unite! University Network for Innovation, Technology and Engineering

Unite! VECP on Architecture Engineering

is a Virtual Exchange Credit Program (VECP) in Unite! – the University Network for Innovation, Technology and Engineering. Students in Architecture and civil engineering from Aalto-yliopisto, Politecnico di Torino and Technical University of Darmstadt can select one or more online courses offered by the other universities and gain credits.

- **Level:** Master of Science in Building Engineering/Laurea Magistrale in Ingegneria Edile
- **Period**: starting fall/winter 2021
- **Language of instruction:** English
- **Mode of Instruction:** Virtual

Topics: Architecture, Engineering, Digital Design and Construction, Sustainability, Advanced Manufacturing, Energy Efficiency, Parametric Design, Algorithmic Design, Structural Design.

Summary of Courses offered

When reading the course information below, please pay attention to the different academic calendars, day and hour of the course and the course requirements. If you have questions on whether the course fits your study plan, please contact your professors or an academic advisor at your home institution.

University	Lecturer	Course Name	Credits	Time Frame	Application possible	UNITE! Student Numbers
Technische Universität Darmstadt (Germany)	Oliver Tessmann (DDU)	Computational Design Basics	5	Summer (April to July) and Winter Semester (October to February)	May 9	7 from each partner/14 UNITE!
		Parametric Design and Construction	3/5*	Summer (April to July)	No	2 from each partner/4 UNITE!
	Ulrich Knaack (ISM+D)	Facade Technologies 1	6	Summer (April to July) and Winter Semester (October to February)	May 9	7 from each partner/14 UNITE!
	Jens Schneider	Spatial Structures	3/6*	Summer (April to July)	No	5 from each partner/10 UNITE!
Aalto University (Finland)	Toni Kotnik	Parametric Design	3	January -February / Period 3 (6 weeks)	No	2 from each partner/ 4 UNITE!
	Toni Kotnik	Algorithmic Design	3/6*	March -May /Period 4 and 5 (12 weeks)	No	2 from each partner/ 4 UNITE!
Politecnico di Torino (Italy)	Anna Osello	Knowledge of the built heritage in the era of the climate changes	18	Winter Semester Oct to Jan	May 9	3 from each partner/ 6 UNITE!
	Vincenzo Corrado	Energy performance design and indoor environmental quality	8	Year-long! Winter AND Summer Semester (Oct to Jan and March to June)	May 9	3 from each partner/ 6 UNITE!
*CP without/with Design Project						

