

# SDU International Summer School

#sdusummerschool

9 – 20 August 2021



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- Courses
- How to apply



University of  
Southern Denmark



# Welcome to the perfect summer

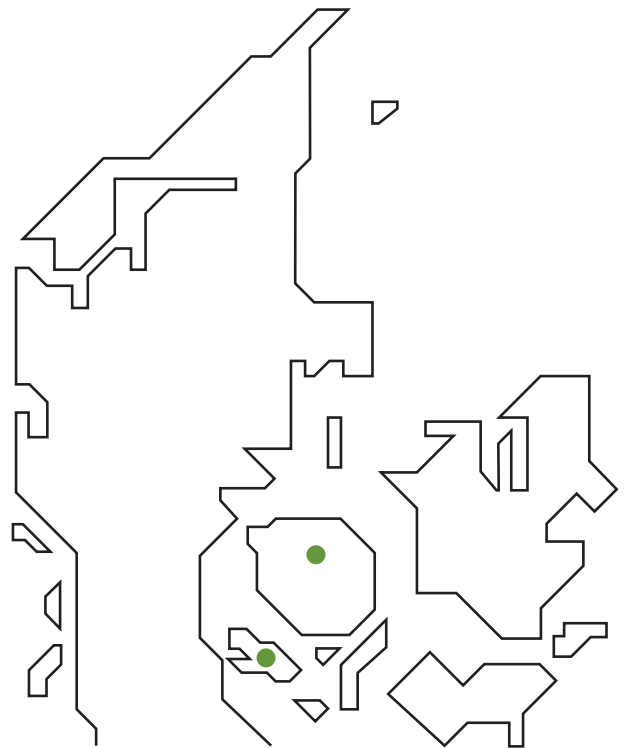
Summer School courses ranging from Drone Technology to Management and Computer Science

This year SDU offers summer school courses on two campuses – Odense and Sønderborg – both known for their state-of-the-art facilities. The robot valley in Odense attracts all kinds of companies as does Sønderborg with the world-famous companies situated here.

At the centre of this high-tech development is SDU with multiple study programmes and extensive research in business, engineering and science. Our rich student life with cafes, concerts, parks and bike lanes across the cities makes it a perfect place to update your skills – and get to know Danish language and culture.

# A summer with state-of- the-art facilities

Spend 2 weeks in Denmark and experience the Danish approach to teaching: Here you will study in state-of-the-art laboratories and classrooms and meet our most inventive and skilled professors in a study environment that cooperates closely with relevant innovative companies.





# Summer in Denmark

Summertime in Denmark fills the cities with young people. You can BBQ in the park. Or go for a swim in the ocean or the harbour swimming pool. Find new adventures at a local concert. In both Odense and Sønderborg the entire city is bubbling with adventures in August!



## Social life

Your summer school also means weeks of fun, experiencing Scandinavian culture and lifestyle and making new friends.

## Festivals

Odense is famous for the annual H.C. Andersen Festival which transforms Odense into a living fairy tale with theatre performances, street art, concerts, lightshows, art exhibitions, storytelling, street performances and more. Should you have the opportunity to extend your stay after our Summer School, you will get the chance to join in on some of the festivities.

## Meeting fellow students

The cities have a vivid student life: You can hang out with fellow students at the university or take your bike to the city centre.

In Odense you will find a student house in the city centre. It is open for all students every day – even on Sundays. Here you can hang out, meet other international and Danish students, enjoy the café and bar and throw yourself into all the summer activities and events.

## Sightseeing

Odense was the birthplace of the famous fairy tale-writer Hans Christian Andersen which makes Odense a charming fairy tale city. Follow his footprints around Odense to be the main character in your own fairy tale.

The beautiful Sønderborg Castle at the waterfront whispers the royal history of this charming, cobbled city at the water.

*Pssst: Check out the traffic lights in the city center of Odense – they have been 'fairytaled'.*



# So much tech

# So much choice

## Hands on

We believe in a hands-on learning philosophy: The more you try yourself, discuss with your professors and develop your own ideas, the better a future employee you will be.

## Work with the industry

Rapidly growing industries are working very closely together with SDU in education, research and development. Odense is known as the robotics hub of Denmark with more than 100 companies working in the field. Also in Sønderborg SDU works closely with local industry like Danfoss, Linak, Ecco, and others to offer the best graduates to the companies.

