6.1 INDUSTRIAL MANAGEMENT

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RATIONALE

The knowledge of this subject is required of all diploma holders who wish to choose industry/field as this career. This course is designed to develop understanding of various functions of management, role of workers and engineers and providing knowledge about safety and labour, industrial laws and management in different areas.

DETAILED CONTENTS

1. Principles of Management (2 hrs)

   - Management, different functions of management: Planning, organizing, coordination and control.
   - Structure of an industrial organization.
   - Functions of different departments. Relationship between individual departments.

2. Human and Industrial Relations (4 hrs)

   - Human relations and performance in organization.
   - Understand self and others for effective behaviour.
   - Behaviour modification techniques.
   - Industrial relations and disputes.
   - Relations with subordinates, peers and superiors.
   - Characteristics of group behaviour and trade unionism.
   - Mob psychology
   - Grievance, handling of grievances.
   - Agitations, strikes, lockouts, picketting and gherao
   - Labour welfare.
   - Workers' participation in management.

3. Professional Ethics (4 hrs)

   - Concept of ethics.
   - Concept of professionalism.
   - Need for professional ethics.
   - Code of professional ethics.
   - Typical problems of professional engineers.
   - Professional bodies and their role.

4. Motivation (4 hrs)

   - Factors determining motivation
   - Characteristics of motivation.

- Methods for improving motivation.
- Incentives, pay, promotion, rewards.
- Job satisfaction and job enrichment.

5. Leadership (4 hrs)

- Need for leadership.
- Functions of a leader.
- Factors for accomplishing effective leadership.
- Manager as a leader.

6. Human Resource Development (4 hrs)

- Introduction.
- Staff development and career development.
- Training strategies and methods

7. Wage Payment (4 hrs)

- Introduction
- Classification of wage payment scheme.

8. Labour, Industrial and Tax Laws (4 hrs)

- Importance and necessity of industrial legislation.
- Types of labour laws and disputes.
- Brief description of the following Acts: The Factory Act 1948; Payment of Wages Act 1936; Workmen Compensation Act 1923; Industrial Dispute Act 1947; Employee' State Insurance Act, 1948; Provident Fund Act.
- Various types of Taxes-Production Tax, Local Tax, Sales Tax, Excise Duty, Income Tax.
- Labour Welfare schemes.

9. Accidents and Safety (4 hrs)

- Classification of accidents; according to nature of injuries i.e. fatal, temporary; according to event and according to place.
- Causes of accidents-psychological, physiological and other industrial hazards.
- Effects of accidents.
- Accidents-prone workers.
- Action to be taken in case of accident with machines, electric shock, road accident, fires and erection and construction accidents.
- Safety consciousness & publicity.
- Safety procedures.
- Safety measures-Do's and don'ts & good housekeeping (5S).
- Safety measures during executions of Electrical Engineering works.

10. Environmental Management (4 hrs)

Basics of environmental pollution, various management techniques for control of environmental pollution, various control acts for air, water, solid waste and noise.

11. Materials Management (4 hrs)

Material 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, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

12. Financial Management (3 hrs)

Important, ledger, Journal, Profit and Loss Account, Balance Sheet, Interpretation of Statements, Ration Analysis, Project financing, Project appraisal, return on investments.

13. Marketing and Sales (3 hrs)

Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligraphy, perfect competition, Cost Elements of Cost, Contribution, Break even analysis, Budgets, Pricing Policies.

RECOMMENDED BOOKS

1. Industrial Engineering and Management by TR Banga.
2. Industrial Engineering and Management by OP Khanna, Dhanpat Rai Publications, Delhi.
3. Industrial Management by VK Sharma, OP Harkut.
4. Sharma BR, Environmental and Pollution Awareness: Satya Prakashan, New Delhi.
5. Thakur Kailash, Environment Protection Law & Policy in India: Deep & Deep publication, New Delhi.
6. Handbook of Small Scale Industry by P.M. Bhandari.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Principles of Management by Philip Kotler, TEE Publication.
9. Industrial Organisation and Management by Tara Chand, Nem Chand and Brothers, Roorkee

6.2 INSPECTION AND QUALITY CONTROL

L	T	P
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RATIONALE

Diploma holders in this course required to measure and inspect for ensuring quality of product. For this purpose, knowledge and skills about standards of measurement, limits, fits and tolerances, types of inspection and various measuring instruments, SQC & quality standards are necessary. Hence this subject.