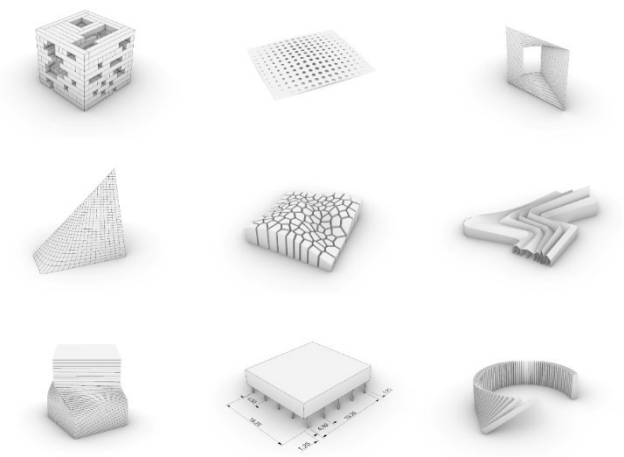
Application information

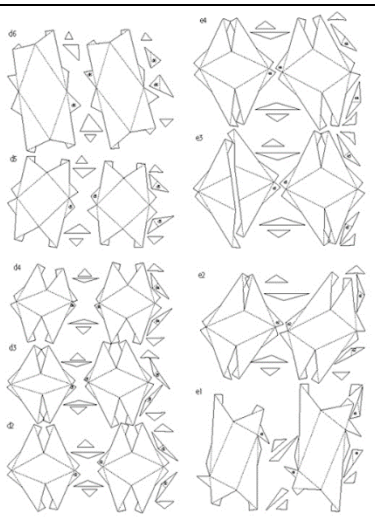
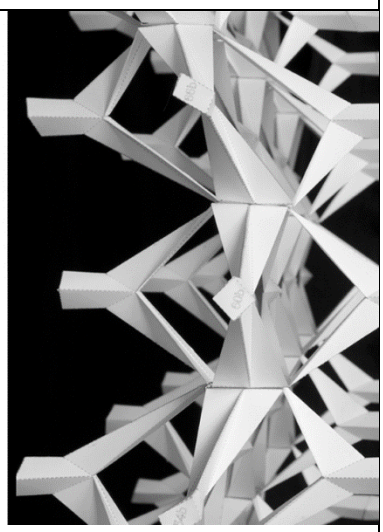
Students apply at the home institution until **May 9th 2021** for courses in fall 2021/winter semester 2021/22.

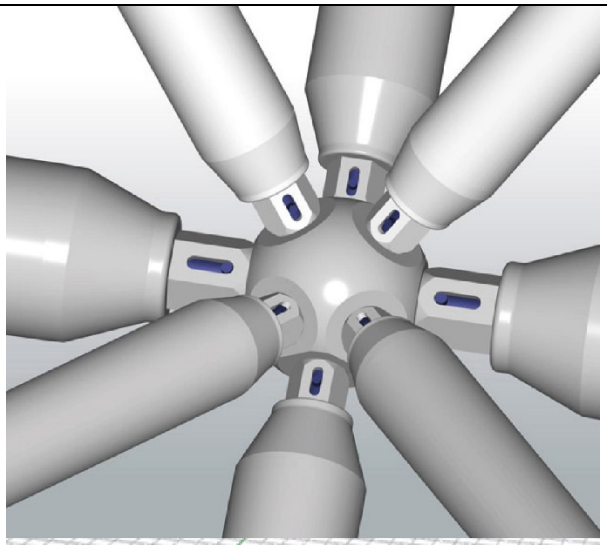
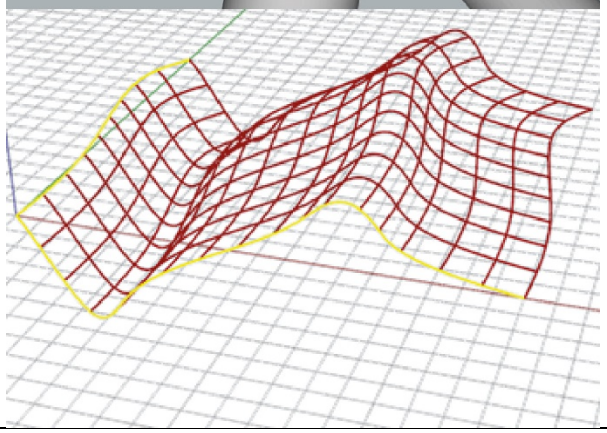
Read the Call for selection for further information.

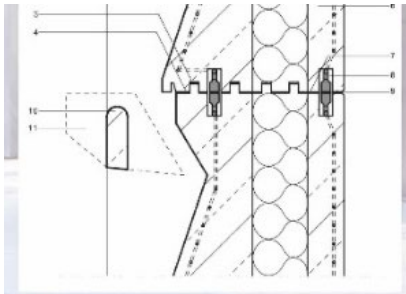
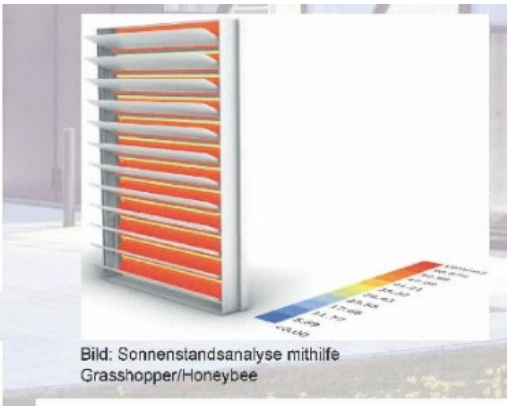
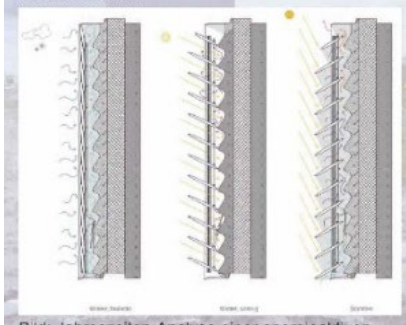
The applications will be processed at the home institution and the students will be nominated to the host institution. You will receive information about the second application to be filled-in at the host institution in late May or June. After successful application at the host institution, you will be enrolled at the host institution. You will have to register for the selected courses before the semester starts.

