DIGITAL DECATHLON

DD: DESIGN TASK

10.10.2023 – 16.02.2024

WUPPERTAL, **GERMANY**:

TRANSFORM AN OLD LOGISTIC HALL

INTO A NEW AND VIBRANT CULTURAL CENTER

Co-funded by the European Union

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CONTENT

PARTICIPATING UNIVERSITIES

	Acronym	Disciplines
BERGISCHE UNIVERSITAET WUPPERTAL	BUW	D04, D09
JADE HOCHSCHULE OLDENBURG	JHS	D 01, D 10
KARELIA AMMATTIKORKEA KOULU OY	KAR	D 02, D 07
POLITECHNIKA WARSZAWSKA	WUT	D 03, D 05
UNIVERSITA DEGLI STUDI DI FIRENZE	UFI	D 06, D08

PROJECT DESCRIPTION

In the northern part of Wuppertal, close to the motorway A 46 there is a logistics center of around 4,000 square meters. This hall is to be converted into a cultural center and thus promote the structural change of the area from an industrial site to a lively quarter with exciting cultural offerings. The use should be as flexible as possible. Planned events may include, for example, concerts, weddings, dance events, lectures, workshops, open workspaces

The alternative building material wood has already been used for the roof structure. Among other things, the glued laminated timber beam used ensures a particularly warm building atmosphere and makes a **significant** contribution to climate protection. In this way, further interventions are to be planned. The entire hall is to be differentiated by inserted wooden constructions, the space is to be structured, thematic areas are to be created in order to make the hall a cultural experience space.

Fig 01: Solar Decathlon 2022

SCHEDULE

This is the preliminary schedule for the digital decathlon. Current changes will be communicated by email. The current schedule can also be found as PI-0002 on Moodle.

Date	Description
01.10.2023	Students get access to the exercises (Moodle/CDE)
09.10.2023	Travel to Wuppertal
10.10.2023	Competition Start in **Wuppertal** Announcements of the group composition Lectures Site Visit Record of Expectations
11.10.2023	Start of Group Collaboration, Workshop
12.10.2023	Returning home
13.10.2023	Start of the "BIM Introduction Course"
	Working Phase and Coaching
31.10.2023	Finish of the "BIM Introduction Course"
	Working Phase and Coaching
24.11.2023	Midterm Evaluations Online Presentation **BEP is ready**
	Working Phase and Coaching
13.02.2024	Travel to Florence
14.02.2024	Competition Final in **Florence** **BEP is updated** Preparation Work for Presentation
15.02.2024	Evaluation Presentation Jury Party
16.02.2024	Returning Home

Table 01: DD Schedule

D00 PRELIMINARIES

On this page you will find the listing of all preliminary information for this project. The document mentioned below are stored on Moodle.

Item	Description	Delivery date	Format
PI-0001	Design Task	01.10.2023	PDF
PI-0002	Project Schedule	01.10.2023	PDF
PI-0003	Data Protection	10.10.2023	PDF
PI-0004	Student team	10.10.2023	PDF
PI-0005	DD Logo	10.10.2023	JPG
PI-0006	EIR - updated at the end of Wuppertal meeting	17.10.2023	PDF
Delivery Items			
DI-0001	Signed Data Protection (PI-0003)	10.10.2023	PDF
DI-0002	Group List PI-0004 (filled out)	10.10.2023	PDF

Table 02: D00 Preliminaries

D01 ARCHITECTURE – JHS

Create a room program for the hall that takes into account its new use as a cultural center.
Design the event hall in a 3D model and derive the following drawings out of it: Floor plan, elevations and sections in 1:200, façade section 1:20. Present your design in renderings and videos.

Software: 3D Modelling Software / Rendering Software

Item	Description	Delivery date	Format
PI-0101	Site Plan	01.10.2023	PDF
PI-0102	Architectural model of existing Hall	01.10.2023	IFC
PI-0103	Structural model of existing Hall	01.10.2023	IFC
PI-0104	Reference projects	01.10.2023	PDF
PI-0105	Room program	01.10.2023	PDF
PI-0106	Enscape Tutorial	01.10.2023	PDF
Delivery Items			
DI-0101	Room Program	30.10.2023	PDF
DI-0102	Architectural Model	14.02.2024	IFC
DI-0103	Floor Plans 1:200	14.02.2024	PDF
DI-0104	Elevations 1:200	14.02.2024	PDF
DI-0105	Sections 1:200	14.02.2024	PDF
DI-0106	Renderings	14.02.2024	PDF
DI-0107	Façade Section 1:20	14.02.2024	PDF
DI-0108	Video	14.02.2024	MP4
DI-0109	Parts of BEP related to Architecture	14.02.2024	PDF

