

# DOCTORATE IN PHILOSOPHY DIGITAL TRANSFORMATION AND INNOVATION

## Overview

\* Please note that the former title of this program was: *Doctorate in Philosophy Electronic Business*.

## Summary

- Degree offered: Doctorate in Philosophy (PhD)
- Registration status options: Full-time
- Language of instruction: English
- Program option (expected duration of the program):
  - within four years of full-time study
- Academic units: Telfer School of Management (<https://telfer.uottawa.ca/en/>), Faculty of Arts (<https://arts.uottawa.ca/en/>), Faculty of Engineering (<http://engineering.uottawa.ca/>), School of Electrical and Computer Science (<http://engineering.uottawa.ca/eecs/>)

## Program Description

The Digital Transformation and Innovation program is a multi-faculty collaboration between the Telfer School of Management, the Faculty of Arts, and the Faculty of Engineering to train highly qualified professionals to create, manage and research the profound change to our world that is happening as a result of electronic digital technology. At its heart, the technology enables the collection and communication of huge amounts of data that transforms how business and society works. It also creates a new online environment where the experience of business and social interactions by individuals is being reinvented. Innovation is an important aspect of the program to emphasize the re-invention and creative design of user experiences in business and social interactions.

For more information please see the DTI Student Association (<https://dtiottawa.ca/>) webpage.

## Main Areas of Research

Research in the Digital Transformation and Innovation program is multi-disciplinary and involves collaboration between professors and students in Telfer School of Management, Faculty of Arts, and Faculty of Engineering. Design is a significant aspect of research in Digital Transformation and Innovation. This includes: design and implementation of applications, information design, visual literacy, user experience, and audience research.

### Telfer School of Management

- Digital Marketing, Consumer Behavior, Customer Experience Design and Relationship Management
- Business Analytics and Business Intelligence
- Health Systems Innovation and Management
- Entrepreneurship, Innovation and Strategic Management
- Business Technology Management (including IT Diffusion, Adoption and Consumerization)
- Globalization, Governance, and Sustainability

### Faculty of Arts

- Algorithmic culture, platformization, and datafication
- Information and communication regulation and policy
- Privacy and surveillance
- Cultural, economic, political, and social impacts of innovation in digital networks and applications
- Information governance and ethics

### Faculty of Engineering

- Applied Data Science
- User Experience
- Digital Health
- Cloud Computing
- Internet of Things

## Other Programs Offered Within the Same Discipline or in a Related Area

- Master of Science Digital Transformation and Innovation
- Master of Digital Transformation and Innovation
- Master of Digital Transformation and Innovation with Concentration in UX Design
- Master of Digital Transformation and Innovation with Concentration in Applied Data Science

## Fees and Funding

- Program fees

The estimated amount for university fees (<https://www.uottawa.ca/university-fees/>) associated with this program are available under the section Finance your studies (<http://www.uottawa.ca/graduate-studies/programs-admission/finance-studies/>).

International students enrolled in a French-language program of study may be eligible for a differential tuition fee exemption (<https://www.uottawa.ca/university-fees/differential-tuition-fee-exemption/>).

- To learn about possibilities for financing your graduate studies, consult the Awards and financial support (<https://www.uottawa.ca/graduate-studies/students/awards/>) section.

## Notes

- Programs are governed by the general regulations (<http://www.uottawa.ca/graduate-studies/students/general-regulations/>) in effect for graduate studies at the University of Ottawa.
- In accordance with the University of Ottawa regulation, students have the right to complete their assignments, examinations, research papers, and theses in French or in English.

## Program Contact Information

Graduate Studies Office, Faculty of Engineering (<https://engineering.uottawa.ca/graduate-studies-office/>)  
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K1N 6N5

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Twitter | Faculty of Engineering (<https://twitter.com/uOttawaGenie/?lang=en>)

Facebook | Faculty of Engineer (<https://www.facebook.com/uottawa.engineering/>)

## Admissions Requirements

For the most accurate and up to date information on application deadlines, language tests and other admission requirements, please visit the specific requirements (<https://www.uottawa.ca/graduate-studies/programs-admission/apply/specific-requirements/>) webpage.

