OFFER FOR INCOMING EXCHANGE STUDENTS @ UNIVERSITY COLLEGE TWENTE

Why study at University College Twente?

Discover University College Twente in the Netherlands: Your Ideal Exchange Destination

Why choose University College Twente for your exchange? We will give you 4 reasons:

1. Interdisciplinary Excellence: At University College Twente, we embrace the synergy between technology and social sciences. Our cutting-edge programs provide a unique opportunity to explore the dynamic interface of these fields, equipping you with a holistic understanding of global challenges.

2. Tailored Learning: We value your individuality. With our flexible curriculum, you can shape your own study path. Our faculty and advisors will guide you, ensuring your academic journey aligns with your passions and aspirations.

3. Nurturing Environment: Experience the advantages of a close-knit community. Our small-scale approach fosters personalized attention and fosters meaningful connections with professors. Together, we'll nurture your growth, empowering you to thrive both academically and personally.

4. Embrace Global Diversity: Our international outlook enriches your exchange experience. Engage with peers from diverse backgrounds, broadening your horizons and fostering cross-cultural understanding.

University College Twente is in Enschede, The Netherlands. Why would you choose the Netherlands for your exchange?

Studying in the Netherlands offers a gateway to Europe's vibrant culture and world-class education. And Enschede is in the centre of Europe:

- 2 hours to Amsterdam
- 6 hours to Paris
- 5 hours to Berlin
- 1 hour to London by plane.

English-taught programs and a welcoming atmosphere make integration seamless. Immerse yourself in Dutch life, explore charming cities, and make memories that will last a lifetime.

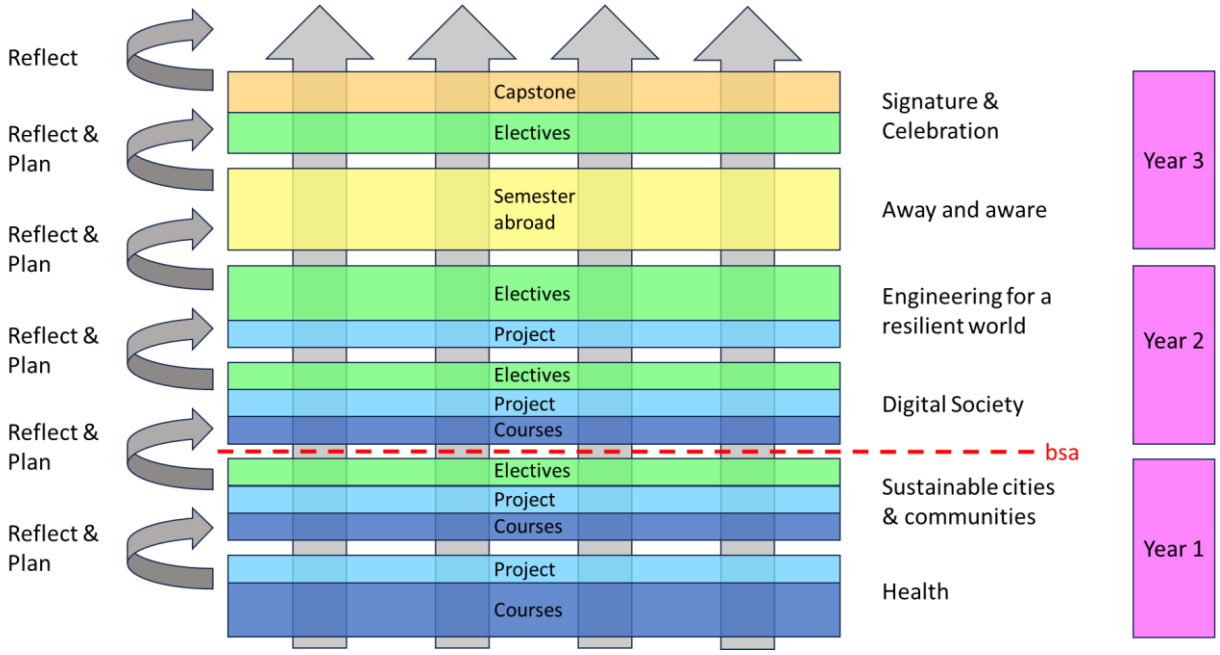
We can't wait to welcome you!

Exchange offer incoming exchange students

At University College Twente you are offered the opportunity to participate in a full semester. We offer students to participate in semester 2 (spring semester), semester 3 (fall semester) or semester 4 (spring semester).

Most semesters consists of:

- Project (9ECTS)
- Domain courses
- Electives



Semester 3: DIGITAL SOCIETY

In semester 3, you will come to understand emerging AI developments and the system in which they are embedded from an interdisciplinary perspective. You will learn to separate fact from fiction and to develop and to defend a grounded position on the future of AI in a selected area. This semester builds on the academic approach (and attitude), professional skills (e.g., collaboration & communication), understanding, and intervention strategies, taking it from the community level to the societal level.

18EC worth of activities are organized by the semester team, while 9EC (or more) of electives you select yourself.

Below you find a short description of the activities in the semester. More detailed information can be found in the course and project syllabi.