## Informal relationships

One of the most noticeable differences for the international students at SDU in Denmark is the informal relationship between students and professors.

This creates a very friendly learning environment where all questions are welcome and encouraged.

## Company visits

SDU has close ties to many companies, working together on research and development and student activities. Some courses will include visits to some of these highly interesting companies.



## Small groups! Intense learning!

Learning in small groups gives you the opportunity to discuss with your fellow students and ask your professors questions. This makes learning more intense and allows you to experiment with your new knowledge.

## International classes

A summer school gives you a unique opportunity to enhance your international profile and improve your network. All courses are taught in English.



## Close to everything

The university is close to everything; your accommodation is just around the corner. The city with cafés and shopping is close to the university in both Sønderbrog and Odense. Beautiful nature is just waiting for you all around.





# Where to stay?

You will live close to the university in both Odense and Sønderborg.

We will help you find the perfect place during your Summer School. Of course, it will be close to the city, close to the university and close to your fellow Summer School students.



Let us help you find a place to stay:  
[sdu.dk/summerschool](https://sdu.dk/summerschool)

# Courses

## Business and Economics

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### Decision, Persuasion and Negotiation

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Like it or not, we have to make numerous decisions every day, and most of our decisions concern how to persuade, how to negotiate, and how to exert influence on other people. Being effective in decision making, persuasion and negotiation is indispensable to be successful in almost any profession. Research has shown, however, even intelligent people are biased in ways that seriously limit the quality of their decisions and compromise their potential in persuading and influencing others.

This course aims to help the students become more effective in decision-making, persuading, and negotiating. We will study the rationales that drive human behavior and the common biases that affect the quality of decisions, with a thorough examination of behavioral perspectives on decision-making, persuasion, and negotiation.

→ Offered in Odense by: Department of Business and Economics

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### Transnational Entrepreneurship, Ideas and Migration

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This summer course is a 5 ECTS block course with 10 intensive lecture/workshop-days in August complemented with readings, video materials and exercises (online). Based on research literature and global reports we develop an understanding on a) how mobile people/migrants do business and diffuse ideas and capitals across borders and contexts and b) how they shape entrepreneurial ecosystems and foster sustainable business solutions. The course builds on the work of global experts, international organizations (e.g. UNCTAD, UN) and academic research. Furthermore, students engage with NGOs and/or real-life transnational/diaspora businesses and produce a collaborative case assignment and present their individual reflections on it in a short video clip.

→ Offered in Odense by: Department of Marketing and Management

## Chemistry, Chemical and Environmental Engineering

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### Biorefinery and Green Fuel Technology

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This course will provide fundamental understanding of technologies for high value products and fuel production from biomass and other renewable sources. The students are expected to obtain understanding of a comprehensive biorefinery system and clear insights into sustainable ways of biorefining options i.e. raw material to final products within the EU and Danish strategic context toward a green transition.

→ Offered in Odense by Department of Green Technology

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### Chemical Biology

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In this diverse course, students will learn about the molecular origins of biological processes by applying chemistry to the “building blocks of life” and implement this knowledge in the space of smart therapeutics, biomolecular structure and function, and drug delivery systems.

→ Offered in Odense by: Department of Physics, Chemistry and Pharmacy

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### Engineering for Sustainability

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The course provides you with skills for understanding the challenges of sustainable development. You will get an introduction to Environmental System Analysis theory, methods and tools. You will learn when and how to apply such methods to the engineering tasks of assessing and designing sustainable solutions. We apply a systems approach throughout the course, and you will get insight into some of the societal frameworks and concepts to sustainability such as Industrial Ecology, Industrial Symbiosis, Circular Economy and Bio-Economy as well as the concept of Cleaner Technology/Best Available Technology and its role in EU environmental regulation. You will get an introduction to some of the core tools, e.g. Material Flow Analysis and Life Cycle Assessment.

