

DIGITAL TOOLS AND OPERATIONS 1

Bachelor in Architectural Studies BAS SEP-2023 DTO1-AS.1.S.A

Area Architecture and Design

Number of sessions: 20

Academic year: 23-24

Degree course: FIRST

Number of credits: 3.0

Semester: 1º

Category: COMPULSORY

Language: English

Professor: **OSCAR HERRERO HERRANZ**

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Óscar Herrero Herranz is an architect licensed from IE University (Segovia).

He has developed both academic and professional career around complex geometry, scripting, visualization and interactive applications.

In the academic side he collaborates with several institutions, giving seminars and courses at IE University, Segovia (Digital Tools and Operations as Teacher and Architectural Geometry I & II as teacher assistant), ETSAM, UPM, Madrid (BIM Master, VR Visualization introduction) or IAAC, Institute for Advanced Architecture of Catalonia (Master in Advanced Computation for Architecture & Design, Digital tools for integrative Modelling Seminar)

At the same time, Óscar is part of the Modelical team since 2015, where he has been involved in big and unique projects like 3D modelling and 2D representation of Nativity façade of Sagrada Familia (Barcelona), BIM modelling and solution development of Santiago Bernabeu Stadium (Madrid), BIM modelling of Kuwait International Airport. Among several VR and interactive experience like FC Barcelona Operations, Barcelona Council Protocol, Doha Port experience or National Museum of Qatar VR experience.

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SUBJECT DESCRIPTION

Digital Tools and Operations is one of the graphic courses offered during the first year of the degree, and serves as the basis for Architectural Geometry 01, which will take place during the second semester.

The course seeks to provide the students with a clear understanding of the fundamentals of digital representation and the relationship between the digital model and the built environment. It is not designed as a software tutorial: additional software workshops will be organized outside of class. The main objective of the course is to provide a critical understanding of digital tools and their potential, in order to represent and model architecture and architectural elements.

The course will be structured around the following content: 1. Digital technologies applied to drawing and representation, 2. Digital technologies applied to 2D and 3D modeling, 3. Digital technologies applied to production and delivery.

Digital Tools and Operations has three main goals:

1. The ability to conceive and represent the visual attributes of objects. Students will be competent in understanding, analyzing and producing legible and precise drawings of objects and spaces that follow architectural drawing standards through the use of Computer Aided Design.
2. To be able to work with proportion, scale and digital drawing techniques
3. To understand and work with different systems and methods of representation, and to evaluate their usefulness in different architectural design contexts.

LEARNING OBJECTIVES

2.1 Basic and General Objectives (per Ministerial Decree EDU/2075/2010, 29 of July; and the official accreditation request for the Bachelor in Architectural Studies, July 2015.)

- CB1: Students have demonstrated knowledge and an understanding of a given area of study, building upon the foundation of secondary education, supported by advanced texts, and including aspects that engage the latest advances in their area of study.
- CB2: Students know how to apply their knowledge professionally to their work or vocation and possess the competencies that are often demonstrated through elaboration and defense of arguments and the resolution of problems within their area of study.
- CB3: Students can gather and interpret relevant facts (usually within their area of study) in order to make judgments that include reflection on relevant social, scientific, and ethical topics.
- CB4: Students can transmit information, ideas, problems, and solutions to both specialized and non-specialized audiences.
- CB5: Students have developed the necessary learning skills to continue their studies with a high degree of autonomy.
- CG2: Knowledge of the role of the fine arts as a factor that can influence the quality of architectural creation.
- CG7: An understanding of the relationship between people and buildings, and between buildings and their contexts, as well as the need to relate buildings and adjacent spaces to needs and to the human scale.

2.2 Specific Competencies Module: Preparatory Subject: Digital Studies

- CE2: Ability to conceive of and represent the visual attributes of objects and to demonstrate command of proportion and drawing techniques, both manual and digital.

2.3 Transverse Competencies of the University

- CT4: Use disciplinary knowledge to analyze and evaluate current situations.
- CT5: Integrate oneself into interdisciplinary and multicultural teams to achieve common goals in

a context of diversity.

2.4 Learning outcomes

Digital Tools and Operations is the only subject in its area of study. Students have to be able to demonstrate:

1. Ability to conceive and represent the visual attributes of objects.
2. Command of proportion and drawing techniques, both manual and digital.

TEACHING METHODOLOGY

3.1 Teaching methodology

The course is predominantly workshop based, with a series of short lectures given by the professor at the beginning of each block or session or even sent to the student to prepare it before the session using videos or short tutorials. The aim of the course is to develop an understanding of architectural geometry and representation through the use of Computer Aided Design from a critical standpoint: it is not intended to be a software tutorial. Initial training on CAD tools will be provided at the beginning of the semester and additional workshops will be carried out outside class time.

Short-term assignments will be developed in class, to apply the theory learned in the preceding lecture. During this time the professor will make corrections and answer questions both individually and to the whole group.