Electives (9EC)

Electives represent *deliberate* choices to develop yourself as 'ATLAS engineer': a rounded problem solver with the interdisciplinary mindset and academic/professional skills needed to contribute to the solution of complex socio-technical challenges (such as posed by the digital society).

See UT Course Catalogue: www.utwente.nl/coursecatalogue

ATLAS Electives offered in Semester 3

Classics from the Sciences (3EC, 1B). Fokko Jan Dijksterhuis.
In this course we study classical papers from the natural and social sciences that are exemplary for the research methods across the sciences. It is an interdisciplinary course that aims at comparing practices of empirical evidence across the sciences, looking for similarities and differences between as well as within the natural and social sciences. The course is reflective but stays close to the scientific content. It raises philosophical questions – and a bit of history too – but you will get to know foundational papers of scientific research. The course offers good opportunities to adapt your topic to the theme of the semester, for example by studying classical papers on machine learning, signal processing, and so on.

Semester project (9EC)

In this project, you will work in groups to develop a position paper advocating for a particular approach to the future development and deployment of AI in society, focused on one of the domains outlined in the VSNU Digital Society program (citizenship and democracy, responsible data science, health and well-being, learning and education, work and organizations, digital cities and communities, safety and security). The project will move through four key phases: exploration, research, debate, and argumentation. Each stage moves toward the development of a well-researched and argued position paper exploring the impact of AI on the digital society. The final challenge will be to translate this academic work into a public communication with impact.

Domain courses (9EC)

Ethics & Governance (3EC) The social science domain course is organized around 3 pillars: philosophy, ethics, and governance. The course begins with the "big questions" that shape conversations around AI, including on the nature of intelligence and of human-machine relations. The course then explores different approaches to AI ethics, including virtue ethics, utilitarianism, and ethics of care. The final part of the course moves to questions of governance, including practical knowledge on the kinds of policies shaping the direction of AI and possible approaches to future regulation. The course is designed to move from a more speculative and reflective position toward more concrete and practical proposals, with the former informing and shaping discussion of the latter. The course connects to the social science learning line's focus on themes of governance, societal structures, values and norms, perception, and knowledge.

Electronics (3EC) The Electronics course introduces the "traditional" (pre-AI) IT system in which software interacts directly with hardware through a set of programming instructions. In the course you will work in a small team on a hands-on electronics project. You can create a "wireless greenhouse", a "smart rubbish bin", a "basement floor alarm", or whatever comes to your mind as an exciting project. In the process you will develop tinkering and troubleshooting skills, going from an idea on paper to something that really works. Lectorials will provide practical insights into component selection (reading a datasheet; component characteristics and limitations), and on how to connect electronic subsystems (e.g., how to use a signal to control the power to an electromotor, or how to amplify a small sensor signal to make it suitable for A/D conversion).

Data Science (3+ EC) Data Science is the emerging interdisciplinary field that lies at the intersection of computer science, statistics, visualization and the social sciences. Scientific and economic progress is increasingly powered by our capabilities to explore big data sets. Data scientists dig for value in data by analyzing for instance texts, application usage logs, and sensory data. They are the driving force behind the successful innovation of Internet companies like Google, Twitter, and Yahoo. The goal of the course Data Science is to teach several data science skills needed in various phases of data analysis projects. The course concept is geared towards *self study* in an assignment & project-driven manner, i.e., it is designed to offer a rich environment for flexible, effective, and efficient self study with ample guidance and supervision. You can adjust the course to your needs in context of the semester project or domain courses. Once enrolled in the course, you can choose from several topics each worth 1.5EC. You need to choose at least two topics to meet the semester requirements, but you are allowed to use your elective space to do additional topics if this fits your personal development plan. In addition, you can choose to do a final (2EC worth) open ended data science challenge, where you apply what you learned to a real-world data set (you can even bring your own data here). Please consult the Data Science course syllabus for details on the topics and the unique SDL approach.

Semester 2: Sustainable Cities & Communities

The concept of sustainable cities and communities has emerged as a symbol of hope in a world facing unprecedented challenges related to urbanization, climate change, and transportation. The urbanization of the world's population is accelerating, with half of the population already residing in cities, and the trend is anticipated to continue. Urban areas are becoming more densely populated, resulting in housing shortages, traffic congestion, and resource strain. The demand for energy, water, food, and other resources increases as urban populations expand. Cities, as significant contributors to greenhouse gas emissions, air pollution, and deforestation, reflect these effects on human health and the natural environment. This renders communities susceptible to the effects of climate change, including rising temperatures, extreme weather events, and sea-level rise.

Obtaining sustainability in urban areas necessitates the application of innovative strategies that integrate new technologies and eco-friendly solutions. Sustainable urban development provides a comprehensive plan for addressing these challenges and creating more resilient, habitable, and prosperous urban environments.

The semester is structured around the Semester 2 project (9EC), which focuses on the social and technical aspects of modern airships as an innovative technology that could contribute to the sustainability of cities and communities. Through the semester project, they will investigate the potential role of airships in our transportation system, opportunities and challenges from a technological and societal perspective, and create socio-technical implementation scenarios. In addition, students will be supported in enhancing their collaboration, communication, presentation and reflective skills through a variety of workshops.