Table 03: Document Structure Discipline 01: Architecture

D02 CONSTRUCTION – KAR

In this discipline you familiarize yourself with timber construction and wooden structures.
As a starting point you are given an architectural model that consists of the frame structure of the hall (Fig 1). Your task is to design wooden outside wall elements that can be easily attached to the frame and that are replaceable.

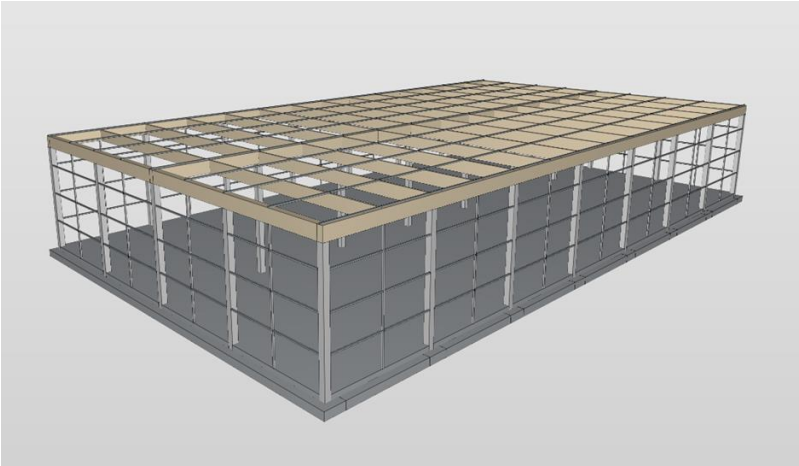

Fig 1. Exemplary concrete pillars of the hall

Software: Revit, ArchiCAD, Solibri

Item	Description	Delivery date	Format
PI-0102	Architectural model	01.10.2023	IFC
PI-0103	Structural model	01.10.2023	IFC
PI-0201	Wood in construction presentation	01.10.2023	PDF
Delivery Items			
DI-0201	Wooden wall element design	14.02.2024	PDF
DI-0202	ARC Model with wooden elements	14.02.2024	IFC
	Parts of mini-BEP related to Construction	14.02.2024	PDF

Table 04. Document Structure Discipline 02: Construction.

D03 MEP – WUT

Create a concept of sustainable building services in the project. Prepare a vision, concept and description of: HVAC (heating, ventilation and air conditioning), water supply and sewerage and electrical / lighting systems. Connect all your building services to BEMS (Building Energy Management) system.

First of all check the owner's project requirements. Specify the appropriate weather conditions for system designing and simulation. Define the right level of indoor environment quality (user's comfort) and indoor air quality.

Secondly, determine which building systems should be used in the project. Check the possibility of using the connection to external networks. Specify the most important equipment and elements of systems. Design and dimension the most important parts of systems. Analyze the possibility of using renewable energy sources as much as possible.

Thirdly, create a BIM model of the proposed system solutions and generate appropriate project documentation. In the drawing part present the most important plans, cross-sections and installation schemes and diagrams. Prepare the most important lists of elements and calculations. In the descriptive part describe the designed systems. Refer solution to nearlyZeroEnergy, nearlyZeroEmission and New European Bauhaus principles.

Software: Autodesk Revit, Applications for design and simulation of building services, Device and equipment selection applications.

Item	Description	Delivery date	Format
PI-0301	Owner's project requirements for building systems	1.10.2023	PDF
PI-0302	Site Plan with external networks	1.10.2023	PDF / DWG
PI-0303	Weather data and reference year data for building simulations	1.10.2023	PDF / EPW
PI-0304	Building systems checklist	1.10.2023	PDF / XLSX