There will be a long-term assignment that will be explained during the first sessions, and is to be carried out throughout the course. At the beginning of each block a new segment will be added to this assignment, that will be completed and handed in at the end of each block. At the end of the course all parts of this long-term assignment will be corrected and improved upon for the final submission. This long-term assignment and its different segments are meant to be started and planned out in class, and finished predominantly at home.

3.2 Student learning method/distribution of ECTS load:

Digital Tools and Operations I is a 3 ECTS subject, distributed in 20 IE sessions of 80+10 minutes, or 30 hours of class. This amount of time is fairly short for the development of the scheduled contents so the students will be asked to continue working at home. Class time will be spent on theory, guided work, and discussions. This scenario will require a commitment from the students to work hard inside and outside school.

3.3 Training activities:

AF1: Workshops and laboratories - 20 hours

AF2: Lectures - 5 hours

AF3: Discussions and seminars - 5 hours

AF10: Submission preparation - 45 hours

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	6.67 %	5.0 hours
Discussions	6.67 %	5.0 hours
Exercises in class, Asynchronous sessions, Field Work	26.67 %	20.0 hours
Group work	0.0 %	0.0 hours
Individual studying	60.0 %	45.0 hours
TOTAL	100.0 %	75.0 hours

PREREQUISITES

Students are required to have:

Their own personal laptop (less than 4y old) with a classical 3 button mouse

A thorough understanding of their own operating system (Windows is recommended)

Also it is suggested to assist any software workshop that IE could offer for first year students.

PROGRAM

SESSIONS 1 - 2 (LIVE IN-PERSON)

G1. INTRODUCTION TO ORTHOGRAPHIC PROJECTIONS AND COMPUTER-AIDED DESIGN

Historical Overview. Types of projection systems. Orthographic projections

Delivery method: Synchronous hybrid

SESSIONS 3 - 4 (LIVE IN-PERSON)

G2. INTRODUCTION TO CASE STUDY ANALYSIS

Elements of Architectural Representation 1

Delivery method: Asynchronous

Orthographic projections. Lineweights and legibility. Introduction to scale and architectural standards

Delivery method: Synchronous hybrid

SESSIONS 5 - 6 (LIVE IN-PERSON)

Orthographic projections. Lineweights and legibility. Introduction to scale and architectural standards

Delivery method: Synchronous hybrid

Elements of Architectural representation 2

Delivery method: Asynchronous

SESSIONS 7 - 8 (LIVE IN-PERSON)

Layer-based drawing. Plan and elevation analysis

Delivery method: Synchronous online

SESSIONS 9 - 10 (LIVE IN-PERSON)

Elevations and drawing correlations

Delivery method: Synchronous hybrid

SESSIONS 11 - 12 (LIVE IN-PERSON)

Elements of Architectural Representation 3

Delivery method: Asynchronous

G3. SECTIONED ORTHOGRAPHIC PROJECTIONS

Introduction to sections and section legibility

Delivery method: Synchronous hybrid

SESSIONS 13 - 14 (LIVE IN-PERSON)

G3. SECTIONED ORTHOGRAPHIC PROJECTIONS

Introduction to sections and section legibility

Delivery method: Synchronous hybrid

Case Study presentation - Assignment A

Delivery method: Synchronous online

SESSIONS 15 - 16 (LIVE IN-PERSON)

Case Study presentation - Assignment A

Delivery method: Synchronous online

G4. AXONOMETRIC SYSTEMS

Introduction to axonometric projections. Isometric

Delivery method: Synchronous hybrid

SESSIONS 17 - 18 (LIVE IN-PERSON)

G4. AXONOMETRIC SYSTEMS

Introduction to axonometric projections. Isometric

Delivery method: Synchronous hybrid

Introduction to oblique axonometric projections. Plan oblique and elevation oblique

Delivery method: Synchronous hybrid

SESSIONS 19 - 20 (LIVE IN-PERSON)

Introduction to oblique axonometric projections. Plan oblique and elevation oblique

Delivery method: Synchronous hybrid

Case Study presentation - Assignment B

Delivery method: Synchronous online

EVALUATION CRITERIA

GRADING AND ATTENDANCE NOTES:

It is highly recommended that students who are in Madrid/Segovia attend the synchronous sessions on Campus. It is at the student's discretion to attend classes on campus or remotely.

It is very important that students remain consistent in their decision of on campus or remote learning, so that the professor and students benefit from the possibility to plan activities in advance, knowing which students will be available in each type of session. Whether a student decides to follow their classes either on campus or remotely, they must commit to that mode, except for exceptional circumstances in which the change is for justified reasons.

The behavior of the students during the sessions must comply with IE University's standards on education, respect for peers and professors, and commitment to joint learning. Students who connect remotely must keep their cameras on, and they must demonstrate the courtesy and online respect necessary in the digital environment.

