

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BRANCH NAME: INDUSTRIAL ENGINEERING (15)**

**SUBJECT NAME: WORK SYSTEM DESIGN**

**SUBJECT CODE: 2171502**

**B.E. 7<sup>th</sup> SEMESTER**

**Type of course:** Core

**Prerequisite:** No specific pre-requisite, primary understanding of production management concepts.

**Rationale:** The course introduces to the methods for analyzing and designing work systems. Production and service systems are made up of work systems. The goal is to apply theory, principles, data and methods to design in order to optimize human well-being and overall system performance. The overall course objective is to enable students to apply work systems methodology in design, analysis and improvement of work systems.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	0	2	6	70	20	10	20	10	20	150

**Content:**

Sr. No.	Content	Total Hrs	% Weight age
1	Work Study - Scope: Introduction, Work study and (I) Top management (II) Middle Mgt. (III) Workers (IV) Personnel, Work Study Techniques.	3	5
2	A) Method Study: Introduction , Work simplification, Selection of Job, Economic Consideration, Design Consideration, Production Consideration, Human Consideration. Search for a job for method study recording techniques, Process chart Construction of Operation Process Chart – Examples & uses, Flow Process Chart – Examples & uses, Flow diagram – Examples & uses. Critical examination, Procedure of investigation, Templates and Models.	17	25
	(B) Movements of workers in shops. Construction of string diagram, Travel chart, Man & Machine chart, Multiple Activity chart.	4	6

	(C) Motion Economy, use of human body, arrangement of work place, design of tools and equipments, Two handed process chart, work station design.	6	8
	(D) Cycle graph and chronocycle graph, Therbligs, Micro motion study, SIMO chart Memo motion study.	4	6
3	(A) Work Measurement :  Introduction, Techniques of W.M., objectives and uses of Time study, Time Study Equipments, Procedure for Time study, Selection of Job for T.S. , Selection of Operator Recording of Information, Breaking operation in to elements, Choice of Elements, Number of readings, Procedure of using and its methods, Training in Rating, Allowances and types, Calculation of standard Time.	22	38
	(B)Other Methods of Work Measurement:  Synthesis, standard data, Production interruption study, analytical estimation, work sampling, statistical concepts, confidence limits, number of observations, P.M.T.S., M.T.M., W.F.S. Industrial visits to be organized to understand the above topics practically, and assessment of the study during visit will carry weightage in Theory and Practical exams.	8	12

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35	30	10	15	5	5

**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. Work study by ILO
2. Work study by R.C. Patel
3. Work study by Suresh Dalela
4. Work study and Ergonomics by S.K. Sharma and Savita Sharma

**Course Outcome:**

After learning the course the students should be able to:

- Define and understand the elements in a work system.
- Analyze the interactions between elements in a work system.
- Construct and use operations process charts, flow process charts, flow diagrams, string diagram, travel chart, man-machine chart, multiple activity chart.
- Carryout time study and occurrence sampling for methods improvement and work measurement applications.

**List of Experiments:**

1. Outlines process chart.
2. Flow process chart and flow process diagram.
3. Man Machine/multiple activity chart.
4. Motion economy.
5. Practice on stop watch reading for time study.
6. Performance rating Exercises: (a) For walking for 50 feet distance. (b) For distribution of playing cards.
7. Study of Calculation of standard time of an engineering job.
8. Study of Activity sampling, predetermined motion and time study (P.M.T.S.), Methods time measurement (M.T.H.) and Synthetic rating.
9. Study of physiological effect of work (Tread Mill Practice)

**Design based Problems (DP)/Open Ended Problem:** None

**Major Equipment:** Tread mill, Time study Stopwatches, Phil Carroll discs etc.

**List of Open Source Software/learning website:** [www. nptel.ac.in](http://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.