

Computer Science 4th semester

Programme:

AP Degree Programme in Computer Science

Semester:

4th semester of the programme.

Pre-requisites:

A foreign qualification similar to 1½-2 years engineering, IT, SW or computer science studies (comprehensive knowledge of Java and SW-Design & UML and experienced C++ or Java programmer).

Availability:

Spring Semester: (end January - June)

Programme information for exchange (Learning Agreement):

For a detailed course description kindly refer to the programme curriculum found under programme information on <http://zibat.dk/curriculums-ordinary-programmes/>

Semester overview:

<i>Study Programme at the Receiving Institution</i>				
Planned period of the mobility: from [month/year] to [month/year]				
Before the mobility		Component/course title (as indicated in the course catalogue)	Semester [e.g. autumn/spring; term]	Number of ECTS credits
	DCS4	Elective no. 1 (see choice of electives offered)	Spring	10
	DCS4	Elective no. 2 (see choice of electives offered)	Spring	10
	DCS4	Elective no. 3 (see choice of electives offered)	Spring	10

				Total: 30 ECTS
Web link to the course catalogue at the Receiving Institution describing the learning outcomes:				
http://zibat.dk/curriculums-ordinary-programmes/				

Semester and Course Description:

The 4th semester in Computer Science consists of electives only.

Electives offered may change each semester in order to always offer relevant subjects.

Below is an example of how the choice of courses look in one semester (spring semester 2018). There will usually be approximately 10 courses to choose from (each 10 ECTS). The electives for each spring semester will usually be available in the middle of November the year before. Please note that the individual courses only will be taught if a sufficient amount of students chose the course

ELECTIVES OFFERED FOR SPRING SEMESTER 2018

Component code (if any)	Component title at the Receiving Institution (as indicated in the course catalogue)	Course Component Description	Available Semester	Number of ECTS credits
DCS 4	WebProgramming - WebApps with Angular	<p>During this course you will learn how to build a modern mobile friendly and responsive WebApps based on the latest version of the most used JavaScript-framework: Angular.</p> <p>Beside Angular, you will learn to use other framework like: TypeScript, NodeJS, Bootstrap 4, RxJS, MongoDB and FireBase. In the course, I will use the new code editor Visual Code, but you are welcome to use your own favourite IDE/Editor if you like.</p> <p>Notice: This course is not a course in HTML, CSS and basic JavaScript (JS). There will be a short introduction to HTML5, CSS 3 and JavaScript and depending on your prerequisites I will offer some extra help/material if HTML/CSS/JS is new to you.</p>	Spring	10
DCS 4	Mobile Application Development	<p>This course is intended to qualify the student to:</p> <p>Design and program mobile application mainly for Android, but also for iOS.</p> <p>Learnings objective</p> <p>Knowledge:</p> <p>The student has knowledge about:</p> <p>The architecture of the Android operating system. The life-cycle of Android activities and fragments.</p> <p>Skills:</p> <p>The student can: Use a modern programming environments to program mobile application.</p>	Spring	10

		<p>Design user interfaces for mobile applications. Make mobile applications for various types of mobile devices. Make mobile applications communicate with back-end systems using relevant network protocols. Use location based services in mobile applications.</p> <p>Competencies: Design and program mobile application</p> <p>Technologies: Cross-plaform application development (Android + iOS) using Microsoft Xamarin, C# and Visual Studio.</p> <p>Android applications using the Java Programming Language and the Android Studio IDE. An Android device (phone or tablet) and/or an Android emulator is used to run the applications.</p>		
DCS 4	Big Data Workshop	<p>This course is intended to qualify the student to: Analyse, Design and Implementation of Big Data .</p> <p>Learnings objectives</p> <p>Knowledge</p> <p>The student has knowledge about:</p> <p>the theory and practice of the Big Data topic understand the concepts of Volume, Variety, Velocity, Variability, Veracity and Complexity for Big Data.. understand Big Data as data driven business (e.g. new combination of data to provide new services)</p> <p>Skills</p> <p>The student can:</p> <p>select, describe and search for literature concerning a problem of his/her own choice within the context of information technology</p>	Spring	10

		<p>discuss relevant processes and analytical approaches associated with the Big Data i.e. maintaining Big Data problems and develop a solution, this could be from analyzing social medias communicate key results.</p> <p>be able to set up a small experiment using techniques and tools from Big Data (mostly Hadoop) e.g. databases, deduce new knowledge, some kind of artificial intelligence</p> <p>Competencies</p> <p>The student can:</p> <p>familiarise himself/herself with Big Data in the context of the theory and/or practices of the discipline without the assistance of others</p> <p>put the chosen topic(s) into a wide perspective and relate it/them to the other topics addressed during the programme.</p> <p>reflect on different uses of Big Data for solving the business of tomorrow.</p> <p>If possible a company will provide a case study to be the base of the mandatory assignment.</p> <p>Technologies</p> <p>The elective educational elements give the student an opportunity to enhance his/her academic and professional competence by specialising and putting themes into perspective within the wider scope of Big Data with a special focus on Hadoop.</p>		
DCS 4	Databases & Data Science	<p>Course Learning Objective Learning outcomes:</p> <p>Knowledge</p> <p>Upon completion of the course, students should have acquired knowledge about theory, principles, and practice of:</p> <ul style="list-style-type: none"> • DB design. • Data structure in different DB systems (SQL, NoSQL). • DBMS (SQL Server, Mongo DB) • DB implementation. 	Spring	10

