



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code:3151509

Semester –V

Subject Name: Work System Design and Ergonomics

Type of course:

Prerequisite: Nil

Rationale:

Study of productivity and Work-study are important tools, this is subject students gets in-depth knowledge for analysis of all the elements, factors, resources and relationships affecting the efficiency and effectiveness of the work being studied. The course also aims at scientifically establishing the time required for a qualified worker to carry out a work element at a defined rate of working. Ergonomic aspects of work system design are also included in the course contents. The scope of this subject is not only limited to the manufacturing applications but it is also relevant for service sector industry.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Work System Design: Introduction and Concept of Productivity, Measurement of Productivity, Productivity Measures, Productivity Measurement Models. Factors Influencing Productivity, Causes of Low Productivity, Productivity Measurement Models, Productivity Improvement Techniques, and Numerical Problems on productivity, Case study on productivity.	08
2	Work Study: Basic Concept, Steps Involved in Work Study, Concept of Work Content, Techniques of Work Study, Human Aspects of Work Study. Method Study: Basic Concept, Steps Involved in Method Study, Recording Techniques, Operation Process Charts, Flow Process Charts, Two-Handed-Process Charts, Multiple Activity Charts, Flow Diagrams. String Diagrams. Principles of Motion Economy: Micro-Motion Study, Therbligs, SIMO Charts. Memo-Motion Study, Cycle graph and Chrono-Cycle Graph, Critical Examination Techniques, Development and Selection of New Method, Installation and Maintenance of Improved Methods.	12
3	Work Measurement: Basic Concept, Techniques of Work Measurement, Steps Involved in Time Study, Time Study Equipment, Performance Rating. Performance Rating: Examples, Allowances,	10



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	Computation of Standard Time, Numerical on Computation of Standard Time. Work Sampling: Basics, Procedure of Work Sampling Study, Numerical Problems on work sampling, Introduction to Synthetic Data and PMTS, Introduction to MTM and MOST, Job evaluation and incentive schemes: Starlight line, Tailor, Merrick and Gantt incentive plans	
4	Ergonomics: Basic Concept, Industrial Ergonomics, Human factor engineering: Definition and history of development of human factors engineering, Types & characteristics of man-machine-system, Relative capabilities of human being and machines; development and use of human factor data; information input and processing, Introduction to information theory; factors effecting information reception and processing; coding and selecting of sensory inputs.	08
5	Human physical dimension concern: Human body: Structure and function, anthropometrics. Anthropometry: body growth and somatotypes, Static and dynamic anthropometry, Stand Posture- erect, Anthropometry landmark: Sitting postures, squatting and cross-legged postures, Anthropometric measuring techniques.	07
	Total Hours	45

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	25	20	20	15	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. M. P. Goover, Work Systems and the Methods, Measurement and Management of Work, Pearson Prentice Hall
2. Work study by International Labour Organization, ILO
3. Manufacturing Organization and Management, Harold Amrine, John Ritchey, Moodie, Kmec, 6th Ed., Pearson
4. Industrial Engineering and Management, by Praveenkumar, Pearson
5. Khan MI; Industrial Ergonomics; PHI Learning
6. Barnes RM; Motion and Time Study; Wiley pub
7. Megaw ED; Contentmproy ergonomics; Taylor & Fracis
8. B. Niebel and Freivalds, Methods standards and Work Design, McGraw-Hill, 2003
9. Sandera M and McCormick E; Human Factors in Engg and design; MGHill
10. Currie RM; Work study; BIM publications



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11. Mynard; Hand book of Industrial Engg

Course Outcomes: Students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Describe Productivity and Productivity Improvement techniques.	25
CO-2	Demonstrate Work study and Work Study techniques	25
CO-3	Illustrate work measurement	25
CO-4	Describe Ergonomics and human physical dimensions.	25

Term Work:

The term work shall be based on the topics mentioned above.

List of Experiments: As per contents

Major Equipment: Nil

List of Open Source Software/learning website:

1. Report preparation on productivity and its techniques.
2. Operation and flow process chart for different products
3. Work Measurement case study
4. Importance of Ergonomics and human physical dimensions.