



SARVAJANIK UNIVERSITY
Sarvajnik College of Engineering and Technology
Bachelor of Technology



Mechanical Engineering Department
B. Tech. Semester VI

Course Name: Industrial and Quality Engineering **Course Code:** BTME14614
Type of course: Professional Elective Course
Prerequisite: Improve productivity and quality by applying industrial engineering, quality control and cost reduction/saving techniques.

Rationale of Course: Prosperity of nation in general depends on the productivity of industries and quality of production. Technical managers, engineers, plant operators, machine operators, supervisors and workers working in industries have to compulsorily meet set standards of production in terms of quality, quantity and productivity so as to compete domestic and international market. This is possible for them only when they employ and exploit the principles of industrial engineering.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	<p>Introduction to Industrial Engineering:</p> <p>Industrial engineering-definition, objectives and techniques, Scope, importance and applications of industrial engineering, Methodology and approach of Industrial engineering, Productivity – concept, definition, importance and ways to enhance it, numeric examples, Introduction to work study, Introduction to statistical quality control (SQC).</p>	10	22%



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



Sr. No.	Topics	Teaching Hrs.	Module Weightage
2.	<p>Work Study and Work Measurement: Work study-Definition, techniques and role to enhance productivity, Importance of human factors in application of work study techniques, Basic procedure of method study, Methods of recording data for method study using standard symbols, process charts and diagrams, Preparation of operation (outline) process chart for given Process planning-concept, meaning, importance, functions, procedure and forms used, Information required for process planning and information available from process planning, Principles of micro motion study, Therbligs and SIMO chart, Man and machine chart, Basic procedure of work measurement, Equipment used in time study, Job elements and their types, Methods of measuring time cumulative and fly back timing, Concept of rating and rating scale, Allowances-types, normal values and applications, Calculation of basic time, standard time and work content, Concept of work sampling/ activity sampling</p> <p>Work Measurement: Objective of CPM & PERT, elements of network, network rules, constraints, error in network, Critical Path Analysis, Activity time and floats, optimization through CPM techniques, PERT and three estimates, critical path analysis of a PERT network, probability of completion of project, controlling and monitoring.</p>	12	25%
3.	<p>Quality Assurance: Definition of quality, quality control (QC), quality assurance (QA), statistical quality control (SQC) and reliability, Importance of quality, Difference between reliability and quality control, Factors affecting and improving reliability, QA tools, Concept of total quality cycle, quality of design, quality of performance, quality of conformity and total quality, Difference between</p>	08	20%



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



Sr. No.	Topics	Teaching Hrs.	Module Weightage
	inspection and quality control, Fundamentals of statistics- types of variations, frequency, class boundary and midpoint, frequency distribution, frequency histogram, frequency bar chart and polygon chart, Frequency distribution curve, central tendency, spread or dispersion and range, mode, median and mean, standard deviation and variance with numeric examples, Concept of probability and normal distribution, Area under normal distribution and examples on normal distribution, Introduction to binomial and Poisson distribution.		
4.	Statistical Quality Control (SQC): Concept of variability, SQC tools and statistical fundamentals, Concept and differences between variables and attributes, Control charts for variable quality types, objectives, applications, calculations of control limits and range/mean, methods to plot and interpretations (X bar-R chart) and examples, Control charts for attribute quality types, objectives, applications, calculations of control limits and range/mean, methods to plot and interpretations (p, np, 100p and c chart) and examples, Process capability – meaning, definition and method to calculate, numeric examples, Acceptance sampling: i. Quality control of incoming raw material and components. ii. Concepts of random sampling. iii. Sampling plans: definition, terminology, types (Single, double and multiple), implementing plans based on given input. iv. OC curve-concept, need, types and Importance, interpretation of given OC curve.	08	20%
5.	Recent trends in industrial engineering: International Organization for standardization and its role, ISO standard series and quality managements system, Total Quality Control (TQC) and Total Quality	07	13%



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



Sr. No.	Topics	Teaching Hrs.	Module Weightage
	Management (TQM) - philosophical concepts. Concept of six sigma and its application, Concept and applications of Kaizen, Definition, objectives and applications of ergonomics, Normal and maximum work area, Environmental requirements of work place..		