### To be eligible, candidates must:

- Hold a master's degree with thesis and a minimum average of A- in one of the following:
  - MSc in Digital Transformation and Innovation, in Management, in Health Systems, or in Systems Science;
  - MAsc in Electrical and Computer Engineering;
  - Master of Computer Science;
  - Master of Information Studies;
  - MA in Communication;
  - A master's in a related, relevant discipline.
- International candidates must check the admission equivalences for the diploma they received in their country of origin.
- Exceptionally, applicants holding a master's degree without thesis may be considered provided their file includes scholarly publications or equivalent evidence of their capacity for advanced research.
- Identify at least one professor in the program whose research interests correspond to yours and who is willing to supervise your research and thesis. We recommend that you contact potential thesis supervisors as soon as possible.
- Meet the following additional coursework requirements set by the Admissions Committee:
  - Students whose master's degree was in an area other than Digital Transformation and Innovation may be required to take up to 12 units of additional courses beyond the 9 units normally required for the PhD. The additional coursework would consist of the following:
    - DTI 7100, or an equivalent course.
    - At least one course (3 units) in a field other than the candidate's chosen field of research, to be chosen from the list of optional courses in the program.
    - The additional coursework is defined by the Admissions Committee, in consultation with the potential supervisor and the Graduate Studies Committee, and is specified in the student's letter of admission.

## Language Requirements

Most courses are delivered in English as the international language for advanced information technology. However, the program will provide an appropriately supportive environment for francophone students to develop professional competence in technical English at their own pace. Students have the right, as stipulated in the University's bilingualism regulations (Academic Regulations I-2), to complete all their work, including their thesis, in the official language of their choice (French

or English). There are fully bilingual professors and advisors who can support students in French.

Applicants whose first language is neither French nor English must provide proof of proficiency in the language of instruction through one of the following two requirements or one of the language tests below.

- Proof of completion within the last five years, of a previous degree program in an English language university.
- Proof of recent prolonged residence and exercise of a profession in an English speaking country (normally at least four years over the last six years).

Language tests recognized by the University of Ottawa:

- TOEFL minimum score of 600 (paper-based) with a minimum score of 50 on the written and 50 on the spoken or a minimum score of 100 (internet-based).
- IELTS minimum score of 7 for 3 of the 4 tests (Reading, Listening, Writing, Speaking) and a minimum score of 6 in the fourth test.
- A score of at least 14 on the CANTEST, with no individual test score below 4.0, along with a minimum score of 4.5 on the oral component of the test.

Note:

- Candidates are responsible for any fees associated with the language tests.
- Test scores cannot be more than two-years-old as of September 1 of the year of potential entry into the program.

## Notes

- The admission requirements listed above are minimum requirements and do not guarantee admission to the program.
- Admissions are governed by the general regulations (<http://www.uottawa.ca/graduate-studies/students/general-regulations/>) in effect for graduate studies.

## Fast-Track from Master's to PhD

Students enrolled in the MSc program in Digital Transformation and Innovation at the University of Ottawa may be eligible to fast-track directly into the doctoral program without writing a master's thesis, provided the following conditions are met:

- Completion of 12 units of MSc courses with a minimum average of 8.5;
- Written recommendation from the proposed PhD thesis supervisor;
- Written recommendation from the Graduate Program Committee.

## Program Requirements

Requirements for this program have been modified. Please consult the 2020-2021 calendars (<http://catalogue.uottawa.ca/en/archives/>) for the previous requirements.

## Doctorate

Students must meet the following requirements:<sup>1</sup>

**Compulsory Courses:**

DTI 8101	Interdisciplinary Doctoral Seminar in Digital Transformation and Innovation I	3 Units
DTI 8102	Interdisciplinary Doctoral Seminar in Digital Transformation and Innovation II	3 Units
3 optional course units from the list of optional courses <sup>2</sup>		3 Units

**Comprehensive Examination:**

DTI 9998	Comprehensive Exam <sup>3</sup>	
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**Thesis Proposal:**

DTI 9997	Doctorate Thesis Proposal <sup>4</sup>	
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**Thesis:**

THD 9999	Doctoral Thesis <sup>5</sup>	
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**Note(s)**