		<ul style="list-style-type: none"> • Data migration. • Data Mining. • Data analysis by visualization <p>Skills Upon completion of the course, students should have acquired the skills to:</p> <ul style="list-style-type: none"> • Design their DB. • Able to use different database systems (DBMS). • Reflect on different choices of different DB/DBMS. • Access their DB from relevant tools and C# applications. • Examining large pre-existing databases in order to generate new information • Use visualization tools. <p>Competencies Upon completion of the course, students should have acquired the competencies to:</p> <ul style="list-style-type: none"> • To be able to analyze, design and implement a database and assess its implications. • To be able to document database system structure as part of the project development • To be able to apply knowledge and skills in the database area for practical use in an organization. <p>Course content: DB Design, SQL Server, No SQL databases, Mongo DB, Data Mining, Data visualization.</p>		
DCS 4	IT-Security	<p>The purpose of this elective area is to develop the student's competencies in making a qualified choices of It-security rules.</p> <p>Learning objectives:</p> <p>Knowledge Upon completion of the course, students should have acquired knowledge about theory, principles, and practice of:</p> <ul style="list-style-type: none"> • Symmetric and asymmetric encryption and their advantages and limitations 	Spring	10

		<ul style="list-style-type: none"> • Network security in general • Digital certificates and the management of these • The techniques used by hackers • IPSec protocol and its use • Secure Virtual Private Network (VPN) and the setup of a VPN • Wireless networks and their vulnerabilities <p>Skills Upon completion of the course, students should have acquired the skills to:</p> <ul style="list-style-type: none"> • Apply various security tools • Defend hacking in integrated environment • Perform password cracking by brutal force <p>Competencies Upon completion of the course, students should have acquired the competencies to:</p> <ul style="list-style-type: none"> • Set up security rules in a company • Install IT-Security tools • Setup a corporate VPN <p>Course content Network security, Cryptography, Man-in-the-middle attack. Password cracking, VPN. Hacking and counter attacks. Database security. PGP.</p>		
DCS 4	Game Development	<p>During this course students will learn how to use Unity and how to build their own (mobile) games in teams of 2-4 students. This course is intended to qualify the student to:</p> <p>Design 2d games for dekstop and mobile Program games in Unity with C#</p> <p>Learning objectives Knowledge: The student has knowledge about: Design simple games Physics engines in games</p>	Spring	10

		<p>Basic Artificial Intelligence in game development Design games in an object oriented programming language</p> <p>Skills: The student can: Use Unity to create games Use the core features in Unity Create games for Computers Create games for phones Write Game Design Documents</p> <p>Competences: The student can: Implement a 2d game in Unity</p>		
DCS 4	IoT	<p>This course will focus on learning the basics of Raspberry Pi, Linux, Python sensors and electrical circuits. Later in the course all students are expected to develop their own IOT device in groups.</p> <p>This course is intended to qualify the student to: Create a IOT device based on Python and Raspberry Pi Develop new concepts Program sensors Learning objectives</p> <p>Knowledge: The student has knowledge about: IOT devices Raspberry Pi Linux</p> <p>Skills: The student can: Install and maintain a linux system Navigate in a linux shell / environment Program in python Make and plan basic electrical circuits</p>	Spring	10

		<p>Work with various sensors Document your work</p> <p>Competences: The student can: Create an IOT device with sensors connected to the internet</p>		
DCS 4	Software testing	<p>Software touches just about everything in our world today. Today's consumers expect intuitive and reliable technology, and in an increasingly crowded market place small missteps can trigger dissatisfaction and abandonment. Software testing addresses weaknesses in software development while building scalable development processes to ensure a best-in-class user experience. In this Software Testing program, you will gain essential knowledge about software testing concepts and techniques. You will also learn how to plan, execute and manage software testing as well as software quality techniques for formal verification, which is used in mission critical projects.</p> <p>This program will be of benefit to Software Testers, Developers and Quality Assurance Engineers. It will provide career-changers with the skills to get an entry-level job in Software Testing and help advance Software Developers skills in unit testing.</p> <p>Job Outlook</p> <ul style="list-style-type: none"> • It is estimated that there are 233,000 Software Quality Assurance Engineers and Testers and there will be 37,000 additional job openings for Software Quality Assurance Engineers and Testers (source: O*Net Online) • Career prospects include software developer, software tester, quality assurance engineer • Software Quality Assurance Engineer is ranked as one of the happiest jobs by Forbes (source: forbes.com). • With digital disruption, many and many companies are moving into DevOps. <p>Learning outcomes:</p> <p>Knowledge Upon completion of the course, students should have acquired knowledge about software testing concepts and techniques (20%), and practice (80%) of:</p>	Spring	10