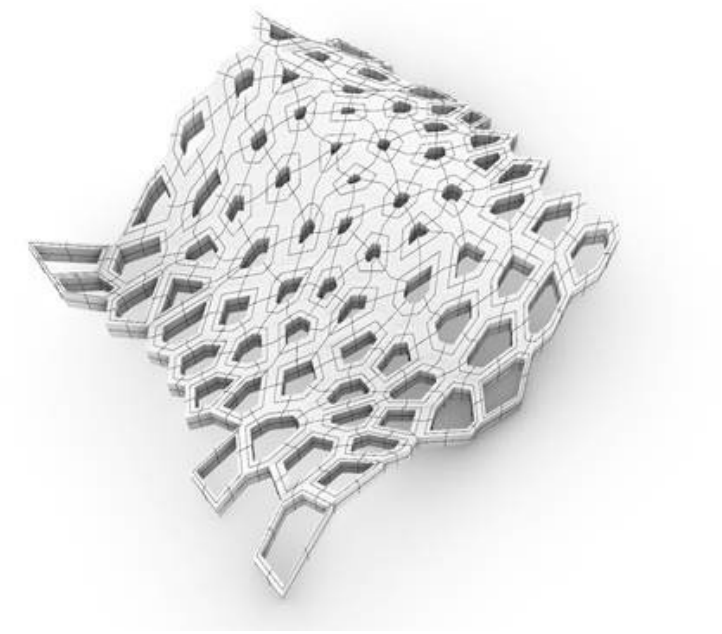
Detailed List of Courses offered from 2021/2022