- <sup>1</sup> The requirements outlined above are minimum. For information about additional courses, please see the Admissions Requirement section.
- <sup>2</sup> The optional course must be selected from the list of courses in the student's chosen field and must be preapproved by the Thesis Advisory Committee
- <sup>3</sup> The comprehensive examination is a two-part examination (written and oral) this is overseen by the Advisory Committee. Once the written exam has been passed, the student proceeds to the oral. A student who fails either component of the exam is allowed to repeat it the following term. A second failure in either component leads to withdrawal from the program. The comprehensive examination must normally be completed within 4 terms of commencing the program and, at the latest, by the end of the fifth term. Failure to sit and pass the examination by the deadline counts as a failure. Further details about the comprehensive exam are posted on the program's website.
- <sup>4</sup> The thesis proposal, prepared under the direction of the thesis supervisor, must be defended to the satisfaction of the Thesis Advisory Committee (TAC). The proposal must normally be successfully completed by the end of the fifth term. In the event of failure, the proposal can be resubmitted and defended the following session at the latest. A second failure leads to withdrawal from the program. The proposal must be successfully defended before submitting it to the research Ethics Board (if required) and before undertaking and independent data collection. Further details about the thesis proposal are posted on the program's website.
- <sup>5</sup> Students are responsible for ensuring they have met all of the thesis requirements (<https://www.uottawa.ca/graduate-studies/students/theses/>).

**Lists of Optional Courses****Management Orientation**

ADM 6260	Project Management I	1.5 Units
ADM 6261	Project Management II	1.5 Units
ADM 6276	Enterprise Resource Planning Systems Management	1.5 Units
ADM 6277	E-Business Energy Management	1.5 Units
ADM 6279	Socio-Technical Change	1.5 Units
ADM 6286	International E-Business Strategies for DTI	1.5 Units
ADM 6420	Digital Marketing	1.5 Units
DTI 5124	Internet Technologies and Mobile Commerce	3 Units
DTI 5125	Data Science Applications	3 Units

DTI 5126	Fundamentals for Applied Data Science	3 Units
DTI 5990	Directed Readings I	1.5 Units
DTI 5991	Directed Readings II	1.5 Units
DTI 6105	Design Thinking	1.5 Units
DTI 6130	Web Services	1.5 Units
DTI 6160	Cyber Security Systems and Strategies	3 Units
DTI 6180	Strategic Knowledge Management	1.5 Units
DTI 6220	Data Analytics and Business Intelligence	1.5 Units
DTI 6230	Business Process Management and Performance Measurement	3 Units
DTI 6240	Mobile Commerce	1.5 Units
DTI 6260	Integrated Networks for the Enterprise	1.5 Units
DTI 6300	Topics in Digital Transformation and Innovation	3 Units
DTI 6301	Topics in Digital Transformation and Innovation	1.5 Units
DTI 6302	Topics in Applied Data Science	3 Units
DTI 6303	Topics in Applied Data Science	1.5 Units
DTI 6304	Topics in User Experience Design	3 Units
DTI 6305	Topics in User Experience Design	1.5 Units
MBA 5270	Knowledge and Information Management	1.5 Units
MBA 6220	Managing Customer Relations and the Sales Process	1.5 Units
MGT 6111	Venture Capital and Private Equity	3 Units
MGT 6160	Systems of Innovation	3 Units
MHA 6271	Application of Information Technology in Health Care	1.5 Units
POP 8950	Special Topics in Population Health	3 Units
<b>Technology Orientation</b>		
ADM 6287	Business Intelligence Technologies and Big Data Analytics for DTI	1.5 Units
CSI 5105	Network Security and Cryptography	3 Units
CSI 5111	Software Quality Engineering	3 Units
CSI 5112	Software Engineering	3 Units
CSI 5115	Database Analysis and Design	3 Units
CSI 5118	Automated Verification and Validation of Software	3 Units
CSI 5122	Software Usability	3 Units
CSI 5180	Topics in Artificial Intelligence	3 Units
CSI 5311	Distributed Databases and Transaction Processing	3 Units
CSI 5386	Natural Language Processing	3 Units
DTI 5175	Mobile Commerce Technologies	3 Units
DTI 5380	Systems and Architectures for Electronic Commerce	3 Units
DTI 5389	Electronic Commerce Technologies	3 Units
DTI 6402	Affective and Persuasive Computing	3 Units
ELG 5121	Multimedia Communications	3 Units
ELG 5142	Ubiquitous Sensing for Smart Cities	3 Units
ELG 5373	Data Encryption	3 Units
GNG 5100	Introduction to Engineering Management	3 Units
GNG 5120	Technology entrepreneurship for Engineers and Computer Scientists	3 Units
GNG 5121	Taguchi methods for efficient Engineering RD	3 Units

