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MENT104 Manufacturing and Fabrication Operations

ECTS Value: 5 ECTS
Self-Study Hours: 60

Contact Hours: 25
Assessment Hours: 40

Overall Objectives and Outcomes

This unit gives the opportunity to students to investigate possible methods to integrate Science, Technology, Engineering and Maths (STEM) whilst focusing on product design and manufacturing/ fabrication operations. Assessment methodologies of practical tasks and typical psychomotor performance rubrics will also be discussed to enable participants to conduct own research on the subject.

By the end of this module, the learner will be able to:

Competences:

a. Develop a critical understanding of STEM Education;

b. Engage with research and develop pedagogic methods to introduce learners to 'true lengths', 'intersection lines', 'true shapes' and the procedures to develop nets of transition pieces;

c. Develop a critical understanding of design processes and manufacturing/ fabrication concepts commonly followed to engineer a product;

d. Engage with literature on current developments of single point cutting tools including cutting speed calculations;

e. Develop a critical understanding of typical material joint configuration, edge preparation for the joint and the most advantageous weld position during production that could be adopted to ensure quality.

Knowledge:

a. Explain how STEM education can be used as an integral approach across disciplines;

b. Demonstrate knowledge of methods used to present orthographic views of objects, sectional views and auxiliary views and how to extract true lengths and true shapes;

c. Demonstrate knowledge of CAD work and pencil sketching;

d. Demonstrate knowledge of manufacturing, fabrication and assembly processes;

e. Demonstrate knowledge of the effect of cutting speeds on surface finish and working lifetime of cutting tool;

f. Demonstrate knowledge of the following standards of: AWS and ISO;

g. Demonstrate knowledge of material joint preparation standards and fabrication (weld) positions to facilitate production;

Skills:

a. Compute accurately the optimum cutting speed to machine a product on a lathe;

b. Apply the design process to develop transferable, creative problem solving skills of students;

c. Produce analytical solutions to problems or to explain science concepts behind the technology used to produce a product;

d. Produce a report to explain principles, concepts and benefits of allowed (permissible) tolerance in dimensions of machined and fabricated products;

e. Produce a report to explain how advanced product engineering performance analysis is applied to improve products;

f. Produce a report to explain different types of joint configurations used to fabricate and assemble products including: permanent joints as when soldering, brazing and welding is used and non-permanent joints as when screws, rivets, bolts and studs are used.

Assessment Methods

This module will be assessed through: Research and Practice Assignment.

Suggested Readings

Core Reading List:

1. Goodhew, P.J. (2010). Teaching Engineering: All you need to know about engineering education but were afraid to ask. UK: The Higher Education Academy. Available from: http://core.materials.ac.uk/repository/teaching-engineering/teaching_engineering_goodhew.pdf

2. Kramer, J., Kim, E., Poreh, D., Agogino, A. (unpublished). Teaching and Evaluating Design Competencies in the 21st Century.

3. Felder, R.M. (1999). 'How to Improve Teaching Quality'. *Quality Management Journal*, 6(2).

4. Baharom, S., Azry Khoiry, M., Hamid, R. Mutalib, A.A., Hamzah, N. (2015). 'Assessment of Psychomotor domain in a Problem-based concrete laboratory'. In *Journal of Enginering Science and Technology* 10(1).

5. Mishra, R., Barrans, S. and Pislaru, C. (2009). '*Imparting psychomotor skills to the learners using computer aided instructions in Engineering Education'*. In: *V International Conference on Multimedia and Information and Communication Technologies in Education*, 22-24 April 2009, Lisbon, Portugal.

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Supplementary Reading List:

1. National Society of Professional Engineers (2013). *Professional Enginering Body of Knowledge: Prepared by the Licensure and Qualifications for Practice Committee of the National Society of Professional Engineers*. Retrieved from: https://www.nspe.org/sites/default/files/resources/nspe-body-of-knowledge.pdf

2. Lang, J.M. (2016). Small Teaching: Everyday Lessons from the Science of Learning. US: Wiley.

3. Chijioke, O.P. (2013). Appraisal of Theoretical Models of Psychomotor Skills and Applications to Technical Vocational Education and Training (TVET) Systems in Nigeria. In *Journal of Research and development,* Vol 1(6).

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