Delivery Items			
DI-0301	Specification of indoor and outdoor designing criteria for building and building spaces.	15.10.2023	PDF / XLSX
DI-0302	Concept of HVAC systems (description and scheme)	22.11.2023	PDF / DWG
DI-0303	Concept of water and sewerage systems (description and scheme)	22.11.2023	PDF / DWG
DI-0304	Concept of electrical / lighting systems (description and scheme)	22.11.2023	PDF / DWG
DI-0305	Concept of BEMS system (description and scheme)	22.11.2023	PDF / DWG
DI-0306	Key technical building solution – plants, equipment, devices, schafts etc.	30.11.2023	PDF / XLSX
DI-0307	BIM model of building systems	14.02.2024	IFC
DI-0308	Selected plans of plant rooms from BIM model	14.02.2024	PDF
DI-0309	Selected cross-section of systems from BIM model	14.02.2024	PDF
DI-0310	Visualization of building systems from BIM model	14.02.2024	PDF
DI-0311	Selected lists of elements from BIM model	14.02.2024	PDF
DI-0312	Selected systems calculations from BIM model or additional software	14.02.2024	PDF
DI-0313	Building systems project description and presentation	14.02.2024	PDF / PPTX
DI-0314	Parts of BEP related to MEP design	14.02.2024	PDF

Table 05: Document Structure Discipline 03: MEP

D04 MODEL CHECKING – BUW

The newly created models (DI-102, and other disciplines (Structural, MEP)) are to be checked for quality according to the modeling guideline of the University of Wuppertal

Software: Solibri (Software licenses for Solibri Office are provided.)

Item	Description	Delivery date	Format
PI-0401	Learning Material Discipline 04 – Model Checking	10.10.2023	PDF
PI-0402	description of the requirements for model checking	10.10.2023	PDF
PI-0403	Modeling guideline of BUW	10.10.2023	PDF
PI-0404	Rulset – BUW_MRL_DD	10.10.2023	CSET
PI-0405	Classification- BUW_Modelelmente DIN276	10.10.2023	CLASSIFICATION
PI-0406	Classification- BUW_Modelelmente Architektur MRL	10.10.2023	CLASSIFICATION
Delivery Items			
DI-0401	Issue Log V1	30.10.2023	PDF
DI-0402	Issue Log V1	30.10.2023	BCF
DI-0403	Issue Log V2 (after fixing the issues)	14.02.2024	PDF
DI-0404	Issue Log V2 (after fixing the issues)	14.02.2024	BCF
DI-0404	Solibri Rule Set	14.02.2024	CSET

Table 06: Document Structure Discipline 04: Model Checking

D05 BIM DESIGN COORDINATION and COMMUNICATION – WUT

BIM models (architectural, structural, MEP and others e.g., electric installations) should be coordinated during the consequitive steps of the design process, so that the correct interdisciplinary federated model has been created with the help of several industry models.
The quality control procedure for individual models and the federated BIM model consists of activities for each model and inter-industry coordination activities.

The basic checklist includes the following issues, with a breakdown of BIM model quality control and interprofessional coordination activities and project team communications Software: Solibri Office and BIMcollab (Software licenses are provided by WUT).

Item	Description	Delivery date	Format
PI-0501	BIM coordination guideline by WUT	10.10.2023	PDF
PI-0502	BIM communication guideline by WUT	10.10.2023	PDF
PI-0503	Basic Solibri Rule Set for interdisciplinary coordination of BIM models	30.10.2023	PDF
Delivery Items			
DI-0501	Federation BIM model in SMC format (Solibri Office) - Midterm Evaluation.	22.11.2023	SMC
DI-0502	Federation BIM model in SMC format (Solibri Office) - Competition Final in Florence	17.01.2024	SMC
DI-0503	Report on BIM communication activities with the help of BIMcollab (reports, activity reports for team members, time progress charts, reports in XLS, PDF) - Midterm Evaluation	22.11.2023	PDF, XLS
DI-0504	Report on BIM communication activities with the help of BIMcollab (reports, activity reports for team members, time progress charts, reports in XLS, PDF) - Midterm Evaluation	15.02.2024	PDF, XLS
DI-0505	Chapters of BEP related to BIM coordination and communication	15.02.2024	PDF, XLS

Table 07: Document Structure Discipline 06: BIM design coordination and communication

D06 CONSTRUCTION SCHEDULING - UFI

Create a time line of the construction works, identifying the sequence of fieldwork operations, and develop a video of the construction process. Use Navisworks to review and coordinate BIM projects, but also to identify clashes and interferences.

Software: Revit, Excel, Navisworks (free version for students).

