COMPUTER-AIDED DESIGN FOR ENVIRONMENTAL PROTECTION
(SYLLABUS)

1. Information regarding the programme

1.1 Higher education institution	Babeş-Bolyai University
1.2 Faculty	Faculty of Environmental Science and Engineering
1.3 Department	Environmental Analysis and Engineering
1.4 Field of study	Environmental Engineering
1.5 Study cycle	Master
1.6 Study programme / Qualification	Sustainable Development and Environmental Management (DSMM)/ Environmental Engineering / Waste Recovery Engineering (IVD)

2. Information regarding the discipline

2.1 Name of the discipline		Computer aided design applicable in environmental protection					
2.2 Course coordinator		Assistant Prof., PhD Manciula Dorin					
2.3 Seminar coordinator		Assistant Prof., PhD Manciula Dorin					
2.4. Year of study	2	2.5 Semester	4	2.6. Type of evaluation	E	2.7 Type of discipline	Compulsory

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	5	3.2 Of which: course	2	3.3 seminar/laboratory	3
3.4 Total hours in the curriculum	70	3.5 Of which: course	28	3.6 seminar/laboratory	42

Time all otment:	hours
Learning using manual, course support, bibliography, course notes	50
Additional documentation (in libraries, on electronic platforms, field documentation)	50
Preparation for seminars/labs, homework, papers, portfolios and essays	50
Tutorship	15
Evaluations	15
Other activities: visits, workshops, and other academic activities	2

3.7 Total individual study hours	112
3.8 Total hours per semester	182
3.9 Number of ECTS credits	7

4. Prerequisites (if necessary)

4.1. curriculum	Basics of environmental engineering: ecological processes, transport and transfer processes, applied mathematics in environmental engineering, descriptive geometry and computer assisted drawing
4.2. competencies	Technical: use of computer software

5.Conditions (if necessary)

5.1. for the course	Necessity of digital projector and computer (laptop)
5.2.for the seminar /lab activities	Laboratory with computers and specific software

6. Specific competencies acquired

Professional competencies	• Acquire communication skills to interact effectively in a professional manner on issues related to technical design; • development of teamwork abilities, to think relationally and find concrete ways to approach and solve graphic problems; • critical analysis, application of models, theories, fundamental engineering concepts related to specific issues concerning environmental protection; • explanation and interpretation of properties, concepts, approaches, models and specific notions relating to technical design in connection with fundamental sciences and engineering; • presentation of drawings, sketches and engineering projects with specific to engineering areas • recognition and description of concepts, theories, methods and graphical models applied in engineering sciences.
Transversal competencies	• work successfully in a team by performing practical tasks; • develop technical and communication skills; • ability to conduct literature research in all existing formats; • knowledge of using specific computer software in the field of environmental studies; • acquiring knowledge of developing a research project;

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• to provide general knowledge related to concepts and methods applied in the area of computer design; • acquisition of theoretical knowledge on principles, general concepts an basic rules of technical graphic design for engineers; • introduction of basic elements specific to computer aided design documentation necessary for the generating technical drawings.
7.2 Specific objective of the discipline	• development of technical skills to achieve graphic representations at different scales; • applying the concepts related the work techniques used in descriptive geometry and technical graphic design.

8.Content

8.1 Course	Teaching methods	Remarks
C1. Introduction to computer graphics. Backgrounds, opportunity and motivation of ecological and engineering design. History of technical graphic design.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C2. Elements of descriptive geometry. Notations and symbols. Projection systems and reference systems. Modelling theory. Conceptual models. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C3. Geometric modeling. Conventions and notations. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C4. Curves. Hermite curves. Bezier curves. B-spline curves. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C5. Surfaces. Explicit, implicit and parametric equations of surfaces. Points on a surface. Embedded curves. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C6. Raster scan graphics. Drawing algorithms. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C7. Clipping. 2D clipping. 3D clipping. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C8. Visible lines and visible surfaces. Algorithms. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C9. Rendering. Illumination models. Transparency. Shadows. Textures. Ray tracing. Radiosity. Color. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C10. The bicubic Hermite surface. Bezier surfaces. B-spline surfaces. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C11. Solids. Parametric solids. Tricubic solid. Curves and surfaces embedded in a solid. Controlled deformation solids. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C12. Complex model construction. Topology of models. Boolean and boundary models. Graphic examples.	• Interactive exposure • Explanation • Conversation	-

	• Didactical demonstration	
C13. Relational geometric synthesis. Relational model structure. Relational entities. Applications. Graphic examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-
C14. Graphic design software. 2D design. 3D design. Examples.	• Interactive exposure • Explanation • Conversation • Didactical demonstration	-

Bibliography

- C. Anghel, G. Şimon, Grafică Tehnică Asistată de Calculator, Editura Risoprint, Cluj-Napoca, 2008;
- J. Moncea, Geometrie descriptive şi desen tehnic, Vol. I, Editura Didactică şi Pedagogică, Bucureşti,
- 1982;
- Enache, T. Ivănceanu, Geometrie descriptive şi desen tehnic, Editura Didactică şi Pedagogică,
- Bucureşti, 1982;
- E. Vasilescu, Desentehnic industrial, Editura Tehnică, Bucureşti, 1994;
- N. Crisan, Notiuni Fundamentale în Desenul Tehnic Industrial, Vol. I, Editura Risoprint, Cluj-Napoca, 2001.
- CAD Book – Course bulletin, Péter Hervay, Richárd Horváth, László Kátai, István Madarász, Budapest University of Technology and Economics Faculty of Mechanical Engineering, 2012;
- Nicos Bilalis, Computer aided design-CAD, Technical University of Crete, 2000;
- Michael E. Mortenson, Geometric modeling, Wiley Computer Publishing, 1996;
- David F. Rogers, Procedural elements for computer graphics, WCB McGraw-Hill, 1985;
- Andrew Mustun, An introduction to computer aided design (CAD), RibbonSoft, GmbH, 2016.