→ Offered in Odense by: SDU Life Cycle Engineering



## Civil and Architectural Engineering

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### Experimental Architecture with Computational Design and Digital Fabrication

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The Summer School will focus on exploring ideas and producing design artifacts as answer to some fundamental driving questions: What kind of tectonic configurations can be enabled by means of digital fabrication such as additive and robotic manufacturing? How do we realize high-performance architecture with it? How can we build bespoke architecture in a sustainable way? Adopting a design/make approach, catalyzed through tailored computational techniques, various structural configurations will be investigated. The school outcomes will be contributing to the creation of an atlas of digitally fabricated tectonic prototypes: Experimental architectural configurations where material/form/structure are developed in a coherent design approach which takes full advantage of the potential of emergent fabrication techniques

→ Offered in Odense by: Civil and Architectural Engineering

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### Urban Resilience

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Urban resilience aims at increasing the ability of urban systems, to respond systemically and dynamically to present and future shock and stresses related to the major global challenges. Urban resilience is instrumental to address both causes and effects of these major global challenges, rethinking the way in which cities are designed, planned and managed, at the same time fostering innovation. The summer school aims at providing the participants with the latest knowledge on urban resilience research, practice and policies through lectures; and to co-develop their skills and knowledge on planning for urban resilience using Odense's real-life experience and challenges as a living laboratory, through problem-based workshops.

→ Offered in Odense by: Civil and Architectural Engineering

## Electrical Engineering

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### Modelling and Simulation of Electrical and Electromechanical Dynamic Systems

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Simulations tools are getting smarter and quicker, and in the years to come they will be taking over and/or improving a lot of laboratory tests for development and prototyping of revolutionary new products. The objective of the course is to introduce modelling of dynamic systems with focus on electrical and electromechanical systems, and to simulate response under different situations and with different impacts. You will develop mathematical models for systems such as motors, inverted pendulums, electrical cars etc. and for different purposes. In addition, you will simulate the models under diverse boundary conditions and be introduced to the simulation software Matlab and Simulink world

→ Offered in Odense by: SDU Electrical Engineering

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### Wind Power Generators - Machines, Control, Converters and EMC

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In this course you will gain a solid theoretical understanding of wind power systems. There will be lectures in Electric Machines, Control, Power converters and Electromagnetic Compatibility (EMC), and you will work with development of a simple power converter for wind power system. Here you will develop and characterize an electronic circuit board, supporting the operation of an electro-mechanical system and learn to apply simulation results in practice. Main topics are: Electromagnetic Compatibility, Printed Circuit Board design, Control, Power Converters and Electric Machines.

→ Offered in Sønderborg by: CIE - Centre for Industrial Electronics

## Innovation, Communication and Design Engineering

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### Engineering Imagination

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Learn to understand and work with experience design. The mission of this interdisciplinary creative program for mixed students is to transform engineers into experience designers through the study of tangible fantasies. During the course, students in small teams will conceptualize, develop and test a concept for a Tangible Fantasy. Here a tangible fantasy is defined as a clear, definite and real idea with no current basis in reality. In short, the creation of an improbable thing.

→ Offered in Odense by: SDU Innovation and Design Engineering

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### Health Tech Innovator

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The challenges of the healthcare systems are apparent and creating a lot of pressure on the current health care systems. For the sector to be able to cope with such future challenges, innovation is needed. In a series of lectures, we will take participants through the important parts of the innovation process in healthcare and relevant technologies, from wicked problems, user-driven innovation, entrepreneurial foundational theories and innovation management tools for aligning entrepreneurial processes with solving real life problems to Intellectual property rights (IPR) and CE marking (health, safety and environmental standards) for product sold within the European Economic Area.

→ Offered in Odense by: SDU Innovation and Design Engineering

## Manufacturing and Management Engineering

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### Circular Economy for Business and Engineers with SDG Focus

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Organizations must rethink and optimize their existing strategies to meet their sustainable business goals due to the constant depletion of vital resources and societal issues' greater demands. The increasing population not only has an impact on natural resources; it also results in more significant pollution and contributes to greater levels of poverty. With these considerations, on September 25, 2015, some countries adopted a new set of sustainable development goals (SDGs) to end poverty and to improve prosperity worldwide. Seventeen sustainable goals have been targeted to achieve by 2030 under the new sustainable development agenda (UN.org, 2015). Further, these sustainable goals encompass a range of perspectives and various levels of applications, including supply chain management. In recent years, academicians, researchers, and practitioners have addressed supply chain management issues because of their significant impacts on organizational developments regardless of the field of applications. Researchers around the globe are exhibiting increased interest in how the circular economy (CE) may contribute to the SDGs. The level of widespread acceptance being generated clearly shows the potential necessity of implementing CE. Nations are feeling pressure from an alarming decrease in resources, pollution, political insecurity, and safety breaches. Contrary to the conventional or linear economy approach, which utilizes the take-use-dispose model, the CE model focuses on value creation by closing the loop. The CE model works as a natural system by using the values of the material, energy, and other resources within a particular ecosystem as a single loop. Hence, in recent years, the CE model has gained popularity among businesses and communities.