- 1. Students have access to a total of four enrollments, in two consecutive academic years.
- 2. Students must attend at least 80% of all class sessions. Students who do not meet this minimum percentage automatically fail both first and second enrollments, and pass directly to the third enrollment.
- 3. Grading of students in the extraordinary enrollments will follow the following guidelines:
 - Students that have failed the subject in first enrollment pass to the second enrollment, except those who do not meet the minimum attendance percentage, and that therefore pass directly to the third enrollment.
- 4. The maximum grade that a student may achieve in second and fourth enrollments is an 8.

EVALUATION SYSTEMS:

- SE1: Attendance and active participation
- SE2 and SE4: Group and collaborative submissions
- SE3 and SE5: Individual submissions

criteria	percentage	Learning Objectives	Comments
Attendance and active participation - SE1	5 %		
Class Exercises - SE3 and SE5	10 %		
Fora and group discussions - SE2 and SE4	10 %		
Assignments - SE3 and SE5	25 %		
Final assignment - SE3 and SE5	50 %		In order to pass the course it is a necessary requirement to achieve a grade of 5.0 or above in the final long-term assignment. Only then will the rest of the components be considered.

RE-SIT / RE-TAKE POLICY

First Evaluation Call

Evaluation during the first call will be continuous: all the work completed by the student will be taken into account, along with his contributions to the class and forums. The evolution of the student's technical and conceptual skills will also be taken into account. The result of this continuous evaluation will constitute the student's grade. No global or final exam will be required during this period.

It is important to note that in order to pass the course it is a necessary requirement to achieve a grade of 5.0 or above in the final long-term assignment. Only then will the rest of the components be considered and averaged. If a student fails to achieve a grade of 5.0 or above in the final assignment, his/her final grade will be the same as his/her long-term assignment grade.

Sobresaliente/Outstanding: 9.0-10.0 (A to A+)

Consistently produces work of the highest quality and craft; exhibits notable progress and development over the course of the semester; meets all course objectives at highest level; attendance is near-perfect, and contributions to course discussions are extremely valuable.

Notable: 7.0-8.9 (B to B+)

Completes all assignments with work of above-average quality and craft; exhibits significant progress and development; meets most course objectives; attendance and participation are very good.

Aprobado: 6.0-7.0 (C to C+)

Completes all assignments with work of acceptable quality and craft; exhibits some progress and development; meets a majority of course objectives. Attendance and participation are acceptable.

Aprobado: 5.0-6.0 (D)

Assignments are delivered but are incomplete and/or of low quality and craft; exhibits little progress and development; meets few course objectives. Attendance and participation are poor, but absences do not total more than 30%.

Suspense: 0-4.9 (F)

Work is incomplete, missing, or does not meet course objectives. Attendance and participation are poor.

Automatic Failure/Suspense: 0 (F)

Please note that a student who misses 30% or more of the scheduled sessions receives an automatic 0.0, and loses his or her right to the Second Evaluation Call.

Second Evaluation Call - June/July

Students who fail to get a grade of 5.0 or above during the First Evaluation Call and whose class attendance meets the minimum requirement of 70% will concur to the Second Evaluation Call, consisting of a global test comprising all the contents of the course. Students who fail this exam, or the attendance criteria, will have to attend the Third Evaluation Call. The maximum grade for the Second Evaluation Call is 8.0.

Third Evaluation Call – (+1)

Students concurring to the third evaluation period are encouraged to follow the course again. They will have the same evaluation system as in the First Evaluation Call, completing all required coursework. Attendance is also required and only excused in the event of overlaps with other courses.

Fourth Evaluation Call – June/July (+1)

Students who find themselves in the 4th evaluation round will have to pass a global exam on the complete contents of the course. The maximum grade for the Fourth Evaluation Call is 8.0.

BIBLIOGRAPHY

Compulsory

- Francis D. K. Ching. (2015). *Architectural Graphics*. John Wiley and Sons,. ISBN 9781119035664 (Printed)

- Paul Lewis, Marc Tsurumaki, David J. Lewis. (2016). *Manual of Section*. Princeton Architectural Press,. ISBN 9781616892555 (Printed)

Recommended

- Ernst Neufert, Peter Neufert. *Neufert, Architects' Data*. John Wiley and Sons. ISBN 9781405192538 (Printed)

- Kathryn Holliday-Darr. *Applied Descriptive Geometry*. Cengage Learning. ISBN 9780827379121 (Printed)

- Helmutt Pottmann, Andreas Asperl, Michael Hofer, Axel Kilian. *Architectural Geometry*. Bentley Institute Press. ISBN 9781934493045 (Printed)

- Mario Carpo. *The Alphabet and the Algorithm*. MIT Press. ISBN 9780262515801
(Printed)

BEHAVIOR RULES

Please, check the University's Code of Conduct [here](#). The Program Director may provide further indications.

ATTENDANCE POLICY

Please, check the University's Attendance Policy [here](#). The Program Director may provide further indications.

ETHICAL POLICY

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