FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Automobile Engineering)**

Semester: **VI**

Course Code: **202010606**

Course Title: **Industrial Engineering and Operations Research**

Course Group: **Professional Elective Course-II**

Course Objectives: The course covers actual practices in industry that includes, 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 industry.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	50 / 18	25 /9	50 / 17	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Productivity and Work study** Definition of productivity, factors affecting productivity. 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). Maynard operation sequence technique (MOST), Determination of time standards. Observed time, basic time, normal time, rating factors, allowances and standard time.	08

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2	**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) ,Control charts for variables and attributes and their applications and interpretation (analysis). Principles of quality ambience : 5 S Principles, Cost of Quality: Characteristics of Quality cost. Cost of quality– prevention/appraisal/failure.	**08**
3	**Reliability Engineering** Introduction to Reliability, definitions, bathtub curve , MTTF, MTBF, MTTR, hazard rate, Reliability block diagram. Series and parallel systems reliability, Concept of Failure Mode & Effect Analysis (FMEA). Fault Tree Analysis (FTA)	**05**
4	**Introduction to Supply chain management** Generic Types of supply chain, Various Definitions, and Implications, Major Drivers of Supply chain. Core Competencies in Supply Chain, Strategic SC Decisions, Customer Relationship Management Strategy, Supplier Relationship Management Strategy, Elements of Strategic Sourcing, A Collaborative Perspective, Development of Partnership.	**08**
5	**Introduction to Industry 4.0:** Introduction, concept of industry 4.0,Industry 4.0 production system, current state of industry 4.0, Technologies.	**02**
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	**14**

List of Practicals / Tutorials:

1	To Study & Prepare Operation Process Chart (OPC) for given assembly.
2	To Study & Prepare Flow Process Chart and Flow Diagram for given assembly for OPC
3	To study & Prepare Man-Machine Chart for the given situation
4	To study & Calculate standard time for given job

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5	To study and construct X bar- R Chart, P Chart and C chart for given processes
6	Performing of FMEA analysis of a system
7	FTA analysis of a given system
8	Evaluation of reliability of systems
9	Solving of linear programming problems
10	Exercises on project management
11	Solving of transportation problems
12	Solving of assignment problems

Reference Books:

1	Work study by International Labour Organization, ILO
2	Industrial Engineering and Management, Problems and Policies-By R.M.Barnes, McGraw-Hill
3	Production and Operations Management – By R. Panneerselvam, PHI Private Ltd
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	Supply Chain Management: Strategy, Planning, and Operation- By S. Chopra and P. Meindl, Pearson Education Asia
9	Operations Research-By R. Paneerselvam, Prentice Hall of India Pvt. Ltd.
10	Industry 4.0-The Industrial Internet of Things, By Alasdair Gilchrist, Apress Publications

Supplementary learning Material:	
1	NPTEL Resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment

Internal Evaluation :

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
20	15	20	30	15	0	

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand concepts of Productivity , work planning and basics of Industry 4.0	**22**
CO-2	Understand the concept of Total quality management	**17**
CO-3	Understand concept of Reliability Engineering	**11**
CO-4	Understand the concepts of Supply chain management	**17**
CO-5	Understand concept of operations research	**33**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2027

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