and operation of tractors, differential lock.
6. Earth Moving Machinery (12 hrs)
Description and working principles of:
 - Bull Dozer
 - Leveller
 - Front end loader
 - Cranes
 - Scrapper

7. Repair and Maintenance (8 hrs)

Faults and their rectification in tractor and maintenance of tractor.

RECOMMENDED BOOKS

1. Farm Machines and Equipment by CP Nakra; Dhapat Rai and Sons, New Delhi.
2. Manual of Tractors by J Konard, Asia Publishing House.
3. Tractors and Agriculture Equipment by Jain and Roy.

6.2 BASICS OF MANAGEMENT

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RATIONALE

The diploma holders are generally expected to take up middle level managerial positions, their exposure to basic management principles is very essential. Topics like Structure of Organization, Leadership, Motivation, Ethics and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

DETAILED CONTENTS

1. Principles of Management (06 hrs)
 - 1.1. Introduction, definition and importance of management.
 - 1.2. Functions of Management
Planning, Organizing, Staffing, Coordinating, Directing, Motivating and Controlling.
 - 1.3. Concept and Structure of an organization

Types of industrial organization
 - a) Line organization
 - b) Functional organization
 - c) Line and Functional organization
 - 1.4. Hierarchical Management Structure
Top, middle and lower level management
 - 1.5. Departmentalization
Introduction and its advantages.

2. Work Culture (06 hrs)
 - 2.1. Introduction and importance of Healthy Work Culture in organization
 - 2.2. Components of Culture
 - 2.3. Importance of attitude, values and behaviour
Behavioural Science – Individual and group behaviour
 - 2.4. Professional ethics – Concept and need of Professional Ethics

- 3. Leadership and Motivation (06 hrs)
 - 3.1. Leadership
 - 3.1.1. Definition and Need of Leadership
 - 3.1.2. Qualities of a good leader
 - 3.1.3. Manager vs. leader
 - 3.2. Motivation
 - 3.2.1. Definition and characteristics of motivation
 - 3.2.2. Factors affecting motivation
 - 3.2.3. Maslow's Need Hierarchy Theory of Motivation
 - 3.3. Job Satisfaction
- 4. Legal Aspects of Business: Introduction and need (06 hrs)
 - 4.1. Labour Welfare Schemes
 - 4.1.1. Wage payment : Definition and types
 - b) Incentives: Definition, need and types
 - 4.2. Factory Act 1948
 - 4.3. Minimum Wages Act 1948
- 5. Management Scope in different Areas (12 hrs)
 - 5.1. Human Resource Development
 - 5.1.1. Introduction and objective
 - 5.1.2. Manpower Planning, recruitment and selection
 - 5.1.3. Performance appraisal methods
 - 5.2. Material and Store Management
 - a) Introduction, functions and objectives of material management
 - b) Purchasing: definition and procedure
 - c) Just in time (JIT)

- 5.3. Marketing and Sales
 - a) Introduction, importance and its functions
 - b) Difference between marketing and selling
 - c) Advertisement- print media and electronic media
 - d) Market-Survey and Sales promotion.
- 5.4. Financial Management – Introduction
 - 5.4.1. Concept of NPV, IRR, Cost-benefit analysis
 - 5.4.2. Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty, Provident Fund
- 5.5 Maintenance Management
 - 5.5.1 Concept
 - 5.5.2 Preventive Maintenance
- 6. Miscellaneous topics (12 hrs)
 - 6.1. Customer Relationship Management (CRM)
 - a) Definition and Need
 - b) Types of CRM
 - c) Customer satisfaction
 - 6.2. Total Quality Management (TQM)
 - a) Inspection and Quality Control
 - b) Concept of Quality Assurance
 - c) TQM
 - 6.3. Intellectual Property Rights (IPR)
 - 6.3.1 Introduction, definition and its importance
 - 6.3.2 Infringements related to patents, copyright, trade mark

INSTRUCTIONAL STRATEGY

It is observed that the diploma holders generally take up middle level managerial positions, therefore, their exposure to basic management principles is very essential. Accordingly students may be given conceptual understanding of different functions related to management. Some of the topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which in turn, will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

