

BENT201 Models to Teach and Learn Engineering

ECTS Value: 5 ECTS
Self-Study Hours: 60

Contact Hours: 25
Assessment Hours: 40

Overall Objectives and Outcomes

This unit is aimed to explore teaching and learning techniques most appropriate for engineering subjects. Besides the few selected techniques referred to in this unit as a springboard for further discussion, students will be guided and encouraged to explore many other alternative techniques available. This unit shall also introduce course participants to computer-aided design (CAD) as a tool to design models to enhance their own students' learning experience. Therefore, participants will be given another tool to draw and develop their own ideas through 2D and 3D models.

Competences

- a. Engage with literature to critically evaluate pedagogical models relevant to engineering;
- b. Develop a systematic approach in selecting an appropriate teaching model relevant to a specific topic in engineering;
- c. Develop an analytic form to make adequate predictions of the impact on student learning;
- d. Develop a comprehensive understanding of the Constructive Alignment Model as applied to the pedagogy of engineering topics;
- e. Engage with literature to critically evaluate the surface and deep learning approaches;
- f. Develop a systematic embedded approach to teaching-learning-assessment towards team work and collaboration;
- g. Use Computer Aided Design tools to draw new drawings and to modify drawings.

Knowledge

- a. Understand the background of computer aided design;
- b. Explain with examples from the world of engineering where CAD can be implemented;
- c. Be familiar with the different tools and operations used for drawing;
- d. Represent dimensions and modifications in a clear manner within a drawing;
- e. Extract various information from available drawings;
- f. Explain a range of analytic methods appropriate to measure the effectiveness of learning;
- g. Discuss the main characteristics of team work and collaboration initiatives at the place of work;

Skills

- a. Prepare a range of model templates to suit different applications;
- b. Produce a 2D model drawing including drawing of standard shapes and designs;
- c. Appraise engineering teaching methodologies from practical day to day examples;
- d. Use Computer Aided Design tools to draw new drawings and to modify existing drawings.

Assessment Methods

This module will be assessed through: Practical Task (30%) and Research Assignment (70%)

Suggested Readings

Core Reading List:

1. Urdarevik, S. (2013). Using Models to Teach and Learn Engineering. In proceedings for the ASQ Advancing the STEM Agenda Conference. Slobodan Urdarevik Western Michigan University;
2. Lowrance, C.J. (2010). An Efficient Teaching Techniques for Engineering –Using Reverse Engineering in the Classroom to Teach Creativity. Retrieved from:
<https://www.asee.org/documents/sections/northeast/2010/An-Efficient-Teaching-Technique-for-Engineering.pdf>
3. 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

Supplementary Reading List:

1. Hiebert, J. (2003). Learning To Learn To Teach: An ‘Experiment’ Model for Teaching and Teacher Preparation in Mathematics. Journal of Mathematics Teacher Education, 6(3) p. 201-222;
2. Oakley, B. (2014). A mind for Numbers: How to Excel at Math and Science. US: Tarcher Perigee.
3. Lang, J.M. (2016). Small Teaching: Everyday Lessons from the Science of Learning.US: Jossey-Bass.
4. Bain, K. (2004). What the Best College Teachers do. US: Harvard University Press.