GNG 5122	Operational Excellence and Lean Six Sigma	3 Units
GNG 5123	Enterprise Architecture	3 Units
GNG 5130	Communication and Influence for Engineers	3 Units
GNG 5131	Sales and Influence for Engineers	3 Units
GNG 5231	Sales Engineer Internship Project	6 Units
GNG 5300	Topics in Engineering	3 Units
GNG 5301	Professional Development Workshops	3 Units
GNG 5310	Topics in Industry Practice	3 Units
GNG 5140	Engineering Design	3 Units
GNG 5141	Creativity and Innovation	3 Units

#### Creative Arts and Humanities Orientation

AHL 5300	Creativity and Innovation	3 Units
CMN 5110	Social History of Communication Technologies	3 Units
CMN 5140	Communication, Globalization and Change	3 Units
CMN 5150	Knowledge Management	3 Units
CMN 5900	Directed Studies in Communication	3 Units
DTI 6102	User Experience Principles and Practices	1.5 Units
DTI 6103	User Research	1.5 Units
DTI 6104	Interaction Design	1.5 Units
DTI 7103	Visual Literacy and User Experience Design Principles	3 Units
ISI 6300	Special Topics in Information Studies	3 Units
ISI 6312	Global Information and Communications Policy	3 Units
ISI 6322	Digital Preservation	3 Units
ISI 6332	Metadata and Taxonomies	3 Units
ISI 6342	Web Architecture and Technologies	3 Units
ISI 6343	Digital Asset Management Technologies	3 Units
ISI 6351	Social Media	3 Units
ISI 6353	Access and Services to Diverse Populations	3 Units
ISI 6381	Knowledge in Organizations	3 Units

## Research

### Research Fields & Facilities

Located in the heart of Canada's capital, a few steps away from Parliament Hill, the University of Ottawa is among Canada's top 10 research universities.

uOttawa focuses research strengths and efforts in four Strategic Areas of Development in Research (SADRs):

- Canada and the World
- Health
- e-Society
- Molecular and Environmental Sciences

With cutting-edge research, our graduate students, researchers and educators strongly influence national and international priorities.

## Courses

### DTI 5100 Introductory Seminar (1.5 unit)

**Course Component:** Seminar

### DTI 5124 Internet Technologies and Mobile Commerce (3 units)

An examination of current Internet technologies, protocols and wired and wireless infrastructures. Analysis of current Internet-based businesses and consumer applications and services. Discussion of mobile commerce business models and strategies and their relevant technologies. Hands-on experience with discussed technologies and applications. Students will complete a project demonstrating and analyzing how an Internet-based application or service could be applied in their field of graduate study.

**Course Component:** Lecture

The courses DTI 5124, GNG 5124 cannot be combined for units.

### DTI 5125 Data Science Applications (3 units)

Analysis and design of various data cleaning, wrangling, blending, and visualization, statistical inference, classification, clustering, regression, and content analysis methods. Use of machine learning algorithms to extract meaningful information from data to make decisions. Formulating analytics problems for business and developing, evaluating, and maintaining machine learning models. Analyzing, generating, and communicating insights on the models. Hands-on experience with an integrated set of current data analytics, data mining, and machine learning tools.

**Course Component:** Lecture

The courses DTI 5125, CSI 5155, CSI 5387, GNG 5125 cannot be combined for units.

### DTI 5126 Fundamentals for Applied Data Science (3 units)

Essential data science concepts relevant to practical applications are covered including: problem formulation; data acquisition; data pre-processing, modeling and statistical analysis. Hands on experience with data science tools and techniques including: supervised and unsupervised machine learning; presentation of results; applications in areas such as accounting, finance, marketing and supply chain management.

