AALBORG UNIVERSITET

STUDIEORDNING FOR MASTERUDDANNELSEN I INFORMATIONS- OG KOMMUNIKATIONSTEKNOLOGIER, 2020

MASTER
KØBENHAVN

MODULER SOM INDGÅR I STUDIEORDNINGEN

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SERVICES AND PLATFORMS

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have a holistic understanding of the ICT environment, i.e. the heterogeneous networks, Internet technologies and business models, on which ICT solutions and services rely
- Must have knowledge about the key Internet technologies and standards for content networking: representation, identification and transport
- Must have knowledge about the characteristics of different networks and the technologies that are important to provide a good user experience for a service
- Must be able to understand the service architectures, platforms and business models that are needed to provide future services and applications

SKILLS

- Must be able to specify requirements for innovative applications, services, solutions or service architectures based on a thorough analysis of the ICT environment and the needs of the target users
- Must be able to assess the network characteristics and limitations, which affect the delivery of content and services to the end users
- Must be able to discuss the technical and business-related aspects of services and service architectures
- Must be able to conceptually construct relevant business models

COMPETENCES

- Must have the competency to assess the viability and potential of new ICT-related technologies, frameworks and concepts
- Must have the competency to identify new business opportunities in relation to ICT services and service architectures
- Must be able to judge and prioritize the validity of various sources of information.

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Services and Platforms
Type of exam	Oral exam based on a project
ECTS	10
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Services og platforme
Module code	ESNMICTM1P4
Module type	Project
ECTS	10
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

ENTREPRENEURSHIP, INNOVATION AND BUSINESS MODELS

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge on theories regarding business development based on communication, media and information technologies, including network economics, information economics, transaction costs analysis, and business ecosystems
- Must be able to understand theories on innovation and entrepreneurship

SKILLS

- Must be able to apply theories and methodological tools on specific company and technology cases
- Must be able to evaluate the application of business models in different business areas

COMPETENCES

- Must have the competencies to discuss the links between different design elements of business models: customer value, organisation, technology and financial issues
- Must have acquired the knowledge and skills to explain the key linkages between the different theories of the course, and use these critically in an analysis of market trends and business models
- Must have acquired the ability to combine knowledge on technological solutions with business development and business potential
- Must master theories and methodological tools to analyse and suggest appropriate and innovative business models for companies, which are offering communication, media and information services and products and using these solutions in their business operations

TYPE OF INSTRUCTION

Types of instruction are listed in § 17

EXAM

EXAMS

Name of exam	Entrepreneurship, Innovation and Business Models
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Entrepreneurskab, innovation og forretningsmodeller

Module code	ESNICTEK1K2
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

COMMUNICATION TECHNOLOGIES AND SERVICE ARCHITECTURES

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Must have knowledge about:

- Spectrum limitations and spectral efficiency.
- Fixed and mobile/wireless broadband infrastructures.
- Short-range technologies.
- Digital broadcast networks (radio and TV).
- New network architectures, including, CDN, SDN, ICN.
- The structure of the Internet and its design principles.
- The key Internet technologies for content networking: representation, identification and transport
- Programming models and interfaces for Internet services, in particular REST, SOAP and Web Services
- The main protocols for streaming media, including session initiation and management
- Mark-up languages and AJAX technologies, e.g. XML, JSON, HTML5, and JavaScript

SKILLS

Must be able to:

- Explain the technical parameters, which drive the development of future networks.
- Evaluate to what extent the future mobile and fixed networks complement or substitute each other.
- Evaluate the strengths and weaknesses in the use of traditional mobile networks, wireless or broadcast networks for mobile TV/radio transmission.
- Evaluate QoS requirements for Internet applications and services.
- Understand the potentials of converged infrastructures.
- Explain the concepts of “service”, “service enablers” and “service architectures”
- Reflect on methods for "enrichment" of services: personalization, use of context, etc.
- Design services for real-time content distribution, including streaming media

COMPETENCES

Must have the competency to:

- Identify and discuss the key technologies and standards for broadband networks and the properties of networks that are essential for supporting services.
- Analyse and assess the potential and limitations of existing and future communication and service infrastructures and help develop new solutions.
- Make a qualified choice of technologies, methods, platforms and service architecture in order to realize a given service.