8.2 Seminar / laboratory	Teaching methods	Remarks
S1/L1.General presentation of computer graphic programs - CAD software and tools. Ecological and engineering design concept.	• Lab assignment • Explanation • Conversation	Individual work
S2/L2.2D and 3D software presentation. General data presentation for individual project. Ecological and technical data and processes analysis.	• Lab assignment • Explanation • Conversation	Individual work
S3/L3.Introduction to CAD 2D software. Description and using of 2D software. Drawing elements, tools and procedures.	• Lab assignment • Explanation • Conversation	Individual work withsoftware
S4/L4. Making sketches and profiles with graphic program Solid Edge. Part 1	• Lab assignment • Explanation • Conversation	Individual work with software
S5/L5. Making sketches and profiles with graphic program Solid Edge. Part 2	• Lab assignment • Explanation • Conversation	Individual work with software
S6/L6. Making sketches and profiles with graphic program Solid Edge. Part 3	• Lab assignment • Explanation • Conversation	Individual work with software
S7/L7. Introduction to 3D software. Description and using of 3D software. Drawing elements, tools and procedures.	• Lab assignment • Explanation • Conversation	Individual work with software
S8/L8. Making sketches and profiles with graphic program G-Sketchup. Part 1	• Lab assignment • Explanation	Individual work with simulation software

	• Conversation	
S9/L9. Making sketches and profiles with graphic program G-Sketchup. Part 2	• Lab assignment • Explanation • Conversation	Individual work with software
S10/L10. Making sketches and profiles with graphic program G-Sketchup. Part 3	• Lab assignment • Explanation • Conversation	Individual work with software
S11/L11. Making sketches and profiles with graphic program Lumion. Part 1	• Lab assignment • Explanation • Conversation	Individual work with software
S12/L12. Making sketches and profiles with graphic program Lumion. Part 2	• Lab assignment • Explanation • Conversation	Individual work with software
S13/L13. Making sketches and profiles with graphic program Lumion. Part 3	• Lab assignment • Explanation • Conversation	Individual work with software
S14/L14. Presentation of individual project	• Conversation	Lab Exam

Bibliography

- C. Anghel, G. Şimon, GraficăTehnicăAsistată de Calculator, EdituraRisoprint, Cluj-Napoca, 2008;
- J. Moncea, Geometriedescriptivăşidesentehnic, Vol. I, EdituraDidacticăşiPedagogică, Bucureşti,
- 1982;
- Enache, T. Ivănceanu, Geometriedescriptivăşidesentehnic, EdituraDidacticăşiPedagogică,
- Bucureşti, 1982;
- E. Vasilescu, Desentehnic industrial, EdituraTehnică, Bucureşti, 1994;
- N. Crisan, NotiuniFundamentaleînDesenulTehnic Industrial, Vol. I, EdituraRisoprint, Cluj-Napoca, 2001;
- CAD Book – Course bulletin, PéterHervay, RichárdHorváth, LászlóKátai, IstvánMadarász, Budapest University of Technology and Economics Faculty of Mechanical Engineering, 2012;
- NicosBilalis, Computer aided design-CAD, Technical University of Crete, 2000;
- Michael E. Mortenson, Geometric modeling, Wiley Computer Publishing, 1996;
- David F. Rogers, Procedural elements for computer graphics, WCB McGraw-Hill, 1985;
- Andrew Mustun, An introduction to computer aided design (CAD), RibbonSoft, GmbH, 2016.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

The course and practical work shows calculation examples, case studies, problems, exercises and examples to familiarize students with elements of technical and computer-aided graphics.

10.Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade(%)
10.4 Course	A theoretical research report related to the topic of the lab project	Examination. Evaluation of the research report (a written paper and an oral presentation)	30%

10.5 Seminar/lab activities	A project developed using the available software	Evaluation of the project (documentation and demonstration) and the 3D graphic design. In order to assess the project, the following elements will be considered: respecting the deadline; project presentation; project aspect, content and references.	60%
	Student activity and active participation in seminars	Scoring. Participation in discussions, debates, preparation of the tasks. Students are rewarded for bringing up more challenging ideas.	10%

10.6

- Each student has to prove that (s)he acquired an acceptable level of knowledge and understanding of the studied domain, that (s)he is capable of stating these knowledge in a coherent form, that (s)he has the ability to establish certain connections and to use the knowledge in solving different problems.
- Minimum 80 % presence at seminar/lab activities.
- Successful passing of the exam is conditioned by the final grade that has to be at least 5.

Signature of course and seminar coordinator:

Lect. Manciula Dorin, PhD Eng.

Date of approval:

14.04.2021

Signature of the head of department