GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Mechanical Engineering / Mechanical Engineering (CAD/CAM)

Subject Code: DI04000261

Subject Name: Industrial Engineering and Management

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	Professional Elective - I

Prerequisite:	Zeal to learn the subject.
Rationale:	The overall prosperity of a nation is fundamentally linked to the productivity and quality of its industrial sector. Industries serve as the backbone of economic development, driving innovation, employment, and global competitiveness. To thrive in both domestic and international markets, it is imperative that all stakeholders including technical managers, engineers, plant operators, machine operators, supervisors, and workers adhere strictly to established standards of production. Industrial engineering always aims to achieve higher productivity and better standards of quality through its constant endeavor in design, improvements and installation of integrated systems of human resource, machines and methods.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Interpret health, welfare, and safety provisions of the Factories Act, 1948.	U
02	Analyze work content and calculate standard time in a given situation.	A
03	Apply production planning and statistical quality control with its applications.	A
04	Identify the basic principles, approaches and principles of management and recognize concepts to specific situations.	R
05	Appreciate the concept of recent trends for improving industrial efficiency and quality.	U

Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	**T**	**PR**	**C**	**ESE(E)**	**PA(M)**	**PA(I)**	**ESE(V)**	
3	0	2	4	70	30	20	30	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weight age
1.	**Plant layout, Industrial Disputes and Safety:** 1.1 Plant, Plant layout and its types. 1.2 Industrial disputes, Settlement of Industrial disputes, Collective bargaining, Conciliation, Mediation, Arbitration. 1.3 Indian Factories Act 1948 and its provisions related to health, welfare and safety.	5	12
2.	**Work study:** 2.1 Work study- Introduction, definition, techniques and role to enhance productivity. Basic procedure of method study. 2.2 Methods of recording data for method study using standard symbols, process charts and diagrams. 2.3 Preparation of operation (outline) process chart for given mechanical assembly components. 2.4 Preparation of flow process chart and flow diagram. Multiple activity chart. 2.5 Develop questioning techniques in analyzing data for method study. Also develop and improve the method, based on analysis of given data for operation process chart and flow diagram. 2.6 Principles of motion economy applied in (a) use of human body, (b) design of work place layout & (c) design of tools and equipment. 2.7 Micromotion study. 2.8 Basic procedure of work measurement and equipments used in time study. Work elements and their types. 2.9 Cumulative and fly back time measurement method. Concept of rating & rating scale. 2.10 Time study Allowances-type, normal values and applications. 2.11 Work content and Calculation of basic time and standard time. 2.12 Concept of work sampling/ activity sampling.	14	32
3.	**Production Planning & Quality Control:** 3.1 Production Planning and Control (PPC)- Introduction, Major functions. 3.2 Concept of Critical Path Method (CPM). 3.3 Basics of plant layout, Types of Production i.e. Mass Production, Batch Production and Job Order Production. 3.4 Economic Batch Quantity (EBQ), Make or Buy decision	10	21

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	3.5 Quality Control: Definition, Objectives, Types of Inspection: First piece, Floor and Centralized Inspection, Advantages and Disadvantages. 3.6 Statistical Quality Control (SQC), Types of Measurements, Variable and attribute type control charts, Uses of X bar & R chart interpretations & examples. 3.7 Uses of p and c charts, interpretations & examples. Application of software tool for SQC like Minitab, MS Excel etc. 3.8 Operating Characteristics curve (O.C. curve), AQL.		
4.	**Principles of Industrial Management:** 4.1 Management, Administration, and Organization, F.W. Taylor's and Henry Fayol's Principles of Management. 4.2 Concept of zero inventory, Just in time (JIT). 4.3 Quality circle, zero defect, 5S concept. 4.4 Training of Workers: Its types, Apprentice Training. 4.5 On the Job training and Vestibule School Training, Job Evaluation and Merit Rating, Objectives and importance.	10	21
5.	**Recent trends:** 5.1 Concept of Lean and Six Sigma and Applications of Lean Six Sigma in manufacturing and service industries. 5.2 Reliability, availability and maintainability, distribution of failure and repair times, determination of MTBF and MTTR. 5.3 Sustainable Manufacturing: Concept of Triple Bottom Line (TBL) Concept of carbon footprint. Life Cycle Assessment (LCA) Tools. 5.4 Artificial Intelligence in Industry: Recently used AI tools in industrial Engineering. Applications in predictive maintenance, quality control and supply chain optimization.	6	14
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
21	28	21	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

