GUJARAT TECHNOLOGICAL UNIVERSITY

AUTOMBILE ENGINEERING (02)

APPLIED INDUSTRIAL ENGINEERING IN AUTOMOBILE
SUBJECT CODE: 2180204
B.E. 8TH SEMESTER

Type of course: Under Graduate

Prerequisite: None**.**

Rationale: The course covers actual practices in automobile industry that includes production planning and control, productivity and work-study, quality control and management, reliability engineering, materials management, operations research, etc. The proper understanding of these concepts will equip the graduates to easily adapt to the actual working environment of automobile industry and ancillary units.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

Course Content

Sr. No	Content	Total Hrs.	% Weightage
1.	**Introduction to Production Planning and Control:** Functions and objectives of Production Planning and Control. Steps of Production Planning and Control: Sales forecasting; Techniques and applications, Process Planning, Scheduling, Dispatching with illustrative examples. Job production/Prototype production, Batch Production, Flow Production. Automatic and semi-automatic assembly lines, Introduction to assembly line balancing.	**3**	**7**
2.	**Productivity and Work study** Definition of productivity, factors affecting productivity, application and advantages of productivity improvement tools. Work Study: Need of work study, Tools used for work study *Method Study:* Objectives and procedure for methods analysis, Recording techniques, Operations Process Chart, Flow Process Chart, Man-Machine Chart, Multiple Activity Chart, Travel Chart, and Two Handed process chart, String Diagram, Therbligs, Principles of Micro motion and Macro-motion study. *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.	**7**	**16**

3	**Quality Management** Definition of quality, Driver's Quality, Quality assurance and control, Total quality management (TQM): Evolution of TQM. Tools and Techniques for preparation and models of TQM Quality problem solving tools: Ishikawa diagrams, Pareto analysis, Check sheets, Histogram, Scatter diagrams, Brain Storming, Statistical Quality Control (SQC) Concept, normal distribution curves and its property charts for variables and attributes and their applications and interpretation (analysis), Process capability, Acceptance sampling, sampling plans, Operating Characteristics- OC curves and Average Outgoing Quality - AOQ curves. Principles for waste reduction and mistake proofing (Poka Yoke), SWOT Analysis. Principles of quality ambience : 5 S Principles Principles of robust design: Taguchi Techniques Continuous Improvement Strategies: Kaizen Deming wheel, Zero defects concept, Bench marking. Six sigma (6 σ). Human Dimensions of Quality and Quality circle. Customer orientation: Quality function deployment (QFD), Customer Satisfaction Measurement. Quality Certification: Quality audit, ISO 9000 series, ISO 14000 series and QS 9000 certification. EURO Standards Cost of Quality: Characteristics of Quality cost. Cost of quality– prevention/appraisal/failure. Stages of TQM implementation.	**15**	**33**
4	**Reliability Engineering** Introduction to Reliability, definitions, bathtub curve , MTTF, MTBF, MTTR, hazard rate, failure rate, probability and sampling, cumulative probability distribution function, Normal and Weibull distributions. Reliability block diagram. Series and parallel systems reliability, Concept of Failure Mode & Effect Analysis - FMEA. Reliability testing and failure of automobiles and Accelerated life testing.	**7**	**16**
5	**Inventory and Supply chain Management** Supply chain management (SCM) - concept of logistics and SCM, Sourcing and procurement - sourcing - factors in source selection - vendor rating, purchasing - objectives and procedure - purchasing systems - tender method, Economic Order Quantity (EOQ) models: Simple model, Model with quantity discounts, Concept of just-in-time manufacturing, Kanban.	**7**	**16**
6	**Introduction to Operations Research** Origin of Operation Research, *Project Management*: Introduction to Project evaluation and review technique (PERT) and Critical Path Method (CPM), critical Path calculation, float calculation and its importance. Cost reduction by crashing of activity, *Linear Programming Problem*: Formulation of Linear Programming (LP) and solution using Simplex method. *Transportation and Assignment*: Transportation Problems definition, Linear form, Solution methods: North west corner method, least cost method, Vogel's approximation method, Assignment Problems	**6**	**13**

Value addition activities suggested: Open Ended Problems, Mock Quality Circles, Case Studies, Group discussions, Presentations. Study of Service Labour Time Schedule for different Autmobiles.

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
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. Production and Operations Management – By R. Panneerselvam, PHI Private Ltd
2. Work study by International Labour Organization, ILO
3. Industrial Engineering and Management, Problems and Policies-By R.M.Barnes,McGraw-Hill
4. Total Quality Management-By Suganthi, L. and Samuel, A.A, Prentice Hall of India Private Limited.
5. Statistical quality control-By Mahajan M., Dhanpat Rai and Co Pvt., Ltd.
6. Reliability Engineering-By Srinath, L.S, East-West Press (EWP) PVT LTD.
7. Reliability and Maintainability engineering- By Ebeling C.E., Tata McGraw-Hill Publications.
8. Reliability in Automotive and Mechanical Engineering –By B.Bertsche, Springer Publications
9. Supply Chain Management: Strategy, Planning, and Operation- By S. Chopra and P. Meindl, Pearson Education Asia
10. Operations Research- By A M Natarajan, P Balasubramani, A Tamilarasi, Pearson Education Inc.
11. Operations Research-By R. Paneerselvam, Prentice Hall of India Pvt. Ltd.

COURSE OUTCOME:

After learning the course the students should be able to:

1. Students will understand concepts of productivity and work planning.
2. Students will understand and apply concept of Production Planning and Control in automobile industry.
3. Students will apply concept of Total quality management in automobile industry.
4. Students will understand concept of Reliability Engineering.
5. Students will understand concept of operations research.
6. Students will understand and apply concept of supply chain management in automobile industry.

Tutorial:

1. Study of different types of production systems and their planning.
2. Study of concepts of work study, method study and work measurement.
3. Study of Quality problem solving tools.
4. Study of concept of six sigma.
5. Study of Concept of Failure Mode & Effect Analysis - FMEA
6. Study of project management.
7. Study of just in time and kanban method

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.