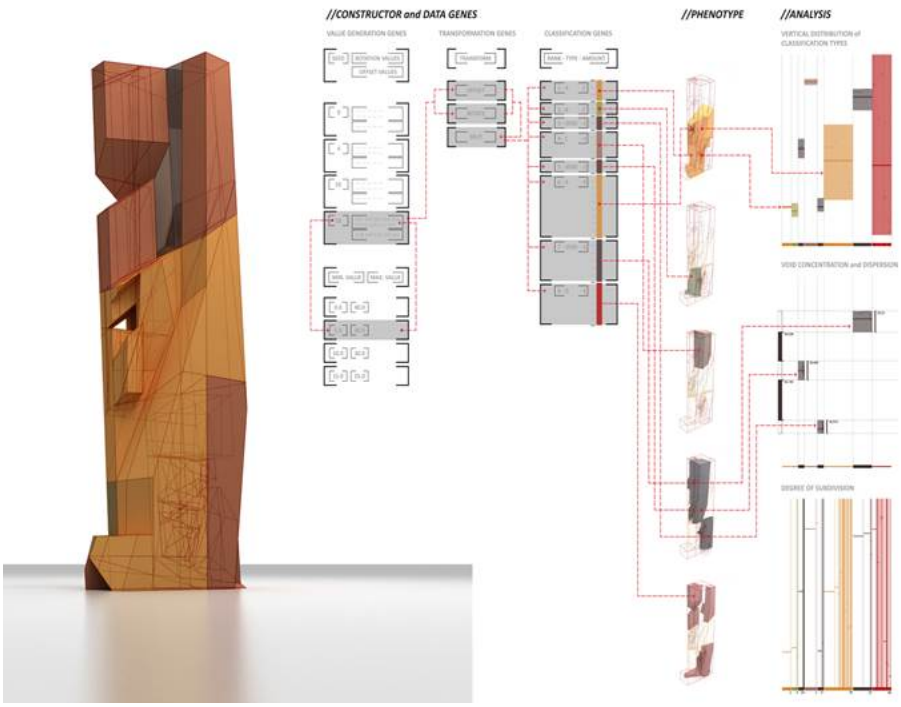
Computational Design Basics:	5 CP course code: 15-01-0354/ 15-02-6466
The course introduces students to the tools and methods of computational design. Students will be introduced to 3d modeling techniques with Rhinoceros, parametric and algorithmic design with Grasshopper, and scripting with Python.	
Lecturer	Prof. Dr.- Ing. Oliver Tessmann
Course dates (TBC)	Mid. October to Mid. February Winter/ Mid. April- Mid. July Summer semester
Times (TBC)	Fri, 12.30 – 14.30
Delivery Method	Moodle
Language	English and German
Contact and Weblink	tessmann@dg.tu-darmstadt.de
https://www.architektur.tu-darmstadt.de/media/architektur/2019_studieren/downloads_5/fb_15_allgemein/semesterbooklet/vergangenes_semester/Semesterbooklet_WS19-20.pdf	

Parametric Design and Construction:	3 or 5 CP course code: 15-02-6467
The Parametric Design and Construction course consists of a series of lecture, tutorials and design exercises. Parametric Design unlocks novel design possibilities and enables interdisciplinary collaboration of architects and structural engineers. These tools and methods will be applied and explored for the design of lightweight spatial structures. In this course participants will learn about space frame structures and their properties through examples from practice and a series of small design exercises. 3D modelling, parametric and structural design calculations will be conducted in Rhino, Grasshopper and Karamba. The course is linked to the Spatial Structures in the TU Da Engineering department. Architects and engineers will collaborate in interdisciplinary design teams. The exam consists of one colloquium and three small design exercises.	 
Lecturer	Prof. Dr.- Ing. Oliver Tessmann
Course dates (TBC)	Mid. April to Mid. July **Summer semester only**
Times (TBC)	Monday, 14.30 – 18.00
Delivery Method	TU ID access to Moodle content/ TUCaN or direct email
Language	English and German
Contact and Weblink	tessmann@dg.tu-darmstadt.de
https://www.architektur.tu-darmstadt.de/media/architektur/2019_studieren/downloads_5/fb_15_allgemein/semesterbooklet/Semesterbooklet_SoSe_2021.pdf	