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References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication
1.	Industrial Engineering & Management	S. C. Sharma, T. R. Banga	Khanna Book Publishing Co. (P) Ltd., New Delhi
2.	Industrial Engineering and Management	O.P. Khanna	Dhanpat Rai Publications (P) Ltd., New Delhi
3.	Statistical Quality Control	Eugene Grant, Richard Leavenworth	McGraw Hill Education (India) Private Limited, Noida
4.	Management: A Global, Innovative and Entrepreneurial Perspective	Heinz Weihrich, Mark V. Cannice, Harold Koontz	McGraw Hill Education (India) Private Limited, Noida
5.	Essentials of Management	Joseph L. Massie	Prentice Hall India Learning Private Limited, New Delhi
6.	Principles of Management	Premvir Kapoor	Khanna Publishing House, New Delhi

(b) Open-source software and website:

1. https://www.minitab.com/en-us/products/minitab/free-trial/ (Minitab Free Trial)
2. https://maitri.mahaonline.gov.in/pdf/factories-act-1948.pdf (Indian Factories Act 1948)
3. https://www.youtube.com/watch?v=qliO4B_ZQko (Plant Safety)
4. https://tinyurl.com/ycybfkuj (Work Study)
5. https://youtu.be/5V84h5PAjAQ?si=3mh9S5XE33ejFdLF (Method Study)
6. https://youtu.be/TlPJPJfstB8?si=sL4yqzsQqAfqfJSL (Time & Motion Study)
7. https://www.youtube.com/watch?v=0ufrez3JMIQ (Work Measurement & methods)
8. https://www.youtube.com/watch?v=1GjR6zySO04 (Standard time calculation)
9. https://www.youtube.com/watch?v=7y-Iom0RTO4 (Critical Path Method)
10. https://www.youtube.com/watch?v=dDzsFuOR-8o (Economic Batch Quantity)
11. https://www.youtube.com/watch?v=n8VeldCFea4 (O. C. Curve)
12. https://www.youtube.com/watch?v=ZaHiNsloTm0 (Acceptance Sampling)
13. https://www.youtube.com/watch?v=68rI_EP-c4w (Vestibule Training)
14. https://www.youtube.com/watch?v=4EDYfSl-fmc (Six Sigma)
15. https://www.youtube.com/watch?v=7YZaWarCrpQ (Sustainable Manufacturing)

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Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Approx. Hrs. Required
01	To study about safety practices followed by industry and provisions of Indian Factories Act 1948.	02
02	To study & Prepare Operation Process Chart (OPC) for given assemblies.	04
03	To study & Prepare Flow Diagram & Flow Process Chart for given assemblies.	02
04	To study & Prepare Man-Machine Chart for the given situation.	02
05	To study & calculate co-efficient of correlation for time study person using performance rating technique.	02
06	To study & calculate standard time for a given job.	02
07	To construct and interpret X bar & R chart for given data of production.	02
08	To construct and interpret c & p chart for given data of production.	02
09	To calculate all required data & prepare charts given in experiment no 8 & 9 using software tool.	02
10	To prepare sampling plan & decide about acceptance or rejection of a particular product using specific sampling plans for given data.	04
11	Presentation/Seminar on any topics given in **Unit– IV & V**.	04
12	*Industrial Visit:* Visit at least one/two related industries. Prepare the report as per given guidelines provided in notes.	-
Total (Hours)		**28**

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment/instrument name with broad specification	Qty.
1.	Decimal stopwatch (Non fly back type)	02 pcs.
2.	Decimal stopwatch (Fly back type)	02 pcs.
3.	Playing cards	2 sets
4.	MS Pins 10 mm diameter $\times$ 15 mm length with tolerance of $\pm$ 0.01mm	100 pcs.

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5.	Buttons of 6 different colors	100 of each
6.	Sampling rack with 1000 washers	1 set

Suggested Project List:

A representative list of projects is given here. The concerned faculty can add similar projects based on student activities (chart/presentation/report/model/animation):

1. Case study on accident happened in any industry with root cause and remedies.
2. Prepare a display chart of OPC, FD, FPC & Man-machine chart (anyone chart).
3. Prepare a summary report of different software tools used for SQC.
4. Case study on Critical Path Method (CPM) for projects/tasks used in industry (like https://blacksmithint.com/understanding-critical-path-in-manufacturing/).
5. Application of TQM in any industry.
6. Case study on application of Quality circle, zero defect concept and 5S Concept in organization (anyone concept).
7. Make a PowerPoint presentation on anyone recent trend applied in industry relevant to subject.
8. Application of Industrial Engineering & Management techniques and tools in any service sector.

Suggested Activities for Students:

These are sample strategies that the course teacher can use to accelerate the attainment of the various outcomes in this course.

Sr. No.	Unit	Unit Name	Activities
1	I	Plant layout, Industrial Disputes and Safety	Videos on topic and safety manuals / guidelines.
2	II	Work Study	Videos on work study, live discussion at workshop place, presentations.
3	III	Production Planning & Quality Control	Videos on QC, live cases during industrial visits, power point presentations, failure analysis with rejected live parts.
4	IV	Principles of Industrial Management	Videos on topics of principles of management, industrial visits, power point presentations.
5	V	Recent trends	Videos on trends and presentations.

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