Program : **Diploma in Mechanical Engineering / Tool and Die Engineering / Manufacturing Technology**	
Course Code : **4024**	Course Title: **Industrial Engineering**
Semester : **4**	Credits: **No Credit**
Course Category: **Program Core**	
Periods per week: **3 (L:3, T:0, P:0)**	Periods per semester: **45**

Course Objectives:

- To introduce the basic role of an industrial engineer starting from the production planning to the costing.
- To have systematic and comprehensive understanding on various aspects related with industrial engineering such as plant location and plant layout, production planning and control, scheduling, forecasting, statistical quality control, total quality management, work study, method study and work measurement etc and its relevance in the industrial environment

Course Prerequisites:

Topic	Course code	Course name	Semester
Knowledge of basic Mathematics		Mathematics I&II	1&2

Course Outcomes:

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

COn	Description	Duration (Hours)	Cognitive Level
CO1	Describe the functions of PPC, different types of plant layout and plant maintenance	11	Understanding
CO2	Apply method study and work measurement techniques in job standardization.	10	Applying
CO3	Interpret the control charts used in quality control.	12	Applying
CO4	Explain the risks involved in acceptance sampling, components of selling price of a product and the depreciation of assets.	10	Applying
	Series Test	2	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2						
CO2	2	2					
CO3	3	3					
CO4	3	3					

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Describe the functions of PPC, different types of plant layout and plant maintenance**		
M1.01	Recognize the functions of Production Planning and Control	4	Understanding
M1.02	List factors affecting the site selection for industry	1	Remembering
M1.03	Classify Plant location, Plant layout and Production Process	3	Understanding
M1.04	Explain the material handling system in an industry	1	Remembering
M1.05	Recognize the importance of plant maintenance	2	Understand
Contents **Production Planning and Control (PPC):** Introduction to functions of PPC- Forecasting – Definition and Methods; Routing – Definition and Procedure; Scheduling – Definition factors affecting scheduling- Gantt chart; Dispatching – Definition and orders in dispatching. Concept of production and productivity, Methods for improving productivity Types of Production: Mass Production, Batch Production and Job Order Production. **Plant Engineering:** Factors for Selection of site of industry; Plant layout; Types; Process; Product, Fixed position, Combination layout; Principles of Material handling equipment; Types of material handling equipments – AGV, forklift truck, cranes, conveyor, hoist (Introduction only) **Plant maintenance:** Importance; Bathtub curve; Planned and Condition based maintenance; Break down maintenance; Preventive maintenance, Predictive maintenance and Scheduled maintenance			
CO2	**Apply method study and work measurement techniques in job standardization.**		
M2.01	Recognize the need for work study	1	Understanding
M2.02	State the method study and time study procedure	2	Remembering

M2.03	Describe the symbols and charts for method study	3	Understanding
M2.04	Calculate standard time for jobs with few elements	4	Applying
	Series Test 1	1	

Work Study: Definition

Method Study: Definition; Objectives; Basic procedure for conduct of Method study;

Tools used; Operation process chart; Flow process chart; Two handed process chart; Man, Machine chart; String diagram and flow diagram.

Therbligs – Symbols, SIMO chart.

Work Measurement: Definition; Basic procedure in making a time study; Employees rating factor; Application of time allowances: Rest, Personal, Process, Special and Policy allowances; Calculation of standard time; Numerical Problems;

CO3	**Interpret the control charts used in quality control**		
M3.01	Describe quality control and classify the inspection process	2	Understanding
M3.02	Use the Statistical concept to measure central tendency and dispersion	4	Applying
M3.03	Sketch the proper control chart for variables and attributes	6	Applying

Contents

Quality Control: Definition; Objectives; QC Process -Types of Inspection- First piece, Floor and Centralized Inspection; Advantages and Disadvantages;

Statistical Quality Control (SQC): Definition, Normal distribution.

Measure of central tendency and dispersion- Mean, Median, Mode, Standard Deviation, Variance- numerical problems

Variables; Attributes; Normal Curve; Uses of X-bar, R, p and c charts; Simple problems

CO4	**Explain the risks involved in acceptance sampling, components of selling price of a product and the depreciation of assets.**		
M4.01	Describe the Operating Characteristics curve	2	Understanding
M4.02	Explain the Principal Constituents in Estimating	1	Understanding
M4.03	Calculate Selling price of a product	4	Applying
M4.04	Calculate the Depreciation using different methods	3	Applying
	Series Test II	1	

Acceptance Sampling: Operating Characteristics curve- Terms in acceptance sampling

O.C curve for Ideal plan and General plan; sampling plan- single, double, multiple sampling plan

Estimating: objectives-Principal Constituents of project estimate

Costing: objectives - -elements of cost -material cost, labour cost, expenses -Direct Cost; Indirect Cost; overheads-types of Overhead; cost structure- Prime Cost; Factory Cost; Office Cost; Selling Price of a product; Numerical Problems; Comparison Between Estimating and Costing

Depreciation: Definition; Causes; Methods: Straight line, Sinking fund, Diminishing Balance Method, Annuity method, Sum of the years digit method; Numerical Problems.

Text / Reference:

T/R	Book Title/Author
T1	M. Mahajan, Statistical Quality Control. Dhanpat Rai Publishing Co Pvt Ltd.
T2	O.P. Khanna, Industrial Engineering and Management, Revised Edition, New Delhi: Dhanpat Rai Publications (P) Ltd.
R1	R. Keith Mobley, Maintenance Fundamentals. 2nd Edition. Elsevier.

Online resources:

Sl.No	Website Link
1	https://nptel.ac.in/courses/112/107/112107142/
2	https://onlinecourses.swayam2.ac.in/nou20_cs07/preview