

| No | Information of subject   |  |
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| 1  | Unit name:   | Quality Control systems  |
| 2  | Code:  | McE- 61028   |
| 3  | Classification:  | Engineering subject  |
| 4  | Credit value:  | 2  |
| 5  | Semester/ Year Offered:  | 1/6  |
| 6  | Pre-requisite:   | Automation, Production Systems and Computer-Integrated Manufacturing |
| 7  | Mode of delivery:  | Lecture, Presentation, Discussion, Class Work                        |
| 8  | Assessment system and breakdown of marks:  | Assignment, Exam 1   |
|    | Assignment / Tutorial  | 30%  |
|    | Exam 1   | 70 %   |
|    |  |  |
| 9  | Academic staff teaching unit:  | Department of Mechatronics   |
| 10 | <p>Course outcome of unit:</p> <p>After completion of this course, students will be able to</p> <ul style="list-style-type: none"> <li>• To define quality programs for manufacturing</li> <li>• To understand inspection principles and practices</li> <li>• To apply inspection technologies</li> </ul>  |  |
| 11 | <p>Synopsis of unit:</p> <p>Quality control has traditionally been concerned with detecting poor quality in manufacturing products and taking corrective action to eliminate it. Quality control also includes inspection procedures and equipment that are used in the factory. Inspection is the subject to examine inspection principles and practices used in manufacturing system. Inspection technologies describe the various technologies used to accomplish inspection and measurement.</p> |  |
| 12 | <p>Topic:</p> <ol style="list-style-type: none"> <li>1. Quality Programs for Manufacturing <ol style="list-style-type: none"> <li>1.1 Quality in Design and Manufacturing</li> <li>1.2 Traditional and Modern Quality control <ol style="list-style-type: none"> <li>1.2.1 Traditional Quality Control</li> <li>1.2.2 The Modern View of Quality Control</li> </ol> </li> </ol> </li> </ol>  |  |

### 1.3 Process Variability and Process Capability

#### 1.3.1 Process Variations

#### 1.3.2 Process Capability and Tolerances

### 1.4 Statistical Process Control

#### 1.4.1 Control Charts

#### 1.4.2 Other SPC Tools

#### 1.4.3 Implementing SPC

### 1.5 Six Sigma

#### 1.5.1 Overview and Statistical Basis of Six Sigma

#### 1.5.2 Measuring the Sigma Level

### 1.6 Taguchi Methods in Quality Engineering

#### 1.6.1 Robust Design

#### 1.6.2 The Taguchi Loss Function

### 1.7 ISO 9000

## 2. Inspection Principles and Practices

### 2.1 Inspection Fundamental

#### 2.1.1 Type of inspection

#### 2.1.2 Inspection procedure

#### 2.1.3 Inspection Accuracy

#### 2.1.4 Inspection versus Testing

### 2.2 Sampling Versus 100% Inspection

#### 2.2.1 Sampling Inspection

#### 2.2.2 100% Manual Inspection

### 2.3 Automated Inspection

### 2.4 When and Where to Inspect

#### 2.4.1 Off-Line and On-Line Inspection

#### 2.4.2 Product Inspection versus Process Monitoring

#### 2.4.3 Distributed Inspection versus Final Inspection

### 2.5 Analysis of Inspection Systems

#### 2.5.1 Effect of Defect Rate in Serial Production

#### 2.5.2 Final Inspection Versus Distributed Inspection

#### 2.5.3 Inspection or No Inspection

#### 2.5.4 What the Equation Tell Us

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|    | <p>3. Inspection Technologies</p> <p>3.1 Inspection Metrology</p> <p>3.1.1 Characteristics of Measuring Instruments</p> <p>3.1.2 Contact versus Noncontact Inspection Techniques</p> <p>3.2 Conventional Measuring and Gaging Techniques</p> <p>3.3 Coordinate Measuring Machines</p> <p>3.3.1 CMM Construction</p> <p>3.3.2 CMM Operation and Programming</p> <p>3.3.3 CMM Software</p> <p>3.3.4 CMM Applications and Benefits</p> <p>3.3.5 Other Coordinate Metrology Techniques</p> <p>3.4 Surface Measurement</p> <p>3.5 Machine Vision</p> <p>3.5.1 Image Acquisition and Digitization</p> <p>3.5.2 Image Processing and Analysis</p> <p>3.5.3 Interpretation</p> <p>3.5.4 Machine Vision Applications</p> <p>3.6 Other Optical Inspection Methods</p> <p>3.7 Noncontact Nonoptical Inspection Techniques</p> |
| 14 | <p>Main references:</p> <p>A Textbook of “Quality Control Systems”, Mikell P. Groover</p>  |
| 15 | <p>Additional references:</p> <ul style="list-style-type: none"> <li>➤ ARNOLD, K.L., The Manager’s Guide to ISO 9000, The Free press, New York,1994.</li> <li>➤ LOCHNER, R., The ISO 9000 Answer Book, Oliver Wight Publications, Inc., Essex Junction, VT, 1994.</li> <li>➤ BARKMAN, W.E., In-Process Quality Control for Manufacturing, Marcel Dekker, Inc., New York, 1989</li> <li>➤ YURKO, J., The optimal placement of inspection along production lines, Master thesis, Industrial Engineering department, lehigh university, 1986</li> <li>➤ ARONSON, R.B...,Finding the flaws, Manufacturing engineering, November 2006,pp.81-88</li> </ul>   |