TYPE OF INSTRUCTION

Types of instruction are listed in § 17

EXAM

EXAMS

Name of exam	Communication Technologies and Service Architectures
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Kommunikationsteknologier og tjenestearkitekturer
Module code	ESNMICTM1K3
Module type	Course
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

APPLICATION DEVELOPMENT

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds upon knowledge obtained in the first semester project.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about appropriate methods for analysis, design, development and test of applications or services based on current or future ICT platforms
- Must understand how to develop application/services providing a good user experience
- Must have knowledge of the capabilities and functionalities of relevant software and hardware tools for application development

SKILLS

- Must have knowledge about mobile platforms, devices, and peripherals (sensors, tags, etc.) and their connectivity
- Must be able to make a well-founded requirement specification for an ICT service or solution, taking into account the target users, stakeholders, business aspects, state-of-the-art technologies and technical constraints
- Must be able to design a full-scale service and realise a more limited prototype of proof-of-concept in the project
- Must be able to reflect on the application development process and the final outcome
- Must be able to develop and test applications and services that can be deployed on ICT and media platforms and infrastructures
- Must be able to develop services with mobile and interactive media and context awareness
- Must be able to develop services including security and handling of personal data

COMPETENCES

- Must have the competency to identify user needs and system requirements in a wide variety of contexts
- Must have the competency to turn them into innovative applications and services building on state-of-the-art within the field of ICT
- Must be able to communicate the above knowledge and skills both orally and in a written repo

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Application Development
Type of exam	Oral exam based on a project
ECTS	10
Assessment	7-point grading scale
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Applikationsudvikling
Module code	ESNMICTM2P6
Module type	Project
ECTS	10
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

INTERACTION DESIGN

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The students is recommended to have basic understanding of human-computer interaction.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must understand the concepts of human computer interaction, interaction design and user experience and the relation between them
- Must have knowledge of different input and output modes for interactive systems, also in a historical perspective
- Must have knowledge of different methods for designing interaction of ICT systems
- Must have knowledge of different strategies for planning the interaction design of ICT systems

SKILLS

- Must be able to apply the concepts of usability and user experience both to screen-based and non-screen-based interactive systems
- Must master different design methods and techniques for creating and testing interactive systems, including non-screen-based systems
- Must be able to identify tensions between different visions for – and interests in – the design of an interactive system
- Must be able to discuss user cognitive models and other descriptions of users
- Must be able to analyse different types of data from and about users
- Must be able to design the interaction of a given system based on data from and about users
- Must be able to reflect critically on methodological challenges in data from and about users as a source for design
- Must be able to evaluate interactive systems using techniques from interaction design and Human Computer Interaction

COMPETENCES

- Must have the competency to reflect on the implications of using different methods and techniques for interaction design, including user involvement, and for evaluating systems
- Must have the competency to analyse the social context in which the use of ICT takes place
- Must have the competency to discuss concepts of privacy, user sovereignty and personalisation in relation to design dilemmas involved the design of interactive systems
- Must have the competency to position the field of interaction design in the professional context of ICT development

TYPE OF INSTRUCTION

Types of instruction are listed in § 17

EXAM

EXAMS

Name of exam	Interaction Design
Type of exam	Written or oral exam
ECTS	5

Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Interaktionsdesign
Module code	ESNICTEK2K5
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

DEVELOPMENT OF ICT AND MEDIA SERVICES

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must be able to understand architectural issues such as the division of functions between terminal, server and networks.
- Must have knowledge about Internet of Things.
- Must have knowledge about smart sensors and smart actuators.
- Must understand general sensor architecture, structure and communication.
- Must have knowledge about basic artificial intelligence and pattern recognition algorithms and principles.
- Must have knowledge about platform programming and scripting (Tablets, Raspberry-pi, Arduino, Smart TV, etc.).
- Must understand interface and communication concepts in relation to external servers, databases, and cloud-based services.
- Must have knowledge about a range of software technologies (e.g. Python, Java, mySQL).
- Must have knowledge about different Software Development Toolkits (SDK), simulators, emulators and Integrated Development Environment (IDE)