RECOMMENDED BOOKS

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill Publishing Co., 7, West Patel Nagar , New Delhi.
4. Modern Management Techniques by SL Goel: Deep and Deep Publications Pvt Limited , Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr. : Prentice Hall of India Pvt Ltd, New Delhi.
6. Essentials of Management by H Koontz, C O' Daniel , McGraw Hill Book Company, New Delhi.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
9. Intellectual Property Rights and the Law by Dr. GB Reddy.
10. Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.
11. Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi
12. Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1.	06	15
2.	06	10
3.	06	15
4.	06	10
5.	12	25
6.	12	25
Total	48	100

6.3 AUTO REPAIR, MAINTENANCE AND DRIVING PRACTICE - II

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RATIONALE

A diploma holder in Automobile Engineering, should have reasonable practice on fault diagnosis with the help of latest machines like engine analyzer etc. Stress has also to be laid on the use of exhaust gas analyzer and other machines for the maintenance of automobiles. Student should also be proficient in driving and maintenance of vehicle. Hence this subject.

LIST OF PRACTICALS

- 1 -6 Trouble shooting of engine: Diagnosing and rectifying the following troubles- Engine overheating, high oil consumption, engine noises and knock, high fuel consumption, starter turns the engine but engine doesn't start, engine fires but dies out, engine misfires, lack of power, poor acceleration, engine produces black and white smoke; use of computerized engine analyzer, exhaust gas analyzer. Bringing exhaust gas contents within emission norms.
7. Engine testing and finding out all parameters using computerized engine analyzer
8. Emission test using exhaust gas analyzer
9. Decarbonising of engine - removing carbon deposits from engine combustion chamber, piston crown, valve parts.
10. Valve servicing:
Refacing, seat reconditioning, lapping, testing, replacing worn out parts and tappet adjustment.
11. Reconditioning of engine - Measuring of bore for wear and ovality, servicing the cylinder bore, replacing of piston and piston rings.
12. Inspection of crank shaft – bearing replacement and setting of journal bearing. Crank pin bearings and crank shaft bearings, measuring bearing clearances by gauges.
13. Servicing of valves and valve mechanism – Replacement of valves, valve seats, valve guides, checking and replacement of defective springs, refacing of valves, tappet and rocker arm and adjusting valve tappets.
14. Surfacing of cylinder head, cylinder block and manifolds with cylinder head refacing machine.
15. Practice in piston ring removal.
16. Practice in honing cylinder block, keeping allowance of clearances.

17. Practice in fitting cylinder liners – sleeving and desleeving.
18. Practice in nozzle grinding and lapping, setting of injection pressure and nature of spray.
19. Practice in bending and nipple forming of fuel pipes.
20. Overhauling of wheel and axles.
21. Overhauling of power brakes. Bleeding of brakes.
22. Practice in brake drum turning, measuring ovality, skimming the brake drum.
23. Tyre retreading. (The students may be taken to a service industry).
24. Practice in wheel balancing
25. Practice in wheel alignment
26. Practice in automatic tyre changers
27. Service of injectors (petrol)
28. Crank shaft regrinding
29. Practice in preparing preventive maintenance schedule
- 30-35. Driving Practice on the road to gain proficiency in driving. 50% of the time of the subject should be given to driving.

Note:

Visit to an automobile or tractor industry/workshop at least for two days. is essential.

RECOMMENDED BOOKS

1. Automobile Engineering by Dr. Kirpal Singh; Standard Publisher, Delhi.
2. Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi.
3. Maintenance and Repair of Motor Vehicle by H.O. Geneva; , R-686, New Rajinder Nagar, New Delhi.

6.4 MOTOR VEHICLE ACT AND TRANSPORT MANAGEMENT

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RATIONALE

A diploma holder in Automobile Engineering is supposed to have knowledge about significance of vehicle accident, accidental vehicle claim procedure from insurance company and about Motor Vehicle Act. Therefore, it is essential to teach Motor Vehicle Act features and appropriate practices covering Motor Vehicle Act. Further, knowledge of transport management systems and techniques would also be an asset to him.

