GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL ENGINEERING (19)
INDUSTRIAL ENGINEERING
SUBJECT CODE: 2161907
B.E. 6th SEMESTER

Type of course: Under Graduate

Prerequisite: None**.**

Rationale:
Industrial Engineering course is to prepare students to understand different aspects like: Plant location and its selection, Plant layout within the plant. It also helps to understand and apply different concept of production planning and control. Study of productivity and Work-study are important tools, after studying it student are able to apply it in the industry for productivity improvement. This course gives idea about how to prepare job plan, and also gives knowledge of industrial legislation. Finally it provides knowledge about quality and entrepreneurship.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Location Selection and Plant Layout:** Nature of Location Decision, Importance of Plant Location, Dynamic Nature of Plant Location, Choice of site for selection, Comparison of location, Principles of Plant layout and Types, factors affecting layout, methods, factors governing flow pattern, travel chart, analytical tools of plant layout, layout of manufacturing shop floor, repair shop, services sectors and process plant. Quantitative methods of Plant layout: CRAFT and CORELAP, Relationship diagrams.	**08**	**15%**
2	**Production Planning and Control:** Types of Production systems and their Characteristics, functions and objectives of Production Planning and Control, Sales forecasting: Techniques and Applications, Steps of Production Planning and Control: Process planning, Leading, Scheduling, Dispatching and Expediting with illustrative examples, Introduction to line of balance, assembly line balancing, and progress control.	**08**	**18%**
3	**Productivity and Work Study:** Definition of productivity, application and advantages of productivity improvement tools, reasons for increase and decreases in productivity. Areas of application of work study in industry. Reaction of management and labour to work study. Method Study: Objectives and procedure for methods analysis, Recording techniques, Operations Process Chart, Flow Process Chart, Man-Machine , Multiple Activity Chart, Travel Chart, and Two Handed process chart, String Diagram, Therbligs, Micro motion and macro-motion study: Principles	**08**	**20%**

	of motion economy, Normal work areas and work place design. Work Measurement: Objectives, Work measurement techniques – time study, work sampling, pre-determined motion time standards (PMTS) Determination of time standards. Observed time, basic time, normal time, rating factors, allowances, and standard time. Introduction to ergonomics.		
4	**Job Evaluation and Wage Plan:** Objective, Methods of job evaluation, job evaluation procedure, merit rating (Performance appraisal), method of merit rating, wage and wage incentive plans.	**05**	**10%**
5	**Industrial Legislation:** Need for Industrial legislation, Factories act 1948, Industrial dispute act 1947, The Indian trade unions act 1926, Industrial employment act 1946, Payment of wage act 1936, Workmen compensation act 1923, Payment of bonus act 1965, Employees provident fund scheme 1952.	**05**	**10%**
6	**Inspection and Statistical Quality Control:** Inspection – functions, types, objectives and benefits, quality control principles, Concepts of quality circles, Total quality management, Quality assurance, Quality audit, Basic Concept ISO 9000, ISO 14000 and QS 9000, Six sigma: Concept, Principle, Methodology, Scope, Advantage and limitations. SQC Concept, variable and attributes, normal distribution curves and its property charts for variable and attributes and their applications and interpretation (analysis) process capability. Acceptance sampling, sampling plans, OC curves and AOQ curves.	**08**	**20%**
7	**Entrepreneurship:** Concept, product identification, infrastructure facilities, preparation of project report, sources of industrial finance, Resources allocation, Government incentives to entrepreneurs.	**03**	**07%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**15**	**15**	**10**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Manufacturing Organisation and Management, Harold Amrine, John Ritchey, Moodie, Kmec, 6ht Ed., Pearson
2. Production System, Planning, Analysis and Control – By J.L. Riggs 3rd ed. Wiley
3. Production and Operations Management – By R. Panneerselvam, PHI Private Ltd.,
4. Industrial Engineering and Production Management Martand Telsang S Chand & company.
5. Industrial Engineering and Production Management by Banga and Sharma, Khanna Publishers.
6. Industrial Engineering and Management by Dr. B. Kumar Khanna Publishers
7. Work study by International Labour Organisation, ILO

Course Outcome:

After learning the course the students should be able to:

1. Demonstrate location decision and site selection
2. Use of plant layout knowledge for betterment of plant
3. Use of Production planning and control
4. Solve forecasting problem by applying different techniques
5. Understanding planning, scheduling and sequencing problems for shop floor
6. Demonstrate assembly line balancing and dispatching
7. Apply work study techniques and understands its importance for better productivity
8. Demonstrate wage and incentive plans
9. Acquire knowledge of industrial legislation
10. Apply statistical quality control techniques for inspection
11. Learn about entrepreneurship to become entrepreneur

List of Experiments:

1. Case study demonstration on location decision and site selection
2. Case study on plant layout problem
3. Exercise on Production planning and control: planning, scheduling and sequencing problems for shop floor
4. Exercise on forecasting problem by applying different techniques
5. Simple Exercise on assembly line balancing and line of balance.
6. Exercise on OPC, FPC, Travel chart
7. Exercise on Method study, Motion Study and work measurement
8. Problems on wage and incentive plans
9. Exercise on statistical quality control techniques

Design based Problems (DP)/Open Ended Problem:

1. Report preparation on plant layout and site selection for different industries
2. Operation and flow process chart for different products
3. Work Measurement case study
4. Real life problems on statistical quality control problems

Major Equipment:

1. **Work study exercise kit:**

List of Open Source Software/learning website:

1. www.nptel.ac.in/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.