

## Technical Drawing and Basics of CAD

Code: MK3GEPRG05GX17-EN

ECTS Credit Points: 5

Evaluation: mid-semester grade

Year, Semester: 1. year, 2. semester

Its prerequisite(s): MK3ABRAA04GX17

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 2+3

### Topics:

Students get acquainted with basic rules of preparation of technical documentation. They acquire the specifications and get routine in preparation and application of technical drawings. They get acquainted with CAD systems, and get routine in the use of AutoCAD software.

Drawing standards, formal requirements of machine drawings. Drawing sheet dimensions, line types and thickness groups. Projection views, sections and sectional views, revolved- and removed sections. Drawings of standardized machine elements: threads and thread symbols, bolted joint, gears, sprocket-wheel, splined shaft, bearings. Representation of welded joints. General prescriptions for dimensioning. Conventional dimensioning methods. Tolerance system. Defining fits: clearance, transition and interference fit. ISO Tolerance system. Form and position tolerances. Defining the surface roughness.

General properties of AutoCAD. Utilization of commands, menu bar options and icons. The layer-system of the AutoCAD, operations with layers. Use of outer references and blocks. Dimensioning possibilities, building up dimensional chains, representation of tolerances.

### Literature:

#### *Compulsory:*

- Tiba Zsolt, Machine drawing, Debreceni Egyetemi Kiadó – Debrecen University Press, 2013
- Learning AutoCAD 2010, Autodesk Official Training Guide Edition, 2010

#### *Recommended:*

- Flender, Technical Handbook
- Szerkesztési atlasz. Szerk.: Nagy Géza. GTE. Budapest, 1991

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** Drawing standards, formal requirements of machine drawings. Drawing sheet dimensions, title block, defining the line types and thickness groups. Standardized letter and figure shape and sizes, scales, full size, reduction scales, enlarged scales.

**Practice:** issuing the task 1: Lettering

#### 3<sup>rd</sup> week:

**Lecture:** Defining the surfaces of a part. Views, auxiliary view, local view, sectional views and sections. Complex sectional views, removed sections, specific sectional views and sections.

**Practice:** issuing the task 2: Drawing Machine Parts. Practicing the presentation methods.

Introduction of CAD systems, general properties of AutoCAD.

**4<sup>th</sup> week:**

**Lecture:** General prescriptions for dimensioning, choosing basis surfaces. Conventional dimensioning methods. Specific dimensioning, defining and giving conical taper and flat taper

**Practice:** submitting the task 1 and 2, issuing the task 3: Shaft drawing. Practicing the presentation methods. User interface of AutoCAD. Utilization of commands, menu bar options and icons.

**6<sup>th</sup> week:**

**Lecture:** Hole-base system, shaft base system. Defining fits: clearance, transition and interference fit.

**Practice:** submitting the task 3, issuing the task 4: Designing Fitting Pieces. Applying the cutting plane and the cutting sphere method to construct the intersection lines of interpenetrating surfaces.

The layer-system of the AutoCAD, operations with layers.

**8<sup>th</sup> week: 1<sup>st</sup> drawing week****9<sup>th</sup> week:****Mid-term test**

**Lecture:** Defining the surface roughness. Feasible roughness with different processing methods. Correlation between the surface roughness and the IT grade of dimension.

**Practice:** elaborating the shop drawing of pattern development of fitting pieces.

Hatching, loading of styles, indication of areas to hatch in AutoCAD.

**11<sup>th</sup> week:**

**Lecture:** springs: standardized representation of helical spring, Belleville spring, buffer spring, annular spring, multi-leaf spring. Keyed joints with saddle keys, sunk keys, parallel keys and woodruff keys. Splined shaft joint.

**Practice:** elaborating the task 5, Drawing threaded joints in section and on view.

Dimensioning possibilities in AutoCAD, building up dimensional chains, representation of tolerances.

**13<sup>th</sup> week:**

**Lecture:** rolling bearings: ball and roller bearings. Riveted joints. Welding symbols and welded joints: butt joint, lap joint, tee joint, corner joint.

**5<sup>th</sup> week:**

**Lecture:** ISO Tolerance system. Basic size, actual size, limits, deviations, fundamental deviation. Defining the tolerance IT grades.

**Practice:** Applying the dimensioning methods to dimensioning parts.

“Modify” commands in AutoCAD. Effect of constructional commands on efficiency.

**7<sup>th</sup> week:**

**Lecture:** ISO Tolerance system. Form and position tolerances. Free dimensional tolerance.

**Practice:** Designing Fitting Pieces. Applying the triangulation and parallel line methods to develop fitting pieces. Representing tolerances and calculating its dimensions.

Insertion of texts in AutoCAD. Loading and modification of letter types.

**10<sup>th</sup> week:**

**Lecture:** Standardized Thread forms and its main features. Threads and thread symbols in drawing. Threaded joints: bolted joint, studed joint, screw fastening.

**Practice:** : submitting the task 4, issuing the task 5: Screw Fastening and Joints. Presentation of tolerances and fits in drawing. Presentation of surface roughness in drawing.

Use of outer references and blocks in AutoCAD.

**12<sup>th</sup> week:**

**Lecture:** Gears and toothed parts. Spur and helical gears, bevel gears, worms, rack and pinion gears, sprockets.

**Practice:** issuing the task 6: Gearing. Drawing keyed joints and splined shaft joint in section and on view.

Drawing in AutoCAD.

**14<sup>th</sup> week:**

**Lecture: End-term test**

**Practice:** submitting the task 5, elaborating task 6.  
Drawing in AutoCAD.

**Practice:** submitting the task 6. Drawing bearings,  
riveted and welded joints in section and on view.  
Drawing in AutoCAD.

## 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

### Requirements

#### A, for a signature:

Attendance on the **lectures** is recommended, but not compulsory.

Participation at **practice** is compulsory. Student must attend the practices and may not miss more than three practice during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Student can't make up a practice with another group. The attendance on practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence due to the lack of active participation in class.

Students have to **submit all the six drawing tasks** made manually as well as with AutoCAD as scheduled minimum on a sufficient level.

During the semester there are two tests: the mid-term test is in the 9<sup>th</sup> week and the end-term test in the 14<sup>th</sup> week. Students have to sit for the tests.

#### B, for grade:

The course ends in **mid-semester grade**. Based on the average of the marks of the drawings and the average of the test results, the mid-semester grade is calculated as an average of them:

- average grade of the six drawing tasks
- average grade of the two tests

The minimum requirement for the mid-term and end-term tests is 60%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score	Grade
0-59	fail (1)
60-69	pass (2)
70-79	satisfactory (3)
80-89	good (4)
90-100	excellent (5)

If the score of any test is below 60, the student once can take a retake test covering the whole semester material.