SKILLS

- Must be able to design and implement platform services/applications using high-level programming languages and development platforms.
- Must be able to perform platform programming and scripting (Raspberry Pi, Arduino, IoS, Smart TV, etc.).
- Must be able to use sensors and actuators to implement Internet of Thing related systems and devices.
- Must be able to use simple artificial intelligence algorithms in platform services and applications.
- Must be able to interface, communicate and use external servers, databases, and cloud-based services.
- Must be able to design, develop and evaluate platform software components.
- Must be able to produce technical documentation

COMPETENCES

- Must have the competency to design and develop viable ICT and media services that can address a wide range of user needs and provide with a good user experience
- Must have the competency to compose more advanced service functionality using state-of-the-art software tools, Internet of Things, cloud architectures, sensors and simple artificial intelligence algorithms

TYPE OF INSTRUCTION

The type of instruction is organised in accordance with the general instruction methods of the programme, cf. § 17.

EXAM

EXAMS

Name of exam	Development of ICT and Media Services
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Udvikling af IKT- og medietjenester
Module code	ESNMICTM2K2
Module type	Course
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

MASTER'S PROJECT

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must be able to understand the relevance of the chosen problem in relation to services, infrastructure, entrepreneurship and innovation including specific knowledge on the core of the problem and the technical context
- Must be able to understand at synthesis level relevant theories and methods in a way that underlines important properties, and thus documents the knowledge about the applied theories, methods and delimitations within the problem field.

SKILLS

- Must be able to design, develop or analyse a comprehensive service or solution that is solidly technical founded, meets end-user requirements and is validated from a market and business perspective.
- Must be able to undertake a thorough analysis of specific applications for technology choices, strategic decisions and innovation.
- Must be able to analyze the possible methods to solve the problem, describe and assess the application of the chosen methods and how this influences the project results.

COMPETENCES

- Must be able to synthesize and describe the choses problem and apply relevant theories, methods and experimental data
- Must have competencies in innovation and entrepreneurship within the field of ICT
- Must be able to contribute to the creative use of technologies to resolve user needs and improve organizational processes.
- Must are able to communicate scientific problems in writing and orally to specialist and non-specialist.
- Must be able to independently initiate and perform collaboration within the discipline and interdisciplinary

TYPE OF INSTRUCTION

The project is performed individually or in small groups of a maximum of three members. At least one internal supervisor is assigned, who works with the primary subject within his/her research. Moreover, additional supervisors e.g. from industry can be involved in the project.

Types of instruction are listed in §17; Structure and Contents of the Programme.

EXAM

EXAMS

Name of exam	Master's Project
Type of exam	Master's thesis/final project
ECTS	15
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Masterprojekt
Module code	ESNMICTM3P2
Module type	Project
ECTS	15
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

ORGANIZATIONS AND INNOVATIONS

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The sub-module: 'POPBL and scientific methods' is a part of this project and the students must pass this sub-module before they go to the project exam.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about business processes and process optimisation
- Must have knowledge about innovation processes
- Must have knowledge about models for diffusion and adoption of technology
- Must have knowledge about technology management

SKILLS

- Must be able to discuss the technical and business-related aspects of service architectures
- Must be able to carry out a detailed analysis of a service, an application or a technical design and develop a well-founded requirement specification for the service
- Must be able to conceptually construct relevant business models
- Must be able to draft a business planMust be able to carry out change management in relation to ICT services

COMPETENCES

- Must have competencies in analysing the business model for a company within the context of a value chain analysis
- Must have competencies in preparing an innovation strategy and a business plan for a company
- Must be able to judge and prioritize the validity of various sources of information.