DETAILED CONTENTS

1. Motor Vehicle Act (12 hrs)
 - 1.1 .Motor Vehicle Act - Main Provisions
 - 1.2. Salient features of Motor Vehicle Act. Requisites and formalities for following:
 - Licensing of drivers and conductors of motor vehicles.
 - Registration of old and new vehicles
 - Control of transport vehicles
 - Transfer of vehicle - Local and State to State
 - Different forms, application for various uses
 - Traffic offences, penalties and procedures

2. Inspection and Fitness of Vehicle (06 hrs)
 - 2.1. Fitness of vehicle -meaning and purpose, provisions in the act,
 - 2.2. Detailed procedure and requirements for vehicle inspection

3. Insurance of Vehicles (06 hrs)
 - 3.1. Meaning of Insurance and its necessity
 - 3.2. Different types - comprehensive and third party insurance
 - 3.3. Procedure to get Accidental claim and compensation
 - 3.4. Surveyor duties
 - 3.5 Relation between company and surveyor
 - 3.6 Duties of driver in case of accident and injury to a person

4. Vehicle Finance (04 hrs)
 - 4.1. Sources and types of finance
 - 4.2. Rate of interest, incentives
 - 4.3. Net borrowing rate, documents required.

5. Driving (08 hrs)
 - 5.1. Principle of driving
 - 5.2. Driving procedure
 - 5.3. Driving precautions
 - 5.4. Driving in abnormal conditions, like hilly area, night, fog, heavy traffic and rain
 - 5.5. Emergency Driving situations
 - 5.6. Driving License - purpose, importance and requirements
 - 5.7. Different types of driving license
 - 5.8. Procedure to get driving license

6. Road Safety (06 hrs)
 - 6.1. Road Signs/signals
 - 6.2. Traffic rules
 - 6.3. Imposition of Penalties for violation of rules
 - 6.4. Duties of Driver, Conductor and Helper towards safety of vehicles/passengers/goods and self

7. Pollution Control (06 hrs)
 - 7.1. Different contents of exhaust from vehicles
 - 7.2. Prescribed standards for pollution
 - 7.3. Status and Schedule for Enforcement of emission norms
 - 7.4. Measurement of emission levels remote sensing of emission

8. Transport Management (16 hrs)
 - 8.1. History of transport with special reference to road transport in India
 - 8.2. Modes of Road transport
 - 8.3. Organization- Service station and its functions, General layout of modern service station, Spare parts section and dealership service section, Accounts and books, Different types of cards and their use in maintaining service station records
 - 8.4. Structure of fleet organization
 - 8.5. State transport - optimum utilization of fleet, theory of fares/freight
 - 8.6. Roadworthiness requirement,
 - 8.7. Maintenance of logbook, History sheet, Causes, and prevention of Road Accident, Analysis of Accident, Economy of replacement, Assessment of used vehicles for sale and purchase, Training of Drivers and Mechanics.
 - 8.8. Taxation – Structure and formalities relating to calculating and paying the relevant taxes.

- 8.9. Central Motor Vehicle Rules – Main features
- 8.10. Vehicle safety standards and regulations
- 8.11. High security registration plaes
- 8.12. UNICEF classification of vehicles.

INSTRUCTIONAL STRATEGY

Teacher should lay emphasis on basic principles and practices covering Motor Vehicle Act and fleet management. Visits should be organized to service stations for understanding of topics.

RECOMMENDED BOOKS

1. Automobile Engineering Vol.I by Dr. Kirpal Singh, Standard Publisher Distributors, Delhi.
2. Transport Management Vol. III & IV by Central Institute of Road Transport, Pune.
3. Motor Vehicle Act of India (with Latest Amendment).
4. Motor Vehicle Act with Rules by B.S. Kohli.
5. Motor Transportation: Principles and Practices by WJ Hudson and James; Ronald Press Company, New York.
6. Transport in Modern India by KP Bhatnagar, Satish Bahadur, DN Aggarwal and SC Gupta.
7. Central Motor Vehicle Rules.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	18
2	06	10
3	06	10
4	04	06
5	08	12
6	06	10
7	06	10
8	16	24
Total	64	100

6.5 PRODUCTION PLANNING AND COSTING

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RATIONALE

A diploma holder in Automobile Engineering is supposed to look after the planning, scheduling and production control activities in the industry. He is also required to have knowledge about cost estimation of new and repaired components, material management, quality aspects and productivity. Therefore it is essential to teach above topics.