Students will also take three domain courses in natural science (3EC), social science (3EC), and mathematics (3EC) in order to successfully complete this objective. **In the domain of natural sciences, they will take the Heat and Thermodynamics course.** The course revolves around the two basic forms of energy transfer: heat and work, and how they can be converted into each other. In the first part, the concept of heat and temperature is discussed: a temperature difference drives a heat flow, while adding heat to a body will raise its temperature, or bring about a phase transition (melting, boiling). These mechanisms will be understood from the molecular picture of gases and liquids.

In the second part, the concept of work is discussed, and how heat can converted into work (engine) or vice versa (heat pump/refrigerator). To this end, two of the most fundamental laws in physics are introduced: the first law of thermodynamics, which dictates if a process is possible, and the second law of thermodynamics, which dictates if a process will happen spontaneously.

The mathematics course will introduce the theoretical concepts underlying the formulations of thermodynamics' laws. In particular, we will provide a mathematical framework for expressing and analysing state equations formulated as nonlinear equations with multiple variables. This will introduce the student to the calculus of functions with multiple variables, partial differentiation, and curves and surfaces that are implicitly defined. Students who want to dive deeper can study a framework to represent concepts like work and (fluid, electromagnetic) flux, as well as the relations between them. This will acquaint them with integration of functions of more than one variable and introduce them to the classical theorems of Gauss and Stokes, two of the corner stones in mathematical physics.

Social Perspectives on Sustainable Systems examines the relationship between social systems and sustainable technology from a social science perspective. The course concentrates specifically on the roles of various actors, including consumers or citizens (at the micro level), organizations (at the meso level), and governments (at the macro level), in the realization of sustainable cities through new forms of sustainable technologies. To address questions regarding the acceptance, implementation, and governance of sustainable technologies, theories and principles from social psychology, sociology, marketing, public administration, and political science are utilized. Theories and principles in social psychology, sociology, marketing, public administration, and political science are used to address the questions associated with the acceptance, implementation, and governance of sustainable technologies. Topics that will be discussed in this 3-EC course include (a) sustainable consumption, (b) social dilemma and sustainability, (c) social marketing for sustainability, (d) corporal social responsibility, (e) governance and governmentality, (f) governing transitions, and (g) democracy and techno-politics.

Students also have **9EC space for the elective courses** they can take from other programs at University of Twente.

Semester 4: Engineering for a Resilient World

Complex real-world challenges can have serious implications for people and for the planet. Considering how the negative ramifications of a particular real-world challenge can constraint societies from functioning, it is crucial to design and develop solutions to that challenge to mitigate its negative effects and to guarantee that those affected by the challenge are able to bounce back. Engineering for a resilient world in pivotal at a time when various real-world challenges and problems can easily emerge.

This semester enables students to closely collaborate with various actors (e.g. peers, experts) to tackle a specific complex real-world challenge using knowledge and skills from a range of academic discipline. This is the semester that provides students with an opportunity to fully engage in an interdisciplinary effort to understand and address a highly complex problem by capitalizing on all competencies acquired from the first three semesters.

A substantial part of the semester has a strong individual character and allows students to showcase self-directed learning, by independently and purposely selecting elective courses that they will follow to sharpen their academic focus and direction.

The semester has two important components, namely, a semester project worth 9 ECs and set of electives amounting to 18 ECs.

Project (9EC). Real-world challenges in complex spatio-temporal systems

Currently, a range of major problems in the world require multidisciplinary solutions. They are ‘wicked’ problems that do not have single causes, and, thus, cannot be solved by single interventions.

Moreover, designing interventions without a thorough and deep understanding of the full complexity of the situation often leads to the opposite of what was wished for. Experts who design solutions for multilevel spatial problems must be aware of the societal context for the problem and be able to cooperate and communicate with other disciplines for the attainment of a common solution.

In this semester's project, students will work on mapping, modelling, and mitigating real-world problems or challenges in complex spatio-temporal systems. The project introduces students to Spatio-Temporal Data and Geographic Information Science.

In large heterogeneous, groups (of about 10) students will select and analyze a suitable problem. In smaller expert teams (of 3 students), they will then design a mitigation strategy for the selected complex real-world problem. Subsequently, students are expected to juxtapose and compare the contents and the nature of different strategies and reflect upon the values and meanings of different perspectives. After the introduction, problem choice and group creation, the project has three phases:

- mapping & modelling – during this phrase, students will be analysing a wicked problem
- mitigation – in this phrase, students will be designing and implementing an intervention
- integration – in this last phase, students will be creating and presenting their integrated solutions to other project groups

Electives (18EC)

During this semester, students have enough space to independently following their learning path by following courses in the mathematics, natural science, and/or social science domains. The selection of electives must be grounded on two considerations. First, the elective courses will provide students with valuable knowledge and skills to tackle the complex real-world challenge selected for their semester project. Second, the elective courses will enable them to acquire the required knowledge and skills for their academic focus and/or direction after the three-year bachelor program.