This course will provide you with skills to the current practices of circular economy (CE) and SDGs for business and engineers and identify and critically discuss the connection between linear/circular economies and environmental sustainability generally and between circular economies and SDGs specifically.

We will apply the Design and systems approach to solve business and engineering tasks. The course sessions use traditional teaching, case-based real-life problems solving tasks, and industrial visits.

→ Offered in Odense by: SDU Sustainable Supply Chain Engineering

## Manufacturing and Management Engineering

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### Project Management

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You will learn how to analyse projects and project processes, and as a result, contribute to the accomplishment of projects. You will obtain insight into the project management discipline and its concepts and assumptions, and will be able to independently utilize the knowledge obtained to work out a project mandate with matching analyses and plans, and also to be able to evaluate project descriptions, analyses and plans worked out by other people. Furthermore, you will be able to independently follow-up on analyses and plans, and in the light of these provide proposals for an appropriate management effort.

→ Offered in Odense by: SDU Global Sustainable Production

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### Six Sigma

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A major part of quality management and cost optimization is quality or process improvement. Of the many methods available, Six Sigma is currently one of the more popular methods. In this course the student will learn the Six Sigma method to the level of Green Belt and be able to apply Six Sigma in practice after the course. The course will present cases from production/manufacturing, service and supply chains.

→ Offered in Odense by: SDU Engineering Operations Management

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### Sustainable Development Goals and Global Production Systems

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Since United Nations launched the global sustainability development goals for 2030 companies across the global have embraced strategies encompassing the SDGs. Yet, unless the companies manage to implement their commitment in the design of their (global) operations there is a danger the SDGs will maintain being strategic commitments only. The aim of the summer school course is to zoom in on the SDGs in general and in particular on the challenges pertaining to implementing them in global production systems/operations as well as how to overcome the challenges.

→ Offered in Odense by: SDU Global Sustainable Production

## Mechanical and Mechatronics Engineering

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### Wind Turbine Technology

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A folk high school in the little village of Askov, not far from the two largest SDU campuses, is the cradle of the successful Danish wind turbine industry. Here, the pioneer Poul la Cour designed and build wind turbines in the 1890s together with his students that later became the grandfathers of wind turbine technology in Denmark and perhaps the world.

In this summer course, we will first visit this historic place and spend the following two weeks on designing, building and testing our own small wind turbine based on today's theories and best practices for wind turbines.

You will learn about the momentum balance that exist between the wind velocities and the aerodynamic forces in the rotor plane of the turbine, and that leads us to the theoretical maximum power limit of  $16/27$  of the kinetic energy in the wind, the Betz' limit.

We will use this knowledge to design an aerodynamically optimal wind turbine blade under constraint that it is structural strong enough to withstand the aerodynamic forces. So, you will also learn to evaluate the structural integrity of a beam subject to distributed forces and use the result to redesign the blade if necessary.

At the end of our two weeks together, we are going to test the power output and structural integrity of your blades on a turbine rotor in real wind conditions. Besides this planned track, there will be opportunities to learn about any other aspect of wind turbine technology from Professor Morten Hartvig Hansen who has studied and taught with this topic for more than 20 years.

→ Offered in Sønderborg by: Centre for Industrial Mechanics



## Mechanical and Mechatronics Engineering

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### Applied Composite Drone Manufacturing

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Drones come in various forms and shapes. The purpose of flying requires smart constructions and lightweight materials, such as composites. The composite lab at the Danish drone center offers various composite manufacturing technologies and materials to build different types of drones. The range of processes spans from additive manufacturing with composite materials over to filament winding and vacuum infusion. Natural fibres, like flax, offer sustainable composites but also glass and carbon fibres could lead to flying solutions.

→ Offered in Odense by: SDU Mechanical Engineering

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### Experimental Fluid Mechanics

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This course introduces methods and techniques for measurement and data analysis in experimental fluid mechanics, e.g. study of aerodynamic in wind tunnel and hydrodynamics in pipes and ducts. During the course you will go through the following subjects: Dimensional analysis, flow similarity and model studies, Design and analyses of experiments and Experiences with different measurement technologies for experiments in fluids. After participation in the course you will be able to plan and conduct experiments in fluids and to document the result from laboratory experiments in a report.

