WORK STUDY AND HUMAN FACTOR ENGINEERING

ENIE 253

Lecture : 3 **Year : II**
Tutorial : 1 **Part : II**
Practical : 3/2

Course Objectives:
The objective of this course is to provide students with a comprehensive understanding of method study, work measurement techniques and human engineering principles to improve productivity, efficiency, and workplace ergonomics.

1 Productivity (4 hours)

1.1 Production and productivity: Importance and role of productivity
1.2 Industrial resource management
1.3 Measurement of productivity
1.4 Productivity improvement factors: Internal and external factors
1.5 Productivity improvement techniques: Work study, work simplification, just-in-time and Lean techniques

2 Work Study (4 hours)

2.1 Concept, work content and content enhancement
2.2 Management techniques to reduce ineffective time
2.3 Segment of work study, human factor considerations
2.4 Role of management, supervisor and workers

3 Method Study (9 hours)

3.1 Method study procedures
3.2 Process and operations, steps involved in process analysis
3.3 Process chart and symbols, outline process chart, flow process chart, two hand process chart and multiple chart
3.4 Flow diagram, string diagram, travel chart, templates and models
3.5 Motion analysis, therbligs, micro motion study,
3.6 Steps in micro motion study: Video recording, frame by frame analysis, simultaneously motion-cycle (SIMO) chart, cycle and chrono-cycle graph
3.7 Principles of motion economy

4 Work Measurement (9 hours)

4.1 Work measurement techniques: Stop watch, predetermined motion time system (PMTS) synthesized time standard, work sampling
4.2 Time study: Essentials, procedures, application, job selection

4.3 Time study equipment, elements breakdown, types of elements
4.4 Rules concerning breakdown of job into elements
4.5 Determination of number of observations, conduction and recording of observation
4.6 Performance rating, factors affecting worker's performance, comparison of observed and standard rating, scales of rating
4.7 Rating factor, work content in terms of time, allowances and calculation of standard time

5 Work Sampling and Synthetic Data (5 hours)

5.1 Work sampling process: Need and basic of sampling benefits, limitations, confidence levels
5.2 Determination of sample size: Statistical method
5.3 Synthetic data
5.4 Advantages of synthetic time system
5.5 Predetermined motion time standard (PMTS), Method time measurement (MTM) and Maynard operation sequence techniques (MOST)

6 Human Factor and Ergonomics (14 hours)

6.1 Ergonomics: Basic approaches, benefits, man-task environment system, main domains of ergonomics, computer based ergonomics
6.2 Man-machine system: Classification of man-machine system, design methodology and criteria for design, work system of controls and displays, environmental factors, visual issues in design
6.3 Agricultural ergonomics and human factors
6.4 Human factor in tourism and hospitality
6.5 Applications of ergonomics in craft and design
6.6 Anthropometry: Structural body dimensions, functional body dimensions, anthropometric parameters measuring tools and dimensions physiology, human stamina, influence of working conditions, psychology
6.7 Steps of design of mechanical system using anthropometric data
6.8 Design for extremes, design for average, design for adjustable range
6.9 Typical values of anthropometric data
6.10 Human factors: Behavioral aspects, cognitive issues, mental workload and human errors.

Tutorial (15 hours)

1. Measurement of productivity
2. Suggest management techniques to reduce ineffective time for a task
3. Practice on drawing different charts and diagrams related to motion study
4. Determination of number of observations and calculation of standard time
5. Determination of standard time using synthetic data
6. Determination of sample size using statistical method

7. Take a hammer and find out the level of anthropometric mismatch with reference to the dimensions in the database
8. Identify the ergonomic issues in any handheld tool from the workshop and give ergonomic design directions for the tool to ensure safety, productivity and comfort of target users

Practical **(22.5 hours)**

1. Recording techniques: Prepare the following chart and diagram, outline process chart, flow process chart, two-handed process chart, string diagram, flow diagram
2. Conduct time study of a repetitive task and calculate standard time using allowance factors
3. Record a simple assembly task and identify unnecessary motions using motion study and therblings analysis
4. Find out the good and bad ergonomic issues of any handheld tool/equipment used in the workshop
5. Study and analyses different postures and comfort in workplace setting using ergonomic chair
6. Anthropometric measurement for workstation design
7. Analyze impact of lighting level, noise condition, temperature variation, and humidity on worker's efficiency
8. Different postures and comforts in workplace setting using ergonomic table

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks distribution*
1 and 2	8	10
3	9	12
4	9	12
5	5	6
6	14	20
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Introduction to Work Study. (1981). Switzerland: International Labour Office.
2. Singh, L. P. (2018). Work Study and Ergonomics. India: Cambridge University Press.
3. Wickens, C. D., Lee, J., Liu, Y. (2014). An Introduction to Human Factors Engineering. India: Pearson.
4. Handbook of Human Factors and Ergonomics. (2021). United Kingdom: Wiley.