

BMEE212L	Quality Control and Improvement	L	T	P	C
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<b>Pre-requisite</b>	<b>BMAT202L, BMAT202P</b>	<b>Syllabus version</b>			
		1.0			
<b>Course Objectives</b>					
<ol style="list-style-type: none"> <li>1. Develop the understanding of process variability and quality control.</li> <li>2. Present a problem oriented in depth knowledge, underlying concepts, tools, and application of quality control.</li> <li>3. Demonstrate the ability to design and implement acceptance sampling and reliability principles.</li> </ol>					
<b>Course Outcome</b>					
At the end of the course, the student will be able to					
<ol style="list-style-type: none"> <li>1. Evaluate the basic statistical concepts and quality tools an industrial case.</li> <li>2. Demonstrate the ability to design, use, and interpret control charts for variables and attributes</li> <li>3. Determine the process capability indices for real time processes and demonstrate Six-Sigma</li> <li>4. Design a sampling plan to construct OC curve and evaluate its effectiveness for a given process.</li> <li>5. Implement the philosophy of Taguchi's DOE and other process improvement methods</li> <li>6. Apply the reliability concepts to solve real time industry problem.</li> </ol>					
<b>Module:1</b>	<b>Introduction to Statistical Quality Control</b>	<b>5 hours</b>			
History of Quality Control - Statistical Quality Control and Statistical Process Control – Need for Statistical Concepts – Important Quality Control Tools - Quality costs and Quality loss – Quality Assurance – Taguchi's Quality Loss Function - limitation of SQC - Service Quality					
<b>Module:2</b>	<b>Control Charts For Variables</b>	<b>7 hours</b>			
Control Charts for Variables - Control Charts for $\bar{X}$ and R - process capability – interpretation- Control Charts for $\bar{X}$ and S - Control Chart for Individual Measurements - Applications of Control Charts for Variables					
<b>Module:3</b>	<b>Control Charts for Attributes</b>	<b>6 hours</b>			
Control Chart for Fraction-Nonconforming (OC curve of the control chart, variable sample size, nonmanufacturing application, the OC function and ARL calculation); Control Charts for Nonconformities or Defects; Choices Between Attribute and Variable Control Charts, Guideline for Implementing Control charts.					
<b>Module:4</b>	<b>Process Capability Analysis and six sigma</b>	<b>5 hours</b>			
PCA analysis using a histogram and probability plot, process capability ratios, Performance index calculation, PCA using a control chart, estimating natural tolerance limits of a process. Six sigma - Concept of six sigma, methods of six sigma, DMAIC methodology, DFSS methodology, six sigma control chart, case studies.					
<b>Module:5</b>	<b>CUSUM Control Charts</b>	<b>6 hours</b>			
Cumulative-Sum (CUSUM) Control Charts - CUSUM Control Chart basic principles for monitoring the shift in process mean, CUSUM design parameters, CUSUM for large shifts - Exponentially Weighted Moving Average (EWMA) control chart (EWMA control chart for monitoring process mean, design of an EWMA control chart.					
<b>Module:6</b>	<b>Acceptance Sampling</b>	<b>7 hours</b>			
The Acceptance-Sampling - Definition of a Single-Sampling - Advantages and Disadvantages of Sampling - Types of Sampling Plan - OC Curve - Designing a Single-Sampling Plan - Double, Multiple, and Sequential - The Dodge–Romig Sampling Plans – Producers risk Consumers risk - AOQL LTPD calculation.					
<b>Module:7</b>	<b>Reliability Engineering</b>	<b>7 hours</b>			
Definition of Reliability – Relationship between MTTF and MTBF - Hazard rate, Reliability					

Distributions, System reliability, Reliability block diagrams: series, parallel and mixed configuration - Achieving Product reliability – Maintainability and availability - Simple problems			
<b>Module:8</b>	<b>Contemporary Issues:</b>		<b>2 hours</b>
Total Lecture hours:			<b>45 hours</b>
<b>Text Books</b>			
1.	Amitava Mitra - Fundamentals of Quality Control and Improvement, 4th Edition, Wiley		
2.	Eugene L. Grant and Richard S. Leaven Worth, Statistical Quality Control, 2017, 7 <sup>th</sup> edition, TMH.		
3.	Charles Ebeling, An Introduction To Reliability And Maintainability Engineering. 2017, Mc Graw Hill.		
<b>Reference Books</b>			
1.	Douglas C. Montgomery. Introduction to Statistical Quality Control, 2013, 7th Edition, John Wiley & Sons.		
2.	Statistical Quality Control. M. Mahajan, 2016, Dhanpat Rai & Sons January.		
3.	L.S.Srinath, Reliability Engineering, 2005, Affiliated East west press.		
Mode of Evaluation: CAT, Written assignment, Quiz and FAT.			
Recommended by Board of Studies		09-03-2022	
Approved by Academic Council		No. 65	Date 17-03-2022