

# DIGITAL TRANSFORMATION AND INNOVATION - ONLINE (DTO)

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## Courses in digital transformation and innovation - online (DTO) are offered by the Faculty of Engineering

### DTO 5100 Foundations and Applications of Machine Learning (3 units)

The capabilities and limitations of machine learning; problem formulation; supervised and unsupervised learning techniques; deploying, monitoring, and evaluating machine learning models; storytelling and assessing the results of learning; current advances in application areas such as business, law, arts, social sciences and education.

**Course Component:** Lecture

The courses CSI 5155, ELG 5255, IAI 5100, IAI 5101, MIA 5100, DTO 5100 cannot be combined for units.

### DTO 5101 Foundations of Machine Learning for Scientists and Engineers (3 units)

The capabilities and limitations of machine learning; problem formulation and requirement engineering; supervised and unsupervised learning techniques; designing, deploying, monitoring and evaluating machine learning models; assessing the results of learning; current advances in application areas such as engineering, science and health.

**Course Component:** Lecture

Courses CSI 5155, ELG 5255, IAI 5101, IAI 5100, MIA 5100, DTO 5101 cannot be combined for units.

### DTO 5120 Essential Concepts in Data Science (3 units)

An introduction to the foundations of data science using a case study approach; overview of the data science process: types of tasks and models, data manipulation, exploratory data analysis, data summarization and data visualization; predictive modeling, descriptive modeling; reporting and deployment.

**Course Component:** Lecture

Courses CSI 4142, DTI 5125, DTI 5126, MAT 4373, DTO 5120 cannot be combined for units.

### DTO 5140 Engineering Design (3 units)

Open ended, hands-on engineering design course that provides students with fundamentals and advanced concepts of the engineering design process from client empathy to prototyping and testing. Students work directly with clients to solve a real societal need. There is a strong component of teamwork and lifelong learning.

**Course Component:** Lecture

### DTO 5150 Topics in Digital Transformation and Innovation (3 units)

Recent and advanced topics in the field of Digital Transformation and Innovation and its related areas. Topics vary from year to year.

**Course Component:** Lecture

### DTO 5310 Ethics for Design, AI and Robotics (3 units)

Artificial Intelligence technologies are becoming ever more present in applications like: automated vehicles and mobility-as-a-service (e.g. driving and system-level control algorithms); business intelligence (e.g. predictive resource allocation); consumer electronics (e.g. social robots and smart speakers); healthcare (e.g. image classification in medical imaging); the justice system (e.g. recidivism prediction and sentencing); and weapons systems (e.g. targeting and kill decision-making). Many of these applications are raising significant ethical concerns. A range of topics in applied technology ethics are examined through the lens of contemporary philosophy and applied ethics texts and popular media articles. Practical frameworks, methodologies and tools for anticipating, and addressing, ethical issues are introduced through hands-on, group-based design thinking workshops and projects.

**Course Component:** Lecture

The courses DTO 5310, DTI 5310, CSI 5195 cannot be combined for units

### DTO 5389 Digital Transformation Technologies (3 units)

Introduction to business models and technologies. Search engines. Cryptography. Web services and agents. Secure electronic transactions. Value added e-commerce technologies. Advanced research questions.

**Course Component:** Lecture

Courses DTO 5389, DTI 5389 cannot be combined for units.

### DTO 6106 User Research and User Experience Principles and Practice (3 units)

User experience (UX) facets including functionality, usability, and desirability; Human-computer interaction (HCI) theories; UX frameworks and patterns for interaction/information/visual design; UX management, design methods, and tools; UX evaluation and usability engineering; Understanding of users' behaviours, needs, motivations, and challenges in user experience (UX); User research methods including interviews, surveys, focus groups, contextual inquiries; Principles and guidelines for generative & evaluative research; Methods in qualitative and quantitative user research; Tools and techniques for in-person and remote research; Heuristic evaluations and usability testing.

**Course Component:** Lecture

Courses DTO 6106, DTI 6102, DTI 6103 cannot be combined for units.

### DTO 6107 Interaction Design and Design Thinking (3 units)

Principles of interaction design (IxD); Usability heuristics for user interface (UI) design; IxD tools and techniques including sketching, wireframing, and prototyping; UI design patterns for navigation, landing pages, search, and e-commerce; IxD best practices for mobile application design. Design thinking as a collaborative creative process for problem-solving and designing human-centered solutions. Design thinking for driving business innovation, new product development, and customer experience. Best practices for design inspiration, ideation and implementation; essential design research skills for empathy, listening, collaboration, observation, critical analysis, and experimentation. Design Thinking tools and techniques including visualization, mapping, storytelling, rapid prototyping, and testing.

**Course Component:** Lecture

Courses DTO 6107, DTI 6104, DTI 6105 cannot be combined for units.

### **DTO 6160 Innovation Management (3 units)**

Examination of the context in which firms and other organizations operate and of the nature and evolution of industries. Survey of research on the nature and evolution of national and regional systems of innovation, and on politically and geographically defined systems that influence the competitiveness of firms and the prosperity of citizens.

**Course Component:** Lecture

Courses DTO 6160, MGT 6160 cannot be combined for units.

### **DTO 6231 Process Modelling, Mining, and Automation (3 units)**

Business Process Management (BPM) languages and technologies. Modelling and analysis of processes. Algorithms, log pre-processing, and tools for Process Mining. Process discovery, conformance, and improvement. Performance and predictive process analytics. Robotic Process Automation (RPA). Process automation tools, challenges, and opportunities. Examples from diverse application domains will be studied.

**Course Component:** Lecture

### **DTO 7103 Visual Literacy and User Experience Design Principles (3 units)**

Fundamentals of visual, interaction and motion design theories and principles as they relate to User Experience Design (UXD). A series of hands-on workshops and assignments focus on building visual literacy through guided observations, visual design critiques, and visual redesigns of existing screen-based digital products (i.e. website, interactive kiosk interface, mobile app etc.). Students will complete a design project. Students will conduct research and scholarship in visual literacy, and UXD and justify their design decisions in writing.

**Course Component:** Lecture

Courses DTO 7103, DTI 7103 cannot be combined for units.