**Course Component:** Lecture

### DTI 5175 Mobile Commerce Technologies (3 units)

Wireless and mobile electronic commerce architecture and applications. Electronic banking, digital cash. Wireless exchanges, business models. Fixed and mobile wireless networks. Routing techniques. Content presentation. Security issues and solutions. Satellite networks for electronic commerce. Overview of relevant standards, protocols and technologies. Case studies.

**Course Component:** Lecture

### DTI 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 DTI 5310, CSI 5195 cannot be combined for units.

**DTI 5380 Systems and Architectures for Electronic Commerce (3 units)**

Content and transactions in e-commerce systems. System architecture with a focus on frameworks, tools and development process. Application frameworks. Information management. Security, standards, and regulatory compliance. Current research issues. Hands-on experience with an integrated set of current e-commerce tools. E-commerce development project.

**Course Component:** Lecture

**DTI 5389 Electronic Commerce 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

**DTI 5501 Fondements de gestion pour les affaires électroniques (3 crédits)**

Théorie des organisations et modèles d'affaires. Cadres d'analyse de gestion. Modèles de l'avantage compétitif. Introduction aux modèles de marketing. Chaînes de valeur. La gestion par les processus. Gestion de la chaîne d'approvisionnement. Gestion de la qualité. Gestion des ressources humaines.

**Volet :** Cours magistral

**DTI 5502 Fondements des technologies de l'information pour les affaires électroniques (3 crédits)**

Technologies d'Internet. Développement d'applications Web. Fondements des réseaux. Gestion des données et résolution de problèmes. Gestion de bases de données et d'entrepôts de données. Outils logiciels.

**Volet :** Cours magistral

**DTI 5503 Fondements des statistiques pour les affaires électroniques (3 crédits)**

Théorie élémentaire des probabilités. Statistiques descriptives. Corrélations. Tables de fréquences. Tableaux croisés. Tests statistiques. Analyse multivariée.

**Volet :** Cours magistral

**DTI 5902 Projet de stage en entreprise / Industry Internship Project (6 crédits / 6 units)**

Projet encadré par un expert de l'industrie et un professeur qui supervise le projet. Les projets internationaux (emplacement ou expert du secteur) sont autorisés. / Project mentored by an industry expert and a professor who co-supervise the project. International projects (location or industry expert) are permitted.

**Volet / Course Component:** Recherche / Research

Préalable : GNG 5301. Les cours DTI 5902, GNG 5902 ne peuvent être combinés pour l'obtention de crédits. / Prerequisite: GNG 5301. Courses DTI 5902, GNG 5902 cannot be combined for units.

**DTI 5990 Études dirigées / Directed Readings I (1.5 crédit / 1.5 unit)**

**Volet / Course Component:** Recherche / Research

**DTI 5991 Études dirigées / Directed Readings II (1.5 crédit / 1.5 unit)**

**Volet / Course Component:** Recherche / Research

**DTI 6102 User Experience Principles and Practices (1.5 unit)**

User experience (UX) facets including functionality, usability and desirability as key success factors for technology adoption and acceptance; Human-computer interaction (HCI) theories; UX frameworks and patterns for interaction design, information design, and visual design; UX management best practices; UX design methods and tools; UX evaluation and usability engineering.

**Course Component:** Lecture

**DTI 6103 User Research (1.5 unit)**

Understanding users' behaviours, needs, motivations and challenges in user experience (UX); Common 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, and moderated vs automated approaches; heuristic evaluations and usability testing.

**Course Component:** Lecture

**DTI 6104 Interaction Design (1.5 unit)**

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.

**Course Component:** Lecture

**DTI 6105 Design Thinking (1.5 unit)**

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

**DTI 6130 Web Services (1.5 unit)**

Web services business models and strategies. Enterprise Application Integration and Service Oriented Architectures. Web services technology standards. Consumer and enterprise adoption of web service technologies and platforms such as Mashups and Cloud Computing.

**Course Component:** Lecture

**DTI 6160 Cyber Security Systems and Strategies (3 units)**

User, data and network security principles. Information systems security standards. Security risk analysis frameworks. Overview of cyber security mechanisms including authentication, access control, data encryption and integrity, and Public Key Infrastructure. Cyber security including security in the wireless, cloud and IoT environments. Payment card industry security standards and compliance.