DETAILED CONTENTS

1. **Inspection** (8 hrs)

- Introduction, units of measurement, standards for measurement and interchangeability.
- International, national and company standard, line and wavelength standards.
- Limits fits and tolerances: study of natural variability of process. Indian standards on limits, fits and tolerances including terminology, guide for selection of fits, clearance, transition and interference. Positional tolerances: maximum material condition usage of standards for deciding tolerance.
- Planning of inspection: what to insect? When to inspect? Who should inspect? Where to inspect?
- Types of inspection: remedial, preventive and operative inspection, incoming, in-process and final inspection.
- Study of factors influencing the quality of manufacture.

2. **Measurement and Gauging** (18 hrs)

- Basic principles used in measurement and gauging, mechanical, optical, electrical and electronic.
- Study of various measuring instruments like: calipers, micrometers, dial indicators, surface plate, straight edge, try square, protectors, sine bar, clinometer, comparators – mechanical, electrical and pneumatic. Slip gauges, tool room microscope, and profile projector, talysurf.
  Limit gauges: plug, ring, snap, taper, thread, height, depth, form, feeler, wire and their applications for linear, angular, surface, thread and gear measurements, gauge tolerances.
- Geometrical parameters & errors:
  Errors & their effect on quality, concept of errors, measurement of geometrical parameter such as straightness, flatness & parallelism.
- Study of procedure for alignment tests on lathes, drilling and milling machines.
- Testing and maintenance of measuring instruments.

3. **Statistical Quality Control** (12 hrs)

- Basic statistical concepts, empirical distribution and histograms, frequency, mean, mode, standard deviation, normal distribution, binomial and Poisson (No mathematical derivations).
- Introduction to control charts, namely X, R, P and C charts and their applications.

- Sampling plans, selection of sample size, method of taking samples, frequency of samples.
- Inspection plan format and test reports
- Concept of total quality management (TQM)

4. **Standards and Codes** (4 hrs)

- National and International Codes.
- ISO-9000, concept and its evolution and implications.

5. **Instrumentation** (6 hrs)

Measurement of mechanical quantities such as displacement, vibration, frequency, pressure temperature, humidity by electro mechanical transducers of resistance, capacitance & inductance type.

LIST OF PRACTICALS

1. Use of dial indicator for measuring taper.
2. Use of combination set, bevel protector and sine bar for measuring taper.
3. Measurement of thread characteristic using vernier and gauges.
4. Measurement of all elements of gauges by using flange micrometer, gear roller tester, gear tooth vernier and profile projector.
5. Use of slip gauge in measurement of center distance between two pins.
6. Use of tool maker's microscope and comparator.
7. Verify that when random samples are taken from a universe with a certain percentage of defectives same percentage tends to appear in random samples by using (Shewart's plastic kit box).
8. Plot frequency distribution for 50 turned components.
9. With the help of given data, plot X, R, P and C charts.

LIST OF RECOMMENDED BOOKS

1. Statistical Quality Control by M.Mahajan: Dhanpat Rai and Sons, Delhi
2. Engineering Metrology by RK Jain
3. Engineering Metrology by RK Rajput; SK Kataria and Sons
4. Production Planning Control and Management by KC Jain & Aggarwal; Khanna Publishers, New Delhi

6.3 AUTOMOBILE ENGINEERING

L	T	P
3	-	2

RATIONALE

These days, automobiles has become a necessity instead of luxury. There has been phenomenal development of Automobile industry. The Diploma holders in Mechanical Engineering are required to supervise production and repair and maintenance of vehicles. For this purpose, knowledge and skills are required to be imparted to them regarding automobile industry as a whole. This subject aims at developing required knowledge and skills in this area:

DETAILED CONTENTS

1. Introduction (4 hrs)

- Components of an automobile
- Classification of automobiles
- Layout of chassis
- Types of drives-front wheel, rear wheel, four wheel, left hand, right hand

2. Transmission System (12 hrs)

- Clutch Function, Constructional details and working of single plate and multiplate friction clutches, Centrifugal and semi centrifugal clutch
- Gear Box – Function, construction and working of sliding mesh, constant mesh and synchromesh gear box, Torque converter and overdrive, fluid coupling
- Function of Universal joint, propeller shaft, Function and construction of differential, Rear axle drives. Function of rear axle and different types of rear axles
- Wheels and Tyres-Types of wheels - disc wheels and wire wheel, Types of tyres used in Indian vehicles, Toe in, toe out, camber, caster, kingpin inclination, Tubeless tyres