→ Offered in Odense by: SDU Mechanical Engineering

## Physics, Energy and Engineering Physics

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### Introduction to Nano-optics

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This course introduces analytical tools used to model and understand the behaviour of light in atoms and materials that are structured on small scales compared with the free-space optical wavelength. We will review simple concepts of electromagnetism, relating far and near-field microscopy, propagating and evanescent waves, as well as linear and nonlinear response theory based on classical and quantum mechanical approaches. These concepts will then be applied to study light-matter interactions in quantum light emitters and low-dimensional systems, with special emphasis on plasmon- and exciton-polaritons in 2D materials (e.g., graphene or atomically-thin semiconductors) for applications in optical sensing, all-optical transistors, and quantum information technology.

→ Offered in Odense by: SDU Nano Optics

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### Medical Devices and Imaging

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In this course you will gain a theoretical understanding and practical experience within medical devices and imaging techniques. There will be lectures in microfluidics including simulation and laboratory exercises where you will design, fabricate and test a microfluidic component. Moreover, you will learn about different medical sensing devices and various imaging techniques.

→ Offered in Odense by: MCI Mads Clausen Institute

## Physics, Energy and Engineering Physics

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### The Dark Universe and (neural) Networks

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Abstract: Our universe presents us with a tantalizing riddle, namely to understand the structure of its “dark sector”. This sector includes the dark matter, which could be a new particle and/or black holes. The course will provide an introduction to the topic of dark matter as a whole and discuss some candidates.

In the second part, the course links to the topic of neural networks, which are becoming powerful tools to tackle deep questions in fundamental physics, including the structure of the dark sector. Finally, networks show up in the fundamental physics of the universe in a different way, namely as a proposal for the deep structure of spacetime itself.

This course will link a theoretical overview of some of the most exciting questions in fundamental physics with applications that bridge the gap to computer science and is suitable for students with a range of different backgrounds in physics (both applied and theoretical), computing and mathematics.

→ Offered in Odense by: Department of Physics, Chemistry and Pharmacy

## Robotics and Drone Technology

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### Introduction to Biologically Inspired Robotics

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Robots inspired by the structure as well as by neural mechanisms in animal brains are playing an increasingly important role as a link between biology and robotics. Students will be introduced to biologically-inspired approaches to robotics – embodied artificial intelligence, neurorobotics and biorobotics. You will learn about how neurons for sensing and control in the biological brain work and their equivalent models as well as how to build simple brains for robots by connecting these artificial neurons together to solve a task. You will also learn how neurons in the brain learn to adapt their behaviour to changes in the environment and control the body accordingly. Finally, you will learn how to model mechanisms of biological learning and apply them to build simple brains for robots that learn to solve tasks and to improve their performance.

→ Offered in Odense by: SDU Bioinspired Robotics

## Robotics and Drone Technology

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### Robotics: Fundamentals and Applications

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Robots are getting smarter and smarter, and taking over a number of tasks for human beings, and there seems to be almost no end to the utilization of robots as novel robotics applications have been being explored and identified continually. This course will give students an overview of the commercially available robots, their application areas, and the state-of-the-art research activities in global robotics community and SDU MIMI research institute, and help students establish strong connection between robotics theory and applications. To this end, fundamentals in robotics will be introduced in the summer course including Kinematics, Dynamics, Control, i.e., KDC pillar modules in robotics, and more importantly, how these theories can be applied in real cases, which will be integrated into a hands-on mini project. In this mini project, you will have opportunity to work on UR (Universal Robots) robot arms for collision avoidance motion planning and control by using the learnt KDC fundamentals. The fundamentals covered in this summer course are mainly for robot arms, but some of them can be general for other types of robots as well.

→ Offered in Odense by: SDU Robotics

### Introduction to Unmanned Aerial Systems Technology

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This course will teach you the basics of drone technology hardware, software and systems. This course involves introduction to the UAVs theories and technologies followed by laboratory exercises in SDU Drone Lab and SDU UAS Test Center at the airport. Based on the knowledge and experiences you gain during this course you will build and fly a multirotor UAV outside at the airport (in teams of 3-4 students). Throughout the course, focus will be on integration of components and subsystems required for a drone platform.

