

2021-2022	Mechanical Engineering	Year 3 - Sem. 5
MECA309	Quality Control in ME	Mandatory
ECTS: 2	<i>Coordinator:</i> Ing. Joseph Gholam	<i>Language:</i> English/French
Total hours: 27 h	<i>Lectures:</i> Ing. Joseph Gholam, Dr Elie Awad, Dr Houssein Baydoun	

Description:

This course gives thorough information and knowledge about: inspection and quality control, understanding metrology and measuring instruments as well as their limits, fits, dimensional and geometric tolerancing, and finally surfaces and characteristics of surfaces. The course covers the following subjects: Inspection; Specifying limits of variability; Quality control and quality insurance; Statistical quality control; Total quality management; DMAIC process; Six sigma; Types of metrology; Methods of measurements; Factors affecting on process of measurement and the accuracy of measuring instruments; Measuring instruments and their selection; Graduated and non-graduated measuring instruments; Sizes and preferred numbers; Dimensions, tolerances, and limits; Go/No-go gauges; Grades of tolerances; Basis and types of fits; Fit selection; When and why GD&T should be used; Feature and feature of size; Material conditions; Datum feature; Feature control frame; Geometric tolerance types and symbols; Characteristics of surfaces; Surface texture & roughness; Surface integrity; and Effect of manufacturing processes.

Learning outcomes:

- Understand what, where, and how to inspect,
- Specify the limits of variability,
- Understand the activities of quality control and quality assurance,
- Identify the types of errors,
- Apply statistical analysis of test data,
- Understand the main concepts of total quality management,
- Apply the DMAIC process and six sigma,
- Understand metrology, its advancements & measuring instruments,
- Identify the factors affecting the process of measurements and the accuracy of measuring instruments,
- Select the appropriate graduated or non-graduated measuring instrument according to the application,
- Understand the choice of sizes from preferred numbers and standard materials,
- Equip with knowledge of limits, fits, tolerances, and gauging.,
- Identify the types of GO/NO-GO gauges according to the application,
- Understand the basis and types of fits,
- Select the appropriate fit according to the mated parts,
- Understand the advantages of GD&T over coordinate dimensioning and tolerancing,
- Identify the difference between feature & feature frame,
- Apply the material conditions, datum feature and feature control frame,
- Apply the geometric types according to the mating parts,
- Understand the characteristics of surfaces,
- Apply the surface texture and roughness according to the desired finish of the part,
- Understand the effect of manufacturing process on the dimensional tolerances and roughness of the surfaces.

Content:

- Inspection and quality control: introduction, inspection, specifying limits of variability, quality control and quality assurance, types of errors and statistical analysis of test data, concepts of total quality management, DMAIC process and six sigma.
- Mechanical measurements and metrology: types of metrology, accuracy and precision of measurements, methods of measurements, factors affecting on process of measurement and the accuracy of measuring instruments, subgrades standard of measurements, measuring instruments and their selection, graduated and non-graduated measuring instruments.

- Limits, fits, and tolerances: sizes and preferred numbers, dimensions, tolerances, and limits, general terminology on limits and fits, go/no-go gauges grades of tolerances, basis of fits, types of fits, fit selection.
- Geometric dimensioning and tolerancing: why and when should GD&T should be used, feature and feature of size, advantages of GD&T over coordinate dimensioning and tolerancing, the cylindrical tolerance zone, material conditions (MMC, LMC, and RFS) datum feature, feature control frame, geometric tolerance types and symbols (form tolerances, profile tolerances, orientation tolerances, location tolerances, and runout tolerances).
- Surfaces and characteristics of surfaces: Characteristics of surfaces, surface texture, surface roughness, surface integrity, effect of manufacturing processes on dimension tolerances and roughness.

References:

- Paul Drake. Dimensioning and Tolerancing Handbook. McGraw Hill (Textbook).
- N.V. Raghavendra, L. Krishnamurthy. Engineering Metrology and Measurements. Oxford Higher Education.

Evaluation Method:

Assessment in the following areas will be converted to points, to compute your final grade in this course:

- Mid-Term
- Final Exam
- Project

Description :

Ce cours offre des informations et des connaissances approfondies concernant : l'inspection et le contrôle de qualité, la compréhension de la métrologie et ses instruments de mesure ainsi que les limites, les ajustements et les tolérances dimensionnelles et géométriques, et finalement les états de surfaces et leurs caractéristiques. Le cours couvre les sujets suivants : Inspection ; Contrôle et assurance de qualité ; Contrôle de la qualité statistique ; Gestion de la qualité totale ; processus DMAIC ; Six Sigma; Types de métrologie; Méthodes de mesures ; Facteurs affectant le processus de mesure et la précision des instruments de mesure ; Instruments de mesure et leurs sélection; Instruments de mesure gradués et non gradués; Dimensions, tolérances et écarts ; Jauges Go/No-go ; Degrés de tolérances ; Systèmes et types d'ajustements ; Sélection d'ajustement ; Quand et pourquoi utiliser GD&T ; Entités et Entités Dimensionnelles ; Exigence de matière ; Eléments de référence ; Cadre de tolérance ; Types et symboles de tolérance géométrique ; Caractéristiques des surfaces ; Texture et rugosité de surface ; Intégrité de la surface ; Effet des procédés de fabrication.