MASTER OF DIGITAL TRANSFORMATION AND INNOVATION WITH CONCENTRATION IN APPLIED DATA SCIENCE

Overview

Summary

• Degree offered: Master of Digital Transformation and Innovation (MDTI)
• Registration status options: Full-time
• Language of instruction: English
• Program option (expected duration of the program):
  • within two 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.

The concentration in Applied Data Science is a multidisciplinary graduate program with a strong commitment to industry relevance and ethics. In the program, students will:

1. Develop and demonstrate the ability to communicate with and integrate multi-disciplinary expertise related to data.
2. Develop and demonstrate the ability to lead, design, and create data-driven transformation and innovation using current and emerging tools, techniques and technology.
3. Obtain the required skills in data cleaning, data quality, data analytics and machine learning to apply data science methods in practice to real problems involving digital transformation and innovation.
4. Develop and demonstrate the ability to assess, test and research innovation in data science with sensitivity and awareness around ethics, equity, diversity, business impact and social impact.

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

• Doctorate in Philosophy Digital Transformation and Innovation
• Master of Science Digital Transformation and Innovation
• Master of Digital Transformation and Innovation
• Master of Digital Transformation and Innovation with Concentration in UX Design

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/)
STE 1024
800 King Edward Ave.
Ottawa ON Canada
K1N 6N5
Tel.: 613-562-5347
Fax.: 613-562-5129
Email: engineering.grad@uottawa.ca

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:

• Have a Bachelor's degree with a specialization or a major (or equivalent) in a relevant discipline with a minimum admission average of 75% (B+).

   Note: International candidates must check the admission equivalencies (https://www.uottawa.ca/graduate-studies/international/study-uottawa/admission-equivalencies/) for the diploma they received in their country of origin.

• Have completed a course in statistics; a course in management information systems or computing; and two advanced courses showing specialization in one of three disciplines: creative arts and humanities (online multi-media or communications); management (digital transformation management or strategy); technology (online application development or data science).

Language Requirements
Most courses are delivered in English as the international language for advanced information technology. However, the program will provide an appropriate 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.

Language tests are entered on the application form. Candidates must provide a copy of their test scores to the Graduate Admissions Office. The following language tests are recognized by the University of Ottawa:

• TOEFL
• IELTS
• CANTEST

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.

Applying to the COOP Option
In order to apply to the co-op option, you must first be admitted to a program that offers co-op.

Your application must be submitted by the end of the first month of enrollment in your primary program, i.e., by the end of September.

Admission to the co-op option occurs on a competitive basis and is managed by the Co-op office. Enquiries should be directed to that office.

To be admitted to the co-op option, you must:

• Be enrolled as a full-time student in the master’s in Master of Digital Transformation and Innovation.

• Have and maintain a minimum CGPA of 7.0 (B+ or 75%) in course taken at the University of Ottawa.

• Be a Canadian citizen, a permanent resident or an international student (authorization or diplomat)

• Pay the required co-op fees.

Program Requirements

Master’s with Project
Students must meet the following requirements:

Compulsory Courses:
- DTI 5125 3 Units Fundamentals for Applied Data Science
- DTI 7101 1.5 Units Research Workshop in Digital Transf. and Innovation
- 3 optional course units from: 3 Units
- CMN 5115 Communication Ethics
- DTI 5310 Ethics for Design, AI, and Robotics
- ISI 5310 Ethics, Values and Information Dilemmas
- 4.5 optional course units from the list of Foundation courses 4.5 Units
- 6 optional course units from the list of Applied Data Science courses 6 Units
- 3 optional course units from the list of optional courses 3 Units

Research Project
- DTI 6997 Research project 6 Units

Applied Data Science Courses
- ADM 6277 1.5 Units E-Business Energy Management
- ADM 6287 1.5 Units Business Intelligence Technologies and Big Data Analytics for DTI
- ADM 6420 1.5 Units Digital Marketing
- CSI 5115 3 Units Database Analysis and Design
- CSI 5180 3 Units Topics in Artificial Intelligence
- CSI 5311 3 Units Distributed Databases and Transaction Processing
- CSI 5386 3 Units Natural Language Processing
- DTI 6302 3 Units Topics in Applied Data Science