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Organizations and Innovations
Type of exam	Oral exam based on a project
ECTS	10
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Organisationer og innovationer
Module code	ESNMICTM1P5
Module type	Project
ECTS	10
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

TECHNOLOGY MANAGEMENT AND BUSINESS PROCESSES

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained knowledge about theories, methods and tools for operation management
- Have gained knowledge about theories, methods and tools for supply chain management
- Have gained knowledge about process optimization, including specific methods and tools like: Technology radar, eTOM, ITIL, LEAN, Six sigma and ARIS
- Have gained knowledge and understanding of the role of technology, innovation, and change in businesses
- Have gained knowledge about organizational change strategies and process models
- Have gained insight into organizing for change (including aspects for culture, power and politics)
- Have gained knowledge about enablers and disablers of change

SKILLS

- Be able to identify specific problems/issues and future challenges in their own firms and apply these theories and methods on them
- Be able to develop and implement an appropriate project design that identifies the processes of product development, operations and supply chain and their interactions.
- Be able to understand the range, scope and complexity of challenges related to the management of technology, innovation and change
- Be able to describe, analyze and redesign innovation- and change management processes
- Be able to identify and analyze the field of innovation and change management including the value position of stakeholders; customers, suppliers and other network partners
- Be able to design, evaluate and audit the innovative capabilities and change management of a business organization
- Be able to apply principles of business model innovation and risk management to suggest redesign and improvement of business models

COMPETENCES

- Be able to present, validate, argue and evaluate the analytical results found
- Be able to design and evaluate innovation- and change management
- Be able to realize and implement innovation- and change management initiatives, including the implementation and design innovation- and change management processes in projects, companies and networks of companies, as well as relating practical innovation- and change management experiences to concept

TYPE OF INSTRUCTION

Types of instruction are listed in § 17

EXAM

EXAMS

Name of exam	Technology Management and Business Processes
Type of exam	Written or oral exam
ECTS	5

Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Teknologiledelse og forretningsprocesser
Module code	ESNMICTM1K2
Module type	Course
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

DESIGN AND INNOVATION

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about (and be able to use) different techniques and methods for elicitation of user requirements hereunder creativity techniques
- Must have knowledge in cognitive psychology
- Must have knowledge about different types of services and the psychological perspectives of user acceptance of these
- Must have knowledge about different user segmentation models

SKILLS

- Must be able to include users' requirements and needs in the design of new services, which can also be based on the re-thinking of an existing product/service design
- Must be able to identify and apply relevant theories and methods for synthesis and evaluation of the user interaction
- Must be capable to identify and apply relevant theories for synthesis and evaluation of user interaction for service development
- Must be able to link aspects of cognitive psychology to development of new services

COMPETENCES

- Must have the competency to analyse a technical service and develop a conceptual design of one or more of the applications necessary to provide the service based on a specific user need.
- Must be able to within one of the company's core areas to give an analysis of the need for the development of draft proposals for a new innovative solution concept.
- Must be able to construct a conceptual prototype followed by the test of the concept.
- Must be able to analyse and respond to cognitive elements of design of services
- Must be able to use different segmentation models for targeting a (conceptual) design process
- Must be able to assess and develop a conceptually based (for example on paper) user interface for a specific service prototype
- Must be able to communicate the above knowledge and skills both orally and in a written repo

TYPE OF INSTRUCTION

Project work, self-study and reflection

EXAM

EXAMS

Name of exam	Design and Innovation
Type of exam	Oral exam based on a project
ECTS	10
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Design og innovation
Module code	ESNMICTM2P5
Module type	Project
ECTS	10
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

COGNITIVE PSYCHOLOGY

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Have gained knowledge about theoretical and historical perspectives within cognitive psychology
- Have gained knowledge about theories and methods in cognitive psychology and neuroscience (e.g. experimental psychology, and specific advanced methods like EEG, MRI, fMRI, and PET)
- Have gained knowledge about the central topics within cognitive psychology (e.g. memory, attention, learning, and problem-solving)
- Have gained knowledge about current research topics in both cognitive psychology and cognitive neuroscience