Item	Description	Delivery date	Format
PI-0601	BIM Click Tutorial CONSTRUCTION SCHEDULING	01.10.2023	PDF
PI-0602	Timeline template	01.10.2023	XLSX
Delivery Items			
DI-0601	Timeline	14.02.2024	PDF
DI-0602	Video	14.02.2024	AVI
	Chapters of BEP related to construction scheduling	14.02.2024	PDF

Table 08: Document Structure Discipline 06: Construction Scheduling

D07 LIFE CYCLE ASSESSMENT – KAR

In this discipline you familiarize yourself with Life Cycle Assessment.
You will calculate greenhouse gas emissions for structural model of the building frame. You will do a quantity calculation as well as carbon footprint calculation (LCA). You will compare the emissions of the timber-concrete frame with alternative full concrete frame. Your task is to do LCA calculation using OneClick LCA software based on the quantity calculation.

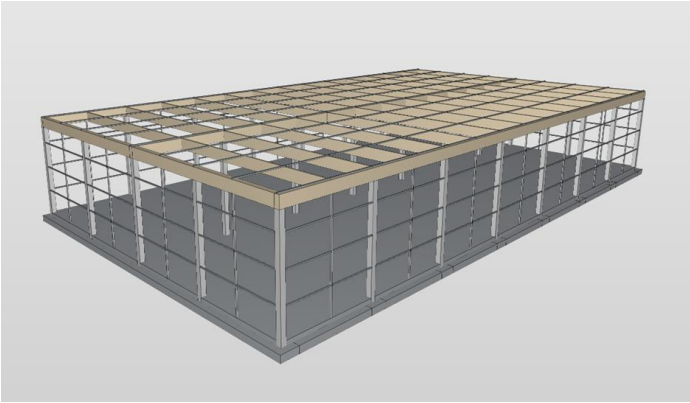

Figure 2. Frame to be calculated in the assingment.

Software: Oneclick LCA, Solibri

Item	Description	Delivery date	Format
PI-0701	Part 1, Environmental footprint of the construction industry and LCA	01.10.2023	PDF
PI-0702	Part 2, Assignment and instructions	01.10.2023	PDF
Delivery Items			
DI-0701	Quantity calculation results	16.01.2024	PDF/Excel/JPG

Table 09: Document Structure Discipline 07: Life Cycle Assessment

D08 SIMULATION - UFI

Digital simulations offer the possibility to take into account the environmental behavior of the building during the design process, supporting the decision making towards the most sustainable solutions. Exploiting the BIM model, simulations consent to evaluate different mix-of-technologies' scenarios in terms of energy performance, environmental quality (correct daylighting, shading) and valorization of solar energy.

Software: Revit (free version for students).

Item	Description	Delivery date	Format
PI-0801	BIM Click Tutorial SIMULATION (Energy, daylight and solar analyses)	01.10.2023	PDF
Delivery Items			
DI-0801	Energy Analysis	14.02.2024	PDF
DI-0802	Solar Analysis	14.02.2024	PDF
DI-0803	Daylight Analysis	14.02.2024	PDF
DI-0804	Results & Design solutions	14.02.2024	PDF
	Chapters of BEP related to simulation	14.02.2024	

Table 10: Document Structure Discipline 08: Simulation

D09 BUILDING PRODUCT TRACEABILITY - BUW

For 10 selected objects, information from the product manufacturers with reference to sustainability certificates is to be coupled as data sets with the BIM model.

Software: Dalux (Software licenses for Dalux are provided.)

Item	Description	Delivery date	Format
PI-0901	Learning Material Discipline 09 - Building Product Traceability	01.10.2023	PDF
PI-0902	Requirements for the documentation of the installed building products	01.10.2023	PDF
Delivery Items			
DI-0901	BIM models including building product information	14.02.2024	Dalux
DI-0902	Documentation of the selection of data sheets relevant to sustainability	14.02.2024	PDF

Table 11: Document Structure Discipline 09: Building Product Traceability

D10 REPORTING - JHS

The group has to prepare Instagram posts to report weekly on their design progress, collaboration experience and working tools used in the project.

Software: Canva (Freeware)

Item	Description	Delivery date	Format
PI-1001	Canva Tutorial I	01.10.2023	PDF
PI-1002	Canva Tutorial II	01.10.2023	PDF
Delivery Items			
DI-1001	Image for Instagram Post	Fridays	JPG
DI-1002	Description	Fridays	TXT

Table 12: Document Structure Discipline 10: Reporting