**Course Component:** Lecture

**DTI 6180 Strategic Knowledge Management (1.5 unit)**

Leveraging a firm's intellectual capital to enhance organizational performance. Business analysis frameworks, strategy roadmaps and enterprise architectures relevant to the planning and execution of knowledge management initiatives in organizations. Using the web to maximize knowledge acquisition and sharing among employees.

**Course Component:** Lecture

**DTI 6210 Electronic Commerce Architecture (1.5 unit)**

Three-tier Architecture. Building an e-Commerce Site. Client and Server side Scripting. Interactivity. E-Commerce Data bases. E-CRM. Wireless Internet and m-Business. Intermediaries and Software Agents. XML applications.

**Course Component:** Lecture

**DTI 6220 Data Analytics and Business Intelligence (1.5 unit)**

Introduction to business data collection, data pre-processing, data warehouses, data marts, and online analytical processing. Data mining tasks including classification, clustering and association rules. Data mining model building, tools and techniques including decision trees, neural networks, and regression analysis. Application of these techniques in business including CRM, target marketing, credit scoring, churn, survival analysis, and fraud detection.

**Course Component:** Lecture

**DTI 6230 Business Process Management and Performance Measurement (3 units)**

Hands on introduction to Business Process Management Technologies. Review of the latest concepts for using technology to improve performance of business processes. Analysis of advances in Internet-enabled B2B and enterprise business models with emphasis on service-oriented and event-driven architecture. Introduction to current performance measurement tools and the role of data science in business process management. Example applications such as supply chain management, order processing, and health care process management will be studied.

**Course Component:** Laboratory, Lecture

**DTI 6240 Mobile Commerce (1.5 unit)**

M-Commerce business models and strategies, Wireless technology standards and evolution. Industry analysis and value creation frameworks. Diffusion and adoption of M-Commerce technologies. Demand-side and supply-side enterprise applications of M-Commerce.

**Course Component:** Lecture

**DTI 6250 Document Engineering for Digital Transf. and Innovation (1.5 unit)**

Digital Transf. and Innovation from a Document Engineering Perspective. E-documents as the basis for DTI relationships. Modelling DTI documents and Processes. XML as a vehicle to defining a formal structural and semantic definition for electronic documents. XML syntax, styles and transformations, Document Type Definitions, and schema languages. XML Vocabularies for DTI. XML standards, specifications, and software architectures for DTI. E-documents within the enterprise. E-document exchanges for multi-company business activities.

**Course Component:** Lecture

**DTI 6260 Integrated Networks for the Enterprise (1.5 unit)**

OSI reference model. LAN characteristics. Interconnecting LAN. Interconnecting with TCP/IP. Routing protocols. IPv6. WAN options. Security protocols. VPN. Enterprise-Wide Solutions.

**Course Component:** Lecture

**DTI 6300 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

**DTI 6301 Topics in Digital Transformation and Innovation (1.5 unit)**

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

**DTI 6302 Topics in Applied Data Science (3 units)**

Recent and advanced topics in the field of Applied Data Science and its related areas. Topics vary from year to year.

**Course Component:** Lecture

**DTI 6303 Topics in Applied Data Science (1.5 unit)**

Recent and advanced topics in the field of Applied Data Science and its related areas. Topics vary from year to year.

**Course Component:** Lecture

**DTI 6304 Topics in User Experience Design (3 units)**

Recent and advanced topics in the field of User Experience Design and its related areas. Topics vary from year to year.

**Course Component:** Lecture

**DTI 6305 Topics in User Experience Design (1.5 unit)**

Recent and advanced topics in the field of User Experience Design and its related areas. Topics vary from year to year.

**Course Component:** Lecture

**DTI 6402 Affective and Persuasive Computing (3 units)**

Overview of human affective models and affect modalities. Design and development of affect estimation algorithms using artificial intelligence. Modality fusion and multimodal affect estimation. Persuasive technology and its applications. Persuasion design and persuasive strategies. Application of persuasive strategies in serious gaming. Current challenges in the fields of affective computing and persuasive technology.