SKILLS

- Be able to evaluate and choose between relevant theories in central topics of cognitive psychology
- Be able to explain the strengths and weaknesses of central topics in cognitive psychology
- Be able to evaluate empirical evidence in relation to cognitive psychology
- Be able to disseminate research-based knowledge in cognitive psychology
- Be able to relate the acquired knowledge to skills related to practical solutions within the field of cognitive psychology

COMPETENCES

- Be able to relate theories on cognitive psychology in an applied setting
- Be able to apply both theory and empiric results in critical discussion within cognitive psychology (e.g. memory and attention)

TYPE OF INSTRUCTION

Types of instruction are listed in §17; Structure and Contents of the Programme.

EXAM

EXAMS

Name of exam	Cognitive Psychology
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Kognitiv psykologi
Module code	ESNMICTM2K1

Module type	Course
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

ENTERPRISES CYBER SECURITY

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The sub-module: 'POPBL and scientific methods' is a part of this project and the students must pass this sub-module before they go to the project exam.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have an overall knowledge about legal problems and legal measures to prevent or diminish problems within the following areas:
    - Personal data and other related information on privacy.
    - Intellectual Property Rights (IPR).
    - Protecting business secrets
    - Net and information security,
    - Criminal cyberattacks
- Must have an overall understanding of what protection and rights the law from the areas listed above offers companies and individuals in specific situations.
- Must have an overall knowledge about what obligations individuals and companies are subject to within the law in relation to different cyber security, privacy and cybercrime problems within an enterprise.

SKILLS

- Must be able to analyze a future comprehensive security service or cyber security solution *within the relevant legal framework* that is solidly technical founded preventing cyberattacks to ensure privacy as well as protection of personal data and other business secrets
- Must be able to undertake an analysis of specific law for applications of technology choices, strategic decisions and innovation
- Must be able to make an overall legal analysis of given cybercrime, cyber security or privacy problem within an enterprise to contribute to select the needed and useful measures to protect the company from further problems in this areas.

COMPETENCES

- Must have competence to deal with cyberattacks from a legal perspective in an appropriate and timely manner.
- Must have competence to assist legal professionals to establish the necessary compliance procedures within the relevant regulatory frameworks to protect enterprises from breaching the regulation on personal data and privacy, but at the same time have a plan for protecting business secrets and IPRs from cyberattacks.
- Must be able to judge and prioritize the validity of various sources of information.

TYPE OF INSTRUCTION

The project is performed individually or in small groups of a maximum of three members. At least one internal supervisor is assigned, who works with the primary subject within his/her research. Moreover, additional supervisors e.g. from industry can be involved in the project.

EXAM

EXAMS

Name of exam	Enterprises Cyber Security
Type of exam	Oral exam based on a project
ECTS	10
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Cyber-security i virksomheder
Module code	ESNMICTM1P6
Module type	Project
ECTS	10
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

CYBERCRIME AND INFORMATION SECURITY LAW

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge about the regulation on personal data and other related privacy rules.
- Must have knowledge about basic regulation on Intellectual Property Rights (IPR).
- Must have knowledge about EU law protecting business secrets that are protected and worth protecting from hacker-attacks from a civil and criminal perspective.
- Must have knowledge about regulation covering net security (ensuring the protection of personal data, business and governments secrets).
- Must have knowledge about regulation on information security, including the safeguarding of information through risk management.
- Must have knowledge about reporting obligations and security plans.
- Must have knowledge about security regulations within the Personal Data Act and special regulations covering information security.
- Must have knowledge about EU regulation on risk management and information security as well as the EU policy in this area.
- Must have knowledge about securing evidence after a cyber-attack for use in further investigations or court proceedings

SKILLS

- Must be able to identify which criminal acts that may be violated in different cyberattacks or hacker-attacks and the criminal procedures that cover this.
- Must be able to identify requirements and create policies to establish a consistent IT architecture that assure information protection.
- Must be able to identify security incidents or cybercrimes and act in timely manner to ensure relevant evidences

