GUJARAT TECHNOLOGICAL UNIVERSITY (GTU)

Competency-focused Outcome-based Green Curriculum-2021 (COGC-2021)
Semester – VIII
Course Title: Quality & Production Management
(Course Code: 4385507)

Diploma Programme in which this course is offered	Semester in which offered
Fabrication Technology	Eight

1. RATIONALE

Quality and Production Management is an indispensable subject for individuals pursuing careers in manufacturing, services, or any industry where the quality of products and services plays a significant role in success. It equips students with the knowledge and skills needed to drive organizations towards higher quality, greater efficiency, and sustainable growth in an increasingly competitive and quality-conscious business environment. Quality and productivity are the base for success of any manufacturing industry. To excel in such fields, students need to equip themselves with conventional as well as modern tools and techniques used for quality control. Material Resource Planning and Inventory control are also important tasks to be performed by an engineer. This course shall delve into such topics in depth and make students compatible with skills needed in the industry.

2. COMPETENCY

The course content leading to the achievement of the following competencies:

- Apply management principles and practices in industrial organizations
- Develop strategic thinking and decision-making skills tailored to industrial environments

3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes

i. Describe the industrial and operations management
ii. Describe the organizations structures
iii. Solve the problems of productivity and monitor product quality levels
iv. Describe inventory control models and Material Handling equipment
v. Interpret modern tools & techniques for Quality Management

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P/2)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	CA	ESE	CA	ESE	
4	0	2	5	30*	70	25	25	150

(*): Out of 30 marks under the theory CA, 10 marks are for assessment of the micro-project to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessing the attainment of the cognitive domain UOs required for the attainment of the COs.

***Legends : L**-Lecture; **T**– Tutorial/Teacher Guided Theory Practice; **P** -Practical; **C** – Credit, **CA** - Continuous Assessment; **ESE** -End Semester Examination.*

5. SUGGESTED PRACTICAL EXERCISES

The following practical outcomes (PrOs) are the sub-components of the COs. *These PrOs need to be attained to achieve COs.*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Study job production, batch production and mass production.	I	02
2	Prepare an Operation Process Chart from given data	I	02
3	Prepare a Flow Process Chart from given data	I	02
4	Study Line Organization, Functional Organization, Line and Staff Organization	II	02
5	Calculate productivity from given case study data	III	02
6	Prepare a Break even analysis from given data	III	02
7	Prepare an X-bar and R chart from give data	III	02
8	Prepare a P type control chart from given data	III	02
9	Conduct ABC analysis for inventory from given data	IV	02
10	Study Material Handling Equipments	IV	02
11	Study ISO 14000 with its benefits	V	02
12	Draw cause and effect diagram (fish bone diagram) from the given technical problem	V	02
13	Prepare Kaizen for given case study	V	02
14	Prepare 5S for given case study	V	02
	TOTAL HRS.		**28**

Note

*i. More **Practical Exercises** can be designed and offered by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*

ii. Boiler suit, safety shoes and necessary hand tools & instruments are compulsory while attending laboratory and has to be bought by students.(Annexure-1)

The following are some sample 'Process' and 'Product' related skills (more may be added/deleted depending on the course) that occur in the above listed Practical Exercises of this course required which are embedded in the COs and ultimately the competency.

Sr. No.	Sample Performance Indicators for the PrOs	Weightage in %
For PrO nos. : 1 to 14		
1	Knowledge of experiment	30
2	Quality of report	30
3	Participation	20
4	Punctuality	10
5	Originality	10
Total		**100**

6. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

These are the major equipments with broad specifications for the PrOs. It is a guide to procure them by the administrators to user in uniformity of practical's in all institutions across the state.

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1.	Necessary Stationary, Graph Paper, Calculator, etc.	All

7. AFFECTIVE DOMAIN OUTCOMES

The following Affective Domain Outcomes (ADOs) are embedded in many of the above-mentioned COs andPrOs.More could be added to fulfill the development of this course competency.

a) Work as a leader/a team member.
b) Practice good housekeeping.
c) Follow safety practices in laboratory.
d) Follow ethical practices

The ADOs are best developed through the laboratory/field-based exercises. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

i. 'Valuing Level' in 1st year
ii. 'Organization Level' in 2nd year.
iii. 'Characterization Level' in 3rd year& 4th year.

UNDERPINNING THEORY

The major underpinning theory is given below based on the higher level UOs of *Revised Bloom's taxonomy* that are formulated for development of the COs and competency. If required, more such UOs could be included by the course teacher to focus on attainment of COs and competency.