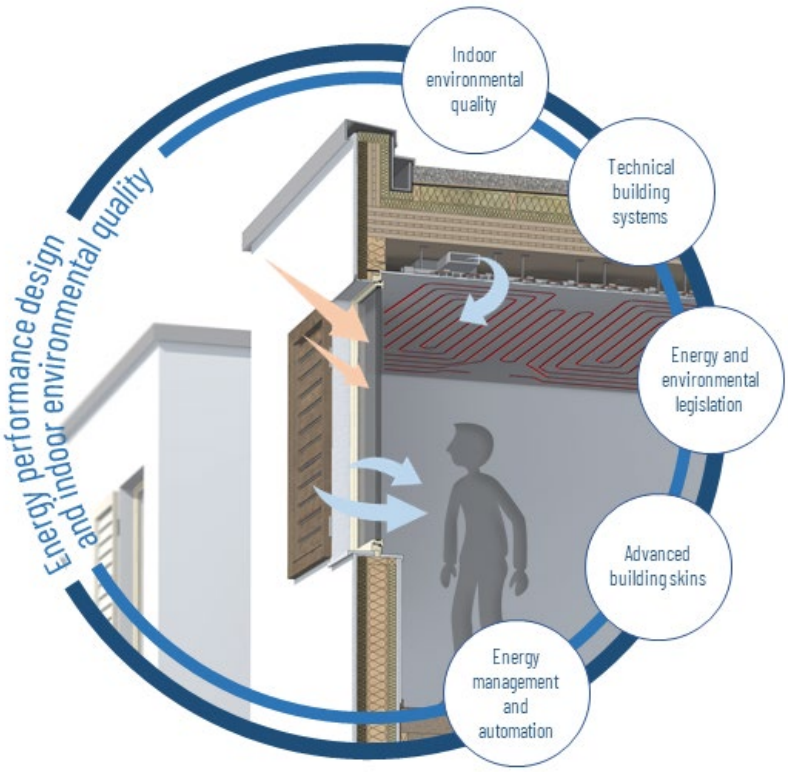
Spatial Structures:	3/6 CP course code: 13-M2-M010
The Spatial Structures course consists of a series of lecture, tutorials and design exercises that revolve around the design, analysis and fabrication of spatial structures. Lightweight spatial, vector-active structure allow for large spanning constructions. Parametric design and digital fabrication allow for ever more complex geometries. The lecture address basic characteristics of spatial structures and presents contemporary and historical examples from practice. The course is held as an interdisciplinary event in cooperation with the department Digital Design Unit (DDU) of the Department of Architecture. In this course participants will learn about space frame structures and their properties through examples from practice and a series of small design exercises. 3D modelling, parametric and structural design calculations will be conducted in Rhino, Grasshopper and Karamba. The exam consists of four graded home exercises including the design of a spatial structure and a colloquium.	 
Lecturer	Prof. Dr.-Ing. Jens Schneider
Course dates (TBC)	30th April to 10th July **Summer semester only**
Times (TBC)	Monday, 14.30 – 18.00
Delivery Method	Moodle content/ TUCaN or direct email
Language	English and German
Contact and Weblink	schneider@ismd.tu-darmstadt.de
https://www.ismd.tu-darmstadt.de/studium_und_lehre_ismd/studierende_ismd/master_vorlesungen_ismd/index.en.jsp	

Façade Technologies 1:	6 CP course code: 13-M4-M002
In view of the national and international climate targets, energy-efficient and energy-flexible facades play an increasingly important role. One current topic is "energy-active facades", which maximise the use of regenerative environmental heat for room air conditioning, while minimising the use of fossil fuels and complex heating and cooling technology. In addition to the lecture, a workshop will be held in which the students will develop a facade mockup which provides for thermal activation on both the outside and inside of the facade in order to absorb heat energy, store it temporarily and release it again at a suitable time. The design, construction and energy performance of the facade system are evaluated. As a tool for the design of the energy-active, inhomogeneous component in COVID-19 teaching, the participants use CAD program and a multiphysics tool for the analysis of heat storage capacity and transfer.	 Bild: konstruktive Detaillösung thermisch aktivierter Fassadenmodule  Bild: Sonnenstandsanalyse mithilfe Grasshopper/Honeybee  Bild: Jahreszeiten-Analyse einer energieaktiven Fassade  Bild: Verschattungsstudie des entwickelten Fassadenkonzepts i Sommer
Lecturer	Prof. Dr.-Ing. Ulrich Knaack
Course dates (TBC)	1st October to 18th February Winter/ 30th April to 10th July Summer semester
Times (TBC)	Wed. 13:30 – 15:00
Delivery Method	Zoom and Direct Email
Language	English and German
Contact and Weblink	knaack@ismd.tu-darmstadt.de
https://www.ismd.tu-darmstadt.de/studium_und_lehre_ismd/studierende_ismd/master_vorlesungen_ismd/index.en.jsp	