3. Steering System (5 hrs)

- Function and principle
- Ackerman and Davis steering gears

- Types of steering gears - worm and nut, worm and wheel, worm and roller, rack and pinion type

4. Braking system (5 hrs)

- Constructional details and working of mechanical, hydraulic and vacuum brake
- Details of master cylinder, wheel cylinder
- Concept of brake drum, brake lining and brake adjustment

5. Suspension System (4 hrs)

- Function
- Types
- Working of coil spring, leaf spring Shock absorber
- Shock absorber

6. Battery (6 hrs)

- Constructional details of lead acid cell battery
- Specific gravity of electrolyte – effect of temperatures on specific gravity
- Capacity and efficiency of battery
- Battery charging, chemical reactions during charge and discharge.
- Maintenance of batteries
- Checking of batteries for voltage and specific gravity

7. Dynamo and Alternator (6 hrs)

- Dynamo - Function and details, Regulators - voltage current and compensated type, Cutout - construction, working and their adjustment
- Alternator-Construction and working, Charging of battery from alternator

8. Diagram of a Typical Wiring System (2 hrs)

9. Lighting System and Accessories (4 hrs)
   - Lighting system
   - Wiring circuit
   - Headlight, aiming of headlights
   - Lighting switches
   - Direction indicators
   - Windscreen wiper
   - Horn
   - Speedometer
   - Heater
   - Air conditioning

LIST OF PRACTICALS

1. Fault and their remedies in (i) Battery Ignition system (ii) Magneto Ignition system
2. Study and sketch of (i) Head Light Model (ii) Wiper and Indicators
3. Study and sketch of (i) AC Pump (ii) SU Pump (iii) Master Cylinders
4. Study and sketch of (i) rear axle (ii) differential (iii) steering system
5. Fault finding practices on an automobile - four wheelers (petrol and diesel vehicles)
6. Assembly and disassembly of petrol and diesel engine of an automobile.
7. Tuning of an automobile engine.
8. Driving practice on a four wheeler.
9. Charging of an automobile battery and measuring cell voltage and specific gravity of electrolyte.
10. Phasing and calibration of fuel injection pump
11. Checking and adjusting clutch pedal play and brake pedal play, tightness of fan belt plate and brake shoe
12. Rotation of wheels and inflation of tyres, alignment of wheels
13. Measuring spark gap, valve clearance and ring clearance
14. Cleaning and adjusting a carburetor
15. Nozzle cleaning, testing and adjustment

RECOMMENDED BOOKS

1. Automobile Engineering Vol. I by Kirpal Singh; Standard Publishers, New Delhi.
2. Automobile Engineering Vol. I by GBS Narang; Khanna Publishers, Delhi.
3. Automobile Engineering by RB Gupta; Satya Parkashan, New Delhi.

6.4 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

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RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS

(1) Entrepreneurship (4 hrs)

- 1.1 Concept/Meaning
- 1.2 Need
- 1.3 Competencies/qualities of an entrepreneur

(2) Entrepreneurial Support System (6 hrs)

- 2.1 District Industry Centres (DICs)
- 2.2 Commercial Banks
- 2.3 State Financial Corporations
- 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

(3) Market Survey and Opportunity Identification (Business Planning) (6 hrs)

- 3.1 How to start a small scale industry
- 3.2 Procedures for registration of small scale industry
- 3.3 List of items reserved for exclusive manufacture in small scale industry
- 3.4 Assessment of demand and supply in potential areas of growth
- 3.5 Understanding business opportunity
- 3.6 Considerations in product selection
- 3.7 Data collection for setting up small ventures

(4) Project Report Preparation (6 hrs)

- 4.1 Preliminary Project Report
- 4.2 Techno-Economic feasibility report
- 4.3 Project Viability

(5) Managerial Aspects of Small Business (8 hrs)

5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control
5.2 Operational Aspects of Production
5.3 Inventory Management
5.4 Basic principles of financial management
5.5 Marketing Techniques
5.6 Personnel Management
5.7 Importance of Communication in business