**Course Component:** Lecture

**DTI 6700 Thèmes choisis en affaires électroniques (3 crédits)**

Sujets actuels et avancés en affaires électroniques et disciplines connexes. Les sujets varient d'une année à l'autre.

**Volet :** Cours magistral

**DTI 6701 Thèmes choisis en affaires électroniques (3 crédits)**

Sujets actuels et avancés en affaires électroniques et disciplines connexes. Les sujets varient d'une année à l'autre.

**Volet :** Cours magistral

**DTI 6900 Stage international / International Work Term (3 crédits / 3 units)**

Expérience pratique dans un milieu de travail international. Noté S (satisfaisant) / NS (non satisfaisant) selon les résultats de rapport écrit et l'évaluation de l'employeur. / Practical international experience.

**Volet / Course Component:** Cours magistral / Lecture

**DTI 6950 Lectures dirigées / Directed Readings (1.5 crédit / 1.5 unit)**

**Volet / Course Component:** Cours magistral / Lecture

**DTI 6997 Projet de recherche / Research project (6 crédits / 6 units)**

Le sujet de recherche, ainsi que le professeur qui va le diriger, doivent être approuvés par la direction du programme avant l'inscription à la troisième session. Le sujet peut être de nature théorique (par exemple, une évaluation de la documentation ou une étude de la littérature scientifique) ou appliquée (par exemple, des études de cas). Un mémoire, d'une cinquantaine de pages, doit être rédigé et approuvé par le professeur qui le dirige ainsi qu'un autre professeur. / The research topic and the professor who will direct it must be approved by the program director prior to registration in the third session. The topic can be theoretical (for instance, based on a documentation assessment or a review of the scientific literature) or applied (based on case studies). A research paper, about 50 pages long, must be written and approved by the project director and another professor.

**Volet / Course Component:** Recherche / Research

**DTI 7100 Research Methods in Digital Transf. and Innovation (3 units)**

Philosophy of Science. Research problem definition. Research Designs. Experimental Research. Modeling principles: analytical modeling and simulation. Measurement and scaling. Sampling. Hypotheses testing and statistical significance. Multivariate Analysis. Mathematical properties of computational problems: decidability and computability. Qualitative methods. Writing a Research Manuscript. Presentation of research results.

**Course Component:** Lecture

**DTI 7101 Research Workshop in Digital Transf. and Innovation (1.5 unit)**

Writing a Research Project proposal including problem formulation and work plan. Essentials of graduate report writing, information management, literature search techniques and reference management. Research ethics including academic integrity and avoiding academic fraud.

**Course Component:** Lecture

**DTI 7102 Interdisciplinary Research Methods in Digital Transf. and Innovation (1.5 unit)**

Writing a Thesis Proposal. Research design. Introduction to positivist and interpretive approaches, behavioral and design science research, qualitative and quantitative research methods, and sampling strategies and techniques.

**Course Component:** Lecture

**DTI 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

**DTI 7990 Proposition de thèse / Thesis Proposal**

**Volet / Course Component:** Recherche / Research

**DTI 8101 Interdisciplinary Doctoral Seminar in Digital Transformation and Innovation I (3 units)**

Recent developments in Digital Transformation and Innovation research. Critical analysis of theories, models, and methods. Critical synthesis of the field literature from different perspectives. Students will write a systematic survey paper of the literature relevant to their research in one of the three fields of the program. The paper must be in a different field from that selected for the paper in DTI 8102. Course reserved for students in the Digital Transformation and Innovation PhD program.

**Course Component:** Seminar

**DTI 8102 Interdisciplinary Doctoral Seminar in Digital Transformation and Innovation II (3 units)**

Recent developments in Digital Transformation and Innovation research. Critical analysis of theories, models, and methods. Critical synthesis of the field literature from different perspectives. Students will write a systematic survey paper of the literature relevant to their research in one of the three fields of the program. The paper must be in a different field from that selected for the paper in DTI 8101. Course reserved for students in the Digital Transformation and Innovation PhD program.

**Course Component:** Seminar

**DTI 9997 Projet de thèse doctoral / Doctorate Thesis Proposal**

**Volet / Course Component:** Recherche / Research

**DTI 9998 Examen général de doctorat / Comprehensive Exam**

**Volet / Course Component:** Recherche / Research