Parametric Design:	3 CP course code: ARK-E2515
The course is an introduction into fundamental concepts of parametric design thinking in architecture and landscape architecture using Grasshopper (Rhinoceros plug- in). The course covers basics of geometry of curves and surfaces, NURBS-geometry and mesh geometry as well as data handling. It is taught as intense one-week long workshop at the beginning of the summer teaching period. Basic knowledge of parametric design thinking, the transformation of concepts into geometric operations and the implementation of these operations in a graphic scripting editor. Requires: Knowledge of Rhinoceros (basic knowledge NURBS curves surfaces).	
Lecturer	Prof Dr Toni Kotnik
Course dates (TBC)	January -February / Period 3 (6 weeks)
Times (TBC)	Tuesday 09.15-12.00
Delivery Method	Moodle
Language	English
Contact and Weblink	toni.kotnik@aalto.fi
https://oodi.aalto.fi/a/opintjakstied.jsp?html=1&kieli=6&Tunniste=ARK-E2515&Ajankohta=12-01-2021	

Algorithmic Design:	3/6 CP course code: ARK-E2515
The course deals with methods of algorithmic design applied to the field of architecture, landscape and interior architecture, construction, as well as in the broad fields of industrial and product design. Although many architects still use computers much like they used analogue drawing boards, intrinsic capabilities of computers allow them to formalize their designs through code. This approach also captures and exploits the inherent contemporary condition of creative practices - when designs become data, it becomes possible to create what was previously undrawable. Require: Basic knowledge of algorithmic design with ability to write and execute own Python scripts as well as formulate design problems in code.	
Lecturer	Prof Dr Toni Kotnik
Course dates (TBC)	March -May /Period 4 and 5 (12 weeks) Spring
Times (TBC)	Tuesday 09.15-12.00
Delivery Method	Moodle
Language	English
Contact and Weblink	toni.kotnik@aalto.fi
https://oodi.aalto.fi/a/opintjakstied.jsp?html=1&kieli=6&Tunniste=ARK-E2513&Ajankohta=02-03-2021&Kieli=6	

Knowledge of the built heritage in the era of the climate changes:	18 CP course code: 01UWENB
The course, carried out in the form of an interdisciplinary laboratory, aims to set the methodological elements of the entire course of studies in Green Building, providing innovative tools and methods for the integration and critical interpretation of heterogeneous data functional to the design, starting from the creation of a digital model on the building scale (the Digital Twin of the Green Building). The theoretical concepts are applied to a real case study shared by all the courses of the first year of the master's degree and refers to a building characterized by a constructive and formal identity that make it peculiar and representative in the context of the international heritage.	
Lecturer	Prof. Dr. Anna Osello
Course dates (TBC)	27th September to 15th January
Times (TBC)	
Delivery Method	Moodle and Zoom with Proprietary S/W tools
Language	English
Contact and Weblink	anna.osello@polito.it
https://didattica.polito.it/portal/pls/portal/gap.pkg_guide.viewGap?p_cod_ins=01UWENB&p_a_acc=2021&p_header=S&p_lang=IT	

Energy performance design and indoor environmental quality:	8 CP course code: 01UUVNB
The course is aimed at providing the basic knowledge and the design skills in the field of the thermal behaviour and energy performance of buildings. Particular attention will be put on the evaluation of the indoor environmental requirements (thermal comfort, indoor air quality), on the thermal performance of the building envelope components, of the analysis of the built environment, on the design of technical building systems, and on the assessment of building energy performance. The course is organized in lectures, numerical exercises and experimental exercises.	
Lecturer	Prof. Vincenzo Corrado
Course dates (TBC)	**Yearly course**: from 27th September to 15th January in the Fall semester AND from 1st March to 11th June in the Spring semester
Times (TBC)	
Delivery Method	Moodle and Zoom with Proprietary S/W tools
Language	English
Contact and Weblink	vincenzo.corrado@polito.it
https://didattica.polito.it/pls/portal30/gap.pkg_guide.viewGap?p_cod_ins=01UUVNB&p_a_acc=2021&p_header=S&p_lang=	