Percentage Distribution of Marks as per Bloom's Taxonomy (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	25	20	20	5	5

Legends: R: Remembrance, U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create

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 from above table.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Publication year	Publication edition
1.	Industrial Engineering (IE) and Management	C.Natha Reddy	New Age International Publishers.	2002.	3 rd edition
2.	Handbook of IE: Technology and operations management	Gavriel Salvendy	Prentice Hall India Pvt. Ltd	2004	3 rd edition
3.	Comprehensive Industrial Engineering	M. J Manek	Laxmi Publications (P) Ltd., New Delhi.	2005	2 nd edition
4.	Introduction to Workstudy.	George Kanawaty	George Kanawaty		2 nd edition
5.	Introduction to Statistical quality control.	Eugene Grant and Richard Leavenworth	TheTata McGraw-Hill ISBN-13:978-0078443541	2007	7 th edition
6.	Hand Book of Industrial Engineering	Prof. K.V.S.S Narayan Rao	NITIE	2019	NA



SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology



Course Outcomes (CO's):

CO. No.	CO Statements After learning this subject, students will be able to	Marks % weightage
CO-1	Enumerate productivity using work study and method study techniques	20
CO-2	Estimate the work content and calculate standard time in a given situation.	20
CO-3	Illustrate Statistical Quality Control tools in a given situation.	20
CO-4	Evaluate Ergonomics for human comfort at work place	20
CO-5	Adapt the emerging trends in industrial engineering.	20

Mapping of (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's):

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	2	2	1	1	0	1	2	1	1	1	1	3	1	1
CO-2	0	1	3	2	2	0	3	2	1	1	1	1	3	2	2
CO-3	2	1	0	2	2	0	3	1	2	2	1	1	2	2	3
CO-4	0	2	2	0	2	2	2	0	3	2	2	0	2	3	1
CO-5	1	3	2	1	2	1	3	3	1	0	3	0	1	1	0
Rationale*	6	9	9	6	9	3	12	8	8	6	8	5	11	9	7

Rationale - Mapping of CO's with PO's and CO's with PSO's:

CO-PO's: According to the aforementioned CO's and PO's mapping (7,2,3), Industrial engineering always aims to achieve higher productivity and better standards of quality through its constant endeavor in design, improvements and installation of integrated systems of human resource, machines and methods.

CO-PSO's: According to the above CO's and PSO's mapping (1), Technical managers, engineers, plant operators, machine operators, supervisor meet set standards of production in terms of quality

This course highly maps with Program outcomes 2, 3,5,7,8,9,11 and Program Specific Outcomes 1 and 2. It states that the course will develop problem analysis, design / development of solutions, modern tool usage, environment and sustainability, ethics, individual and teamwork, project management and finance and finally it will lead to convert conceptual knowledge of mechanical engineering to real life application and with the use of modern computing tools.



SARVAJANIK UNIVERSITY
Sarvajani College of Engineering and Technology
Bachelor of Technology



List of Practical:

1. Case study demonstration on location decision and site selection
2. Tutorials on Production Planning and Control
3. Case study on plant layout problem
4. Exercise on OPC, FPC, Travel chart
5. Exercise on Method study, Motion Study and work measurement
6. Problems on wage and incentive plans
7. Exercise on statistical quality control techniques
8. Case study analysis of Entrepreneurship
9. Exercise on Waste management

Major Equipment: NIL

List of Open learning website:

1. https://www.academia.edu/83942060/Introduction_to_Modern_Industrial_Engineering_Version_2_0
2. <http://nraoiekc.blogspot.com/2017/06/productivity-science-principle-of.html>
3. <https://nraoiekc.blogspot.com/2017/06/productivity-engineering-principle-of.html>
4. <http://nraoiekc.blogspot.com/2017/06/industrial-engineering-in-all-branches.html>

List of Open Source Software: NIL