		<ul style="list-style-type: none"> • How to structure your application for testability? • Better practices for writing good tests that are readable and maintainable. • Testing in the agile world. • Behavior Driven Development (BDD). • Test Driven Development and its benefits. • Refactoring and Continuous Integration • How to mock external Resources • How to create and implement Unit tests and the elements of a good test • How to create basic API and web service tests. • Performance testing and how to create a performance test using Visual Studio and Visual Studio team services (VSTS) • How to analyze performance test results using Application Insights. • Exploratory testing in the context of visual Studio and Microsoft Test Manager • Automation and how to choose the right tool for automate testing. • How to implement and automate a delivery pipeline: development-continuous integration-continuous deployment and delivery using TeamCity. <p>Skills</p> <p>Upon completion of the course, students should have acquired the skills to:</p> <ul style="list-style-type: none"> • Develop a structured test plan. • Be able to develop an agile testing strategy. • Develop high quality software • Apply and master various automation testing tools • Be able to implement and automate a delivery pipeline <p>Competencies</p> <p>Upon completion of the course, students should have acquired the competencies to:</p> <ul style="list-style-type: none"> • Easily integrate a development team in a company as a good tester • Select an appropriate tool for automate testing and software delivery 		
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DCS 4	DevOps	<p>DevOps terms Build servers on premise/cloud Continuous integration /cloud Continuous deployment /cloud Testable code (S.O.L.I.D principles(some of them)) Dependency injection (DI) Company visit meetups workshops external speakers</p> <p>Skills: The student can:</p> <p>Understand how the DevOps support the agile system development process Setup a buildserver Understand Design Pattern to create testable code (SOLID) Code testable code Test the code setup a CI/CP flow with test and integration to Prod/Test systems deployment to cloudservices understanding containers fx. docker GitFlow + branching</p> <p>Technologies: Docker Buildserver:Jenkins/Teamcity Versionscontrol: Git + GitFlow Backend :Cloud services fx Azure, amazon webservices Manage : Trello/TeamServices/Jira</p>	Spring	10
DCS 4	Process Improvement	<p>This elective course helps the student develop competencies to participate in systematic improvement of existing system development processes. The course takes a pragmatically balanced approach including both and agile and disciplined techniques. The acquired competencies are particularly helpful to students aiming to become project managers or process specialist, but generally useful for any professional developer.</p>	Spring	10

		<p>The course also helps the student further developing the competencies to transfer knowledge from the education to practical applications in companies conducting system development. The course applies a hands-on approach that includes a 2 x 2-week field study (group work) of actual system development processes in a company.</p> <p>The learning objectives are achieved by acquiring knowledge of and skills with the following methodologies:</p> <ul style="list-style-type: none"> • Kanban • CMMI • Appreciative Inquiry <p>Learning Objectives</p> <p>Knowledge</p> <p>The student has knowledge about</p> <ul style="list-style-type: none"> • methods for improving system development processes. • techniques for eliciting information about existing system development processes. <p>Skills</p> <p>The student has acquired the skills to</p> <ul style="list-style-type: none"> • perform a process analysis based on systematic application of appropriate techniques. • communicate the analysis results from a process analysis to relevant target groups. • document and communicate the work process as a process analyst. <p>Competences</p> <p>The student has acquired the competencies to</p> <ul style="list-style-type: none"> • create and communicate proposals for process improvements based on a process analysis. 		
	<p>Artificial Intelligence</p>	<p>Learning outcomes:</p> <p>Knowledge</p> <p>By the end of this course, you should be able to acquire knowledge about the theory, concepts and search techniques on:</p> <ul style="list-style-type: none"> • Uniformed search algorithms (BFS, DFS, Deepening Search, Uniform Cost Search). • Unformed Search algorithms (Greedy Search, A* and heuristics, A* Graph Search, Game tree). 		<p>10</p>

		<ul style="list-style-type: none"> • Constraint Satisfaction Problems. CSP 1 • Constraint Satisfaction Problems. CSP 2 • Game Trees (Minimax, Alpha-beta pruning) • Game Trees (Expectimax ,utilities) • Supervised Learning (Neural Networks, Bayesian learning) <p>Skills Upon completion of the course, students should have acquired the skills to be able to:</p> <ul style="list-style-type: none"> • built autonomous agents that efficiently make decisions in fully informed, partially observable and adversarial settings. • Build autonomous agent that will be able to draw inferences in uncertain environments and optimize actions for arbitrary reward structures. • Master the techniques that apply to a wide variety of artificial intelligence problems and that serve as the foundation for further study in any application area you choose to pursue. <p>Competencies Upon completion of the course, students should have acquired the competencies to:</p> <ul style="list-style-type: none"> • To be able to select appropriate search algorithms to solve specific search problems • to be able to apply the search algorithm to game scenarios (i.e. Pacman game). <p>Keywords: BFS, DFS, Deepening Search, Uniform Cost Search, Greedy Search, A*, heuristics, A* Graph Search, Constraint Satisfaction Problems (CSP 1 & CSP2), Minimax, Alpha-beta pruning, Expectimax ,utilities, Neural Networks, Bayesian learning.</p>		
				TOTAL:30 ECTS