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – I **Industrial Management**	1a. Interpret the concepts of Industrial Engineering and Production Management 1b. Describe the role of an Industrial Engineer 1c. Compare production and industrial management 1d. Describe time study and method study	1.1 Concept of Industrial Engineering 1.2 History and Development of Industrial Engineering 1.3 Roles of Industrial Engineer 1.4 Applications of Industrial Engineering 1.5 Production Management 1.6 Production Vs. Industrial Management 1.7 Operations Management 1.8 Management Science - Its Historical Development 1.9 The Tools of Management Science 1.10 Managerial Economics 1.11 Managerial Accounting 1.12 Time Study 1.13 Method Study

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit– II **Organizational Management**	2a. Describe characteristics of an organization 2b. Describe the principles of organization 2c. Describe organizational management 2d. Describe communication systems	2.1 Concept of Organization 2.2 Importance of Organization 2.3 Characteristics of Organization 2.4 Elements of Organization 2.5 The Process of Organization 2.6 Organization theory 2.7 Principles of Organization 2.8 Organizational Structure 2.9 Types of Organization 2.10 Line or Military or Scalar Organization 2.11 Functional Organization 2.12 Line and Staff Organization 2.13 Organizational Development 2.14 Managerial Leadership 2.15 Communication Systems 2.16 The Dynamics of organization
Unit – III **Production Planning & Control**	3a. Compare production methods 3b. Describe factors affecting productivity 3c. Prepare Break even analysis 3d. Describe Statistical Quality Control tools 3e. Calculate productivity	3.1 Production & Productivity 3.1.1 Production 3.1.2 Productivity 3.1.3 Factors affecting Productivity 3.1.4 Increasing productivity of resources 3.1.5 Kinds of productivity measures 3.2 Process Planning 3.2.1 Process Charts 3.2.2 Manual Process Planning 3.2.3 Automated Process Planning 3.2.4 Generative Process Planning 3.3 Break Even Analysis 3.4 Make or buy decision 3.5 Statistical Quality Control (SQC) 3.4.1 Statistical Quality Control (Definition & Concept) 3.4.2 Control Charts and their applications 3.4.3 Process Capability Analysis 3.4.4 The Zero Defect Concept

Unit	Unit Outcomes (UOs)	Topics and Sub-topics
Unit – IV **Material Purchase & Stores Management**	4a. Classify inventory 4b. Describe EOQ 4c. Describe MRP 4d. Describe Principles of Material Handling 4e. Describe modern concepts of Material Handling Equipments	4.1 Inventory Control & Management 4.1.1 Inventory Classification 4.1.2 Inventory Management 4.1.3 Objectives of Inventory Control 4.1.4 Functions of Inventories 4.1.5 EOQ (Economic Order Quantity) 4.1.6 Inventory Models 4.1.7 ABC Analysis 4.1.8 MRP-1 (Material Requirements Planning) 4.1.9 MRP-2 (Manufacturing Resource Planning) 4.2 Material Handling Equipment 4.2.1 Introduction and Definition 4.2.2 Function and Principles of Material Handling 4.2.3 Engineering and Economic Factors 4.2.4 Relationship to Plant Layout 4.2.5 Selection of Material Handling Equipment 4.2.6 Types of Material Handling Equipments 4.2.7 Modern Concepts
Unit– V **Modern Tools & Techniques for Quality Management**	5.a Define quality 5.b Describe dimensions of quality 5.c Describe ISO 9000 5.d Describe ISO 14000 5.e Describe TQM	5.1 History, Concept and definition of Quality 5.2 Introduction to Quality management 5.3 Dimensions of quality 5.4 Quality Circles 5.4.1 ISO 9000 5.4.2 ISO 14000 5.5 Modern Tools & Techniques 5.5.1 Six Sigma 5.5.2 TQM 5.5.3 5S 5.5.4 Kaizen 5.5.5 Fishbone Diagram 5.5.6 Computer Aided Quality Control

8. SUGGESTED SPECIFICATION TABLE FOR QUESTIONPAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Industrial Management	10	3	7	0	10
II	Organizational Management	10	3	7	0	10
III	Production Planning & Control	14	3	11	4	18

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
IV	Material Purchase & Stores Management	12	3	11	4	18
V	Modern Tools & Techniques for Quality Management	10	3	11	0	14
	TOTAL	**56**	**15**	**47**	**8**	**70**

Legends : *R=Remember, U=Understand, A=Apply and above (Revised Bloom's taxonomy)*
Note : *This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks and marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from above table.*

9. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related ***co-curricular*** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should perform following activities in group and prepare reports/charts for each activity. They should also collect/record physical evidences for their (student's) portfolio which may be useful for their placement interviews:

a) Prepare solutions of different assignments given by subject faculty.
b) Visit the local industries and collect all relevant information regarding type of organizational structure
c) Download videos showing material handling equipments and their capabilities
d) Student will visit the respective discipline industry / site and will prepare a process flow chart for a particular product.
e) Prepare power point presentation on any modern quality management tools and techniques.

10. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

a) Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b) Guide student(s) in undertaking micro-projects.
c) ***'L' in section No. 4***means different types of teaching methods that are to be employed by teachers to develop the outcomes.
d) About ***20% of the topics/sub-topics*** which are relatively simpler or descriptive in nature is to be given to the students for ***self-learning***, but to be assessedusing different assessment methods.
e) With respect to ***section No.10***, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.

11. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-projects are group-based (group of 3 to 5). However, **in the fifth and eighth semesters**, the number of students in the group should ***not exceed three.***

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The duration of the micro project should be about **14-16** ***(fourteen to sixteen) student engagement hours*** during the course. The students ought to submit micro-project by the end of the semester to develop the industry-oriented COs.

A suggestive list of micro-projects is given here. This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:
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a) **Creating Digital Portfolio:** Students should observe and collect photographs and images of any one product manufacturing process flow adopted in industry and make a report on it.
b) **Chart making:** Prepare chart / drawing on industrial engineering practices like root cause analysis (fish bone diagram) for a defect, Six Sigma, Kaizen, 5S, ABC analysis, etc. given by the subject teacher.
c) **Model Making:** Students should build 3D model of various object as per shape and dimension from thermocol, hardboard scrap, wooden scrap, plastic or metal scrap or drawing sheet etc.
   - Prepare a model of any conventional material handling equipment.
   - Prepare a model of any advanced material handling systems.
d) **Video Preparation:** Student have to prepare his/her video on demonstrating different modern quality management tools like ISO 14000, TQM, Six Sigma, etc. given by the subject teacher.
e) **E-learning projects:** Students have to use internet and other online resources for preparation of report and/or download video on the topic given by the subject teacher within the syllabus or beyond the syllabus.
f) **Report preparation:** Student has to use different books, technical magazine, journals etc. for preparation of a report on the topic given by the subject teacher within the syllabus or beyond the syllabus.
g) **Power point presentation**: Students has to prepare a power point presentation of 10 to 15 slides on the topic given by the subject teacher within the syllabus or beyond the syllabus. In the end of presentation student has to ask at least 3 to 5 MCQ based question to identify the gain of listeners at the end presentation.
h) **Collect and study brochure** of different material handling equipments from local vendor/ online vendor.

12. SUGGESTED LEARNING RESOURCES

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Industrial Engineering & Production Management	M. Mahajan	Dhanpat Rai & Co.
2	Industrial Engineering & Management	O.P.Khanna	Dhanpat Rai Publications

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
3	Statistical Quality Control	M. Mahajan	Dhanpat Rai & Co.
4	CAD/CAM/CIM	P. Radhakrishnan S. Subramanyan V. Raju	New Age International Publishers
5	Industrial Engineering & Operations Management	S. K. Sharma & Savita Sharma	S.K. Kataria & Sons
6	Quality Management	Kanishka Bedi	Oxford University Press

13. SOFTWARE/LEARNING WEBSITES

- https://en.wikipedia.org/wiki/5S_(methodology
- http://leanmanufacturingtools.org
- www.slideshare.net
- http://in.kaizen.com/knowledge-center/what-is-5s.html
- https://archive.org
- www.nptel.ac.in
- https://youtu.be/B6SrUunh9Zk
- https://youtu.be/TWXAzr-Bhfc
- https://youtu.be/HVbbSl5WreA
- https://youtu.be/mRxICdUYaCs
- https://youtu.be/pZdzYDVlC8c
- https://youtu.be/-pWnhGI-fN4
- https://youtu.be/RkPBiAUGo-M

15. PO-COMPETENCY (CO) MAPPING

Semester VIII	Quality & Production Management(Course Code: 4385506)						
	POs						
Competency & Course Outcomes	PO 1 Basic & Discipline specific knowledge	PO 2 Problem Analysis	PO 3 Design/ develop-ment of solutions	PO 4 Engineering Tools, Experimen-tation & Testing	PO 5 Engineering practices for society, sustainability & environment	PO 6 Project Manage-ment	PO 7 Life-long learning
Competency	• Apply management principles and practices in industrial organizations • Develop strategic thinking and decision-making skills tailored to industrial environments						
Course Outcomes CO 1) Describe the industrial and operations management	3	-	-	-	-	2	-
CO 2) Describe the organizations	3	-	-	-	-	2	-

structures							
CO 3) Solve the problems of productivity and monitor product quality levels	3	1	-	-	-	2	1
CO 4) Describe inventory control models and Material Handling equipments	3	1	-	-	-	1	1
CO 5) Interpret modern tools & techniques for Quality Management	3	1	-	-	2	1	1

*Legend : '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

16. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Sr. No.	Name and Designation	Institute	Contact No.	Email
1.	Mr. Ashoksinh M. Gohil *Lecturer in Fabrication Technology*	Sir Bhavsinhji Polytechnic Institute Bhavnagar	9924682010	amgohilges@gmail.com
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