COMPETENCES

- Must have the competency to select and prioritize measures for protection of networks, services, personal data and other protectable information, and thus prepare an information security policy and security plans.
- Must be able regularly as part of a company's planning and operation to take appropriate technical and organizational measures to manage the risks to ensure personal security of networks and services that meet a certain level of security.
- Must have the competency to act in timely manner on criminal acts and seek to establish th

TYPE OF INSTRUCTION

Types of instruction are listed in § 17

EXAM

EXAMS

Name of exam	Cybercrime and Information Security Law
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale

Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Cyberkriminalitet og informationssikkerhed
Module code	ESNMICTM1K1
Module type	Course
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

PRIVACY & SECURITY FRAMEWORKS IN ORGANIZATIONS

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of top cyber security threats like, destructive malware, fake antiviruses & Denial-of-Service attacks in organizations
- Must have knowledge of appropriate security methods for analysis, design and test of applications and services in enterprises.
- Must have knowledge about how to design and define security policies for trusted and untrusted devices Ex., Bring your own device (BYOD)

SKILLS

- Must be able to apply the knowledge of interaction design in cyber security and trust to design Cyber Trust Indicators i.e., Usable Security
- Must be able to incorporate principles of usability into the design of secure systems
- Must be able to efficiently design and implement commonly used cryptosystems i.e., Cryptography
- Must be able to design and develop techniques for avoiding, finding, and fixing software vulnerabilities.
- Must be able to design and develop security services and solutions targeting a specific application domain i.e., Software Security
- Must be able to identify, select and apply state-of-the-art technologies for fine-grained control of information in enterprises

COMPETENCES

- Must have the competency to build secure system incorporating techniques from
    - Human Interaction and Usable Security
    - Commonly Used Cryptosystems
    - Secure software Implementation
    - Hardware Security
- Must have the competency to discuss, analyse and develop conceptual privacy and security policies and architectures
- Must have the competency to argue for solutions and suggestions based on theories, state-of-the-art studies within privacy and security and interaction design
- Must be able to communicate the above knowledge and skills both orally and in a written repo

TYPE OF INSTRUCTION

Project work

EXAM

EXAMS

Name of exam	Privacy & Security Frameworks in Organizations
Type of exam	Oral exam based on a project
ECTS	10

Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Privacy og sikkerhedsrammer i organisationer
Module code	ESNMICTM2P4
Module type	Project
ECTS	10
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Tatiana Kozlova Madsen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

CYBER SECURITY AND TRUST

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge of standards addressing top cyber security challenges
- Must have knowledge of effective measures that cyber security programs should take
- Must have knowledge of trusted and open architectures
- Must have an understanding of device security trends and threats associated with “Bring your own device” (BYOD)
- Must have knowledge of (mobile) device management and integrity factors for trusted and untrusted devices
- Must have knowledge of strong user and machine authentication based on valuable assets
- Must have knowledge of hardware-based encryption (“Security on chip”) for higher performance
- Must have knowledge of technologies already embedded in enterprise endpoints
- Must have knowledge of cyber attacks
- Must have knowledge of behavioural profiling and intrusion prevention tools for layer defences
- Must have knowledge of security services and policies within public and private cloud networks

SKILLS

- Must be able to identify requirements and create policies to establish a consistent architecture
- Must be able to monitor, detect and respond to anomalies in the cyber-space
- Must be able to analyse the integrity of the platform to ensure that no unauthorised use has occurred.
- Must be able to design and implement different levels of trust in open architectures.

COMPETENCES

- Must have the competency to design cyber security measures for enterprises
- Must have the competency to discuss end-to-end standards to enable seamless security in an open ecosystem.
- Must have the competency to discuss the business potential and implications of trusted ecosystems

TYPE OF INSTRUCTION

Types of instruction are listed in §17, Structure and contents of the programme.