DETAILED CONTENTS

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|----|---|----------|
| I. | Introduction to Production Planning and Control | (04 hrs) |
| | 1.1 .Necessity of planning and control. | |
| | 1.2. Functions of production, planning and control department, Factors determining control procedure. | |
| | 1.3. Advantages of Production Planning & Control | |
| | 1.4 Types of production. | |
| 2. | Planning | (08 hrs) |
| | 2.1 Forecasting | |
| | 2.2 Material planning and allocation | |
| | 2.3. Allocation for optimum utilization | |
| | 2.4. Break even analysis. | |
| | 2.5. Procedure for process planning. Process planning sheet. | |
| | 2.6. Calculation of man and machine hours. | |
| 3. | Production Control | (08 hrs) |
| | 3.1. Objectives | |
| | 3.2. Routing | |
| | 3.3. Loading and scheduling | |
| | 3.4. Dispatching | |
| | 3.5. Follow up | |
| 4. | Inspection and Quality Control | (12 hrs) |
| | 4.1. Inspection - Need and Planning for Inspection | |
| | 4.2. Types of Inspection | |
| | 4.3. Role of Operator and Inspector in Inspection | |
| | 4.4. Quality Control and Quality Assurance - Meaning and Need | |
| | 4.5. Statistical Quality Control | |

- 4.6. Acceptance Sampling
- 4.7. Control Charts for variables and Attributes
- 4.8. QC tools
- 4.9. Introduction to 5S and Kaizan technique.

5. Standards and Codes (04 hrs)
 - 5.1. National and International Codes
 - 5.2. Concept, elements, benefits and implementation of Quality Management System (ISO 9000) and environmental Management System (ISO 14000), Quality Circles

6. Introduction to Estimating and Costing (02 hrs)
 - 6.1. Meaning and importance of estimating and costing.
 - 6.2. Difference between estimating and costing.
 - 6.3. Importance of preparing realistic estimates.
 - 6.4. Estimating procedures.

7. Elements of Cost and Estimation (20 hrs)
 - 7.1. Terms used in costing
 - 7.2. Direct materials - components
 - 7.3. Direct costs e.g. labour, raw material, hired equipment, machines and equipment, components

Indirect materials such as lubricants, cotton waste and indirect labour.

 - . Overhead expenses - rent of building, office expenses, depreciation and service charges
 - 7.5. Profits – Concepts and requirements
 - 7.6. Variable and fixed cost, production cost
 - 7.7. Perception of job/work order
 - 7.8. Different units of work (Bifurcation as per type, section).
 - 7.9. Analysis of time – Handling time, preparation time, production cycle time, inspection and dispatch time
 - 7.10. Computation of charges.
 - 7.11. Operator charges, supervisory charges, storage charges, components charges, material charges, consumable stores charges, Total charges. Estimation of service charges, overhauling
 - 7.12. Estimation for machining, casting, forging, welding and fabrication

8. Productivity (06 hrs)
 - 8.1. Production, productivity,
 - 8.2. Factors affecting productivity,
 - 8.3. Measurement of productivity
 - 8.4. Causes of decrease in productivity

INSTRUCTIONAL STRATEGY

Efforts should be made to relate process of teaching with direct experiences in the industry. Students should be taken to various industrial enterprises for better conceptualization of specific topics such as production planning, inspection and quality control. Simple problems on costing should be given to students for comprehension

RECOMMENDED BOOKS

1. Production Estimating and Costing by M. Adithan and B.S. Pabla, Konark Publishers, Delhi
2. Industrial Engineering and Management by T.R Banga, and S.C. Sharma, Khanna Publishers, Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	04	06
2	08	12
3	08	12
4	12	20
5	04	06
6	02	04
7	20	32
8	06	08
Total	64	100

6.6 PROJECT WORK

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Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given for a group. The students should identify or given project assignment at least two to three months in advance. The project work identified in collaboration with industry may be preferred.

Each teacher is expected to guide the project work of 4-5 students.

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr . No.	Performance criteria	Max . mar ks	Rating Scale				
			Excell ent	Ver y good	Goo d	Fai r	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		100	100	80	60	40	20

The overall grading of the practical training shall be made as per following table

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared “not eligible to receive diploma”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

Important Notes

- 1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**
- 2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
- 3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
- 4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.