→ Offered in Odense by: SDU UAS Centre

## Software Engineering and Computer Science

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### Artificial Intelligence for Healthcare Data

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Every day, a massive amount of patient data is generated and recorded on a global scale. Artificial Intelligence (AI) has the power to automatically process all this complex data and use it to improve the accuracy and quality of healthcare services, and to generate innovative solutions in this sector. It can therefore be used in a variety of settings and disease conditions for e.g., the improvement of diagnosis and treatment decisions, prediction of clinical outcomes, patient monitoring and development of medical devices. This course will introduce students to the fundamentals and applications of AI in the healthcare environment, by offering the chance of working with different types of health data, such as structured patient journals, medical imaging results, and time-series. Techniques used to handle health data, as well as selective AI algorithms suited for the problems, will be explored across real-life challenges within the healthcare setting. Focus will be given to supervised machine learning algorithms, e.g. classification, regression.

→ Offered in Odense by: SDU Software Engineering

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### Continuous Delivery and DevOps

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During the course you will learn to apply software engineering practices and tools from professional software developers. The course in Software Delivery and DevOps is organized by Praqma and SDU and you will get tips and tricks on how to use Git, Docker, Jenkins and more. After completing the course you will be able to: 1. Construct a continuous delivery pipeline and apply it on a small software project, 2. Apply professional tools for build, test, and deployment automation, 3. Demonstrate DevOps mindset, 4. Compare Continuous Delivery and DevOps with other software engineering approaches, describe their prerequisites, benefits and barriers, 5. Explain how continuous delivery can support innovation experiments and value creation.

→ Offered in Odense by: SDU Software Engineering

## Software Engineering and Computer Science

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### Deep Learning

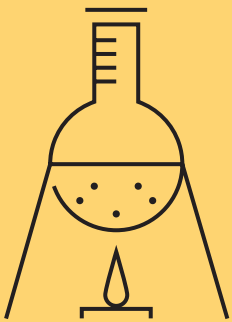
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Machine learning has become a part in our everyday life, from simple product recommendations to personal electronic assistant to self-driving cars. Especially deep learning has gained a lot of interest in the media and has demonstrated impressive results. This intensive course will introduce you to the exciting world of deep learning. We will learn about the theoretical background and concepts driving deep learning and highlight and discuss the most noteworthy applications of deep learning but also their limitations. Furthermore you will also apply and implement your first deep neural networks in order to solve various interesting machine learning tasks.

→ Offered in Odense by: Department of Mathematics and Computer Science



# 5 reasons to choose SDU International Summer School



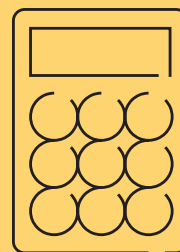
**1. State-of-the-art facilities and laboratories**



**2. Hands-on learning philosophy**



**3. Work closely with inventive industries**



**4. Earn 5 ECTS**



**5. Great social life**

# Summer School





A perfect place to update  
your skills – and get to  
know Danish language  
and culture





# Free admission

## Have a great summer for free

(we are not kidding!)

Exchange students from a partner university pay no tuition. Ask your international coordinator if your university is a partner university – and if you can be nominated for SDU International Summer School.

Guest students pay tuition fees. For tuition rates and more information please refer to [www.sdu.dk/summerschool](http://www.sdu.dk/summerschool) or contact us at [summerschool@sdu.dk](mailto:summerschool@sdu.dk)

# How to get here

It is really easy →  
to get here

**By plane:**

Two international airports are located close to both Odense and Sønderborg: One in Copenhagen and one in Billund.

**By train:**

Travel by train and enjoy the flat Nordic landscape on your way. The train stations in both Sønderborg and Odense are located in the middle of the city close to the harbour, shopping, cafes close to the university.

**By bike:**

Yes, Denmark is too far away to reach by bike. But when you get here you will realize why Denmark is internationally praised for its many bike lanes. Rent a bike during your stay and join your fellow students in the bike lanes.

# Want to apply?

Find more information  
about SDU International  
Summer School and our courses  
at [sdu.dk/summerschool](https://sdu.dk/summerschool)

## Facts:

Dates: 9 - 20 August 2021

Venue: SDU Campuses in Odense or Sønderborg

Level: Advanced Bachelor 5 ECTS

Fee: Free for exchange students

## Admission & Practical stuff

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