(6) Legal Aspects of Small Business (6 hrs)

6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
6.2 Factory Act and Payment of Wages Act

(7) Environmental considerations (6 hrs)

7.1 Concept of ecology and environment
7.2 Factors contributing to Air, Water, Noise pollution
7.3 Air, water and noise pollution standards and control
7.4 Personal Protection Equipment (PPEs) for safety at work places

(8) Miscellaneous (6 hrs)

8.1 Human relations and performance in organization
8.2 Industrial Relations and Disputes
8.3 Relations with subordinates, peers and superiors
8.4 Motivation – Incentives, Rewards, Job Satisfaction
8.5 Leadership
8.6 Labour Welfare
8.7 Workers participation in management

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari

7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

6.5 INSTALLATION, TESTING & MAINTENANCE

L	T	P
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RATIONALE

A diploma engineer comes across installation, maintenance and testing of various machines and equipment in industries. The layout of different machines, their foundations is an important phenomenon of an industry. He should know the various methods of testing & maintenance. This subject will enable the diploma holders to deal with such aspects.

DETAILED CONTENTS

1. **Introduction** (4 hrs)

   - Necessity of testing, repair and maintenance
   - Economic aspects, manpower planning and materials management
   - Fits and tolerances – common fits and tolerances used for various machine parts

2. **Execution and Commissioning of Machines (Installation)** (4 hrs)

   - Location, layout and positioning of machines
   - Foundation – types of foundation, foundation plan, erection and leveling, grouping, vibration damping, vibration isolation – methods of isolation

3. **Inspection, Servicing, Repair & Overhauling of machines and equipment** (8 hrs)

   - Inspection of various machines and equipment
   - Servicing of various machines and equipment
   - Repair of various machines and equipment
   - Overhauling of various machines and equipment
   - Recalibration of various measuring instruments, testing the speed of machines, accuracy of machines, alignment and performance of machines.

4. **Maintenance planning & stages of maintenance** (6 hrs)

   - Maintenance planning
   - Various stages of maintenance

5. **Reliability, availability and Maintainability** (4 hrs)

6. **Overhauling** (6 hrs)

   - Frequent failure of common parts, their causes & remedical measures.
   - Maintenance schedule**.**
   - Parts which require frequent maintenance such as belts, couplings, nut, bolts, their repair & maintenance to avoid downtime.

7. **Maintenance** (10 hrs)

- Meaning of maintenance, advantages & disadvantages
- Types of maintenance
- Preventive, predictive & breakdown maintenance.
- Maintenance organization.
- Centralized maintenance & decentralized maintenance.
- Computerization of maintenance.

8. **Storage of parts:** (6 hrs)

- Storage of parts used frequently for replacement and parts which are not easily available in local market.
- History cards of different machines.
- Machines repair/replacement decision.

LIST OF PRACTICALS

1. Preparation of prevention maintenance check.
2. Condition monitoring by NDT.
3. Case study on trouble free maintenance.
4. Project on maintenance of utility equipment like compressors, pumps, driers, and actuator type valves.
5. Equipment/machine leveling and alignment.
6. Maintenance of material handling equipment – pulley blocks, hand operated cranes, fork fits, hydraulics jacks, mobile cranes, and winches.
7. Use of lubrication equipment like oil gun, grease gun.
8. Removing old lubricant, cleaning and replenishing and machine with fresh lubricant.
9. Case study on computerized maintenance schedule.
10. Reconditioning of machine parts.
11. Visit to maintenance department of an industry & prepare a report.

RECOMMENDED BOOKS

1. Industrial Maintenance by HP Garg; S. Chand and Company.
2. Plant Maintenance Engineering by RK Jain; Khanna Publishers.
3. Installation, Servicing and Maintenance by SN Bhattacharya; S. Chand and Company.
4. Installation, Maintenance, Servicing by AR Basu; M Dutta and Co., Calcutta.
5. Maintenance Engineering and Management by RC Mishra and K Pathak; Prentice Hall of India Pvt., Ltd., New Delhi.

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 5-6 students.

- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics of production
- Projects connected with repair and maintenance of plant and equipment
- Projects related to identification of raw material thereby reducing the wastage
- Any other related problems of interest of host industry

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. marks**	**Rating Scale**				
			Excellent	**Very good**	**Good**	**Fair**	**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 organisations 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.