EXAM

EXAMS

Name of exam	Cyber Security and Trust
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Cyber-sikkerhed og tillid
Module code	ESNICTEK3K4
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

MARKETS, REGULATION AND STANDARDIZATION

2020/2021

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must have knowledge on trends in ICT infrastructure and service markets
- Must have knowledge on tools and methods to analyse market developments
- Must have knowledge on the drivers and implications of ICT convergence
- Must have knowledge on the basic economics of Internet
- Must have knowledge on governance issues regarding Internet
- Must have knowledge on central regulatory issues concerning ICT infrastructures and services
- Must be able to understand the importance and role of standards, standardization organizations and standardization processes
- Must have knowledge on the relationships between innovation and standardization

SKILLS

- Must be able to critically assess a market analysis of ICT infrastructure and service markets
- Must have the ability to analyse the interplay between technology and market convergences in the ICT area
- Must be able to evaluate analyses of the economics of Internet
- Must be able to understand analyses of Internet governance issues
- Must be able to perform an analysis of the implications of regulatory initiatives regarding ICT infrastructures and services
- Must be able to apply theories on network economics, information economics, and transaction costs on standardization issues

COMPETENCES

- Must have competencies in using tools and methods for market analysis
- Must have competencies in taking advantage in service and business developments of knowledge on converging ICT markets
- Must have competencies in guiding and managing analyses of the implications of Internet economics and governance on service business development
- Must have Competencies in understanding how regulations of ICT markets will affect market developments
- Must have competencies to outline the role of standards in business developments in the ICT area

TYPE OF INSTRUCTION

Types of instruction are listed in §17; Structure and Contents of the Programme.

EXAM

EXAMS

Name of exam	Markets, Regulation and Standardization
Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Markeder, regulering og standardisering
Module code	ESNMICTM3K2
Module type	Course
ECTS	5
Language of instruction	English
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design

IDENTITY AND ACCESS MANAGEMENT

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The module builds on knowledge obtained in the module “Internet technologies and service archi-tectures” or similar.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

- Must be able to explain the concepts of security, privacy and trust
- Must be able to explain the concepts of attributes, claims, assertion and claims-based identities
- Must have knowledge about the principles and methods for access control, authentication, authorisation and identification
- Must be able to explain the key concepts and principles of identity management
- Must have knowledge of key management, certificates, tokens and credentials
- Must have knowledge about state-of-the-art principles and guidelines for protecting users’ privacy
- Must have knowledge of state-of-the-art technologies and frameworks for fine-grained management of personal attributes
- Must be able to understand the concepts of linkability and unlinkability and state-of-the-art principles for establishing trust
- Must have knowledge about security architectures, including policies and policy management
- Must have knowledge of national identity management frameworks such as NemID / MitID

SKILLS

- Must be able to discuss the differences between physical identities and online digital, virtual and partial identities
- Must be able to identify the personal attributes that are needed to perform a given task
- Must be able to apply methods for privacy protection, encryption, access control, authentication and authorisation as a part of service development, including privacy by design principles
- Must be apply to apply state-of-the-art technologies for realising advanced services with privacy protection, e.g. OAuth and OpenID Connect
- Must be able to analyse and design information flow and architectures for secure ICT services and solutions
- Must be able to design applications and services incorporating security elements (e.g. payment, authentication), different assurance levels, and management of user identities (authentication, authorisation, privacy protection)

COMPETENCES

- Must have the competency to design secure services and security architectures with controlled exchange of attributes between stakeholders and minimal disclosure of personal information
- Must be able to discuss and reflect on management of personal information for access to resources and for personalisation of services

TYPE OF INSTRUCTION

Types of instruction are listed in §17; Structure and Contents of the Programme.

EXAM

EXAMS

Name of exam	Identify and Access Management

Type of exam	Written or oral exam
ECTS	5
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

FACTS ABOUT THE MODULE

Danish title	Identitets- og adgangshåndtering
Module code	ESNICTEK2K2
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Copenhagen
Responsible for the module	Ove Kjeld Andersen

ORGANISATION

Study Board	Study Board of Electronics and IT
Department	Department of Electronic Systems
Faculty	Technical Faculty of IT and Design