Technology
Arts Sciences
TH Köln

Course Manual KL

design and 3D-CAD

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General information

Long name	design and 3D-CAD
Approving CModule	KL_BaET, KL_BaOPT
Responsible	Prof. Dr. Michael Gartz Professor Fakultät IME
Valid from	winter semester 2021/22
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Michael Gartz Professor Fakultät IME
Requirements	mathematics elementary geometry three-dimensional spatial sense
Language	German
Separate final exam	Yes

Literature

- Hoischen, Technisches Zeichnen, Cornelsen
- Krause Werner, Grundlagen der Konstruktion, Hanser
- Decker Karl Heinz, Maschinenelemente, Funktion, Gestaltung und Berechnung, Hanser
- Steinhilper, Röper, Maschinen- und Konstruktionselemente 1 und 2, Springer
- Naumann, Schröder, Bauelemente der Optik, Hanser Verlag

Final exam

Details	Within the three-part examination the taxonomy ratings like understanding, appliance, analyzing, synthesizing and evaluating are examined. Within the first part the students have to state their project which they had processed during the term. They have to exemplify the most difficult construction problems and how they have analyzed and solved them. The have to assess the chosen approach. In the second part of the examination the students will get a freehand sketch, which have to be analyzed und to which they have to create a suitable 3D geometry model using a 3D design program and they have to make the engineering drawing with dimensioning. In the third part of the examination construction problems have to be analyzed and based on the fundamental terms and on the technique presented in the lecture an appropriate solution has to be stated. The suitability of different construction solutions have to be assessed.
Minimum standard	50 % of the questions out of all parts of the examination correctly answered correct construction and engineering drawing of the component part without any serious errors
Exam Type	EN mündliche Prüfung, strukturierte Befragung

− Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	basic skills of technical drawing composition of the engineering detail drawing drawing formats labelling field and list of parts arrangement of the views line types and line strength technical views engineering standards dimensioning normal dimensioning coordinate dimensioning sectional view representation of a thread surface specifications tolerances fitting position tolerances and form tolerances suitable for production constructiong and dimensioning
Knowledge	Three-dimensional construction Introduction to a 3D CAD program sketching basics sketching tools Project geometries work elements work points working axes work levels 3D elements extrusion rotation bores thread roundings subassemblies place components create components in assemblies replace components in assemblies create dependencies editing components in assemblies detailed drawings derive detail drawing from 3D component create Views dimension

Special requirements

none

Accompanying material	Presentation slides for the lecture as pdf-files, exercise tasks as downloadable files
Separate exam	No

Knowledge	construction elements in particular precision mechanics free from distortion lens holder scatter-resistant components beam drops
Knowledge	Materials and material science ferrous alloy non-ferrous metals synthetic materials special materials glassware ceramics surface refinement varnishing anodizing coating burnishing
Knowledge	manufacturing method turning milling drilling grinding
Knowledge	analysis of strain and mechanical strength fundamentals applications
Skills	to calculate the mechanical strength the raw material consumption the material costs
Skills	to define tolerances dimensions
Skills	to determine path of rays the material the manufacturing method
Skills	to assess surface quality dimensional accuracy feasibility of the construction

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	1
Exercises (shared course)	0

Tutorial (voluntary)	0

− Lecture / Exercises

Learning goals

Goal type	Description
Skills	technical drawing
Skills	Create a 3D geometric model using a CAD program
Skills	Checking and evaluating the design in production-orientated manner
Skills	Check and evaluate strength simulation for plausibility
Skills	Recognizing and understanding interrelationships
Skills	analyse a constructive task analyze Independently recognized constructive tasks Analyze the given constructive tasks
Skills	design a solution approach for the constructive task Consideration of construction possibilities / resources Consideration of the available time quota
Skills	Presentation of a project outline Describe the task outline the approach
Skills	Milestone presentation to check the progress of the project Describe the task outline the approach Present results in a clearly structured way Discuss technical and scientific results
Skills	Final presentation with presentation of the realized solution approach Describe the task outline the approach Present results in a clearly structured way Discuss technical and scientific results

Special requirements

none

Accompanying material	oral discussions with project supervisor with individual references
Separate exam	No

Skills	optional: realize basic optical structures yourself build adjust Carry out function test
Skills	apply scientific / technical laws Calculating and drawing beam paths Estimate error influences Check the suitability of the construction, check the composition
Skills	Work on complex technical tasks in a team Organize into subtasks Discuss measurement results complement each other meaningfully

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Project	2
Tutorial (voluntary)	0