### Foundation Courses

#### Management Orientation

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>DTI 5124</td>
<td>Internet Technologies and Mobile Commerce</td>
<td>3</td>
</tr>
<tr>
<td>DTI 6130</td>
<td>Web Services</td>
<td>1.5</td>
</tr>
<tr>
<td>DTI 6170</td>
<td>Cyber Security Systems and Strategies</td>
<td>1.5</td>
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<tr>
<td>DTI 6220</td>
<td>Data Analytics and Business Intelligence</td>
<td>1.5</td>
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<tr>
<td>DTI 6260</td>
<td>Integrated Networks for the Enterprise</td>
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#### Technology Orientation

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>DTI 5175</td>
<td>Mobile Commerce Technologies</td>
<td>3</td>
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<tr>
<td>DTI 5380</td>
<td>Systems and Architectures for Electronic Commerce</td>
<td>3</td>
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<tr>
<td>DTI 5389</td>
<td>Electronic Commerce Technologies</td>
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#### Creative Arts and Humanities Orientation

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>ISI 6342</td>
<td>Web Architecture and Technologies</td>
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### Optional Courses

#### Management Orientation

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<th>Course</th>
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<tbody>
<tr>
<td>ADM 6260</td>
<td>Project Management I</td>
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<tr>
<td>ADM 6261</td>
<td>Project Management II</td>
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<tr>
<td>ADM 6276</td>
<td>Enterprise Resource Planning Systems Management</td>
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<tr>
<td>ADM 6277</td>
<td>E-Business Energy Management</td>
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<tr>
<td>ADM 6279</td>
<td>Socio-Technical Change</td>
<td>1.5</td>
</tr>
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<td>ADM 6286</td>
<td>International E-Business Strategies for DTI</td>
<td>1.5</td>
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<tr>
<td>ADM 6420</td>
<td>Digital Marketing</td>
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<td>DTI 5124</td>
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<td>DTI 5125</td>
<td>Data Science Applications</td>
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<td>DTI 5126</td>
<td>Fundamentals for Applied Data Science</td>
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<tr>
<td>DTI 5990</td>
<td>Directed Readings I</td>
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<td>DTI 5991</td>
<td>Directed Readings II</td>
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<td>DTI 6130</td>
<td>Web Services</td>
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<td>DTI 6170</td>
<td>Cyber Security Systems and Strategies</td>
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<td>DTI 6180</td>
<td>Strategic Knowledge Management</td>
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<td>DTI 6220</td>
<td>Data Analytics and Business Intelligence</td>
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<tr>
<td>DTI 6230</td>
<td>Business Process Management and Performance Measure</td>
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<td>DTI 6240</td>
<td>Mobile Commerce</td>
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<td>DTI 6260</td>
<td>Integrated Networks for the Enterprise</td>
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<tr>
<td>DTI 6260</td>
<td>Topics in Digital Transformation and Innovation</td>
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<td>DTI 6301</td>
<td>Topics in Digital Transformation and Innovation</td>
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<td>DTI 6302</td>
<td>Topics in Applied Data Science</td>
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<td>DTI 6303</td>
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<td>DTI 6304</td>
<td>Topics in User Experience Design</td>
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<tr>
<td>DTI 6305</td>
<td>Topics in User Experience Design</td>
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<tr>
<td>MBA 5270</td>
<td>Knowledge and Information Management</td>
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<tr>
<td>MBA 6220</td>
<td>Managing Customer Relations and the Sales Process</td>
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<tr>
<td>MGT 6111</td>
<td>Venture Capital and Private Equity</td>
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<td>MGT 6160</td>
<td>Systems of Innovation</td>
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<td>MHA 6271</td>
<td>Application of Information Technology in Health Care</td>
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<td>POP 8950</td>
<td>Special Topics in Population Health</td>
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<tr>
<td>ADM 6287</td>
<td>Business Intelligence Technologies and Big Data Analytics for DTI</td>
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<td>CSI 5105</td>
<td>Network Security and Cryptography</td>
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<td>CSI 5111</td>
<td>Software Quality Engineering</td>
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<td>CSI 5112</td>
<td>Software Engineering</td>
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<td>CSI 5115</td>
<td>Database Analysis and Design</td>
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<tr>
<td>CSI 5118</td>
<td>Automated Verification and Validation of Software</td>
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<tr>
<td>CSI 5122</td>
<td>Software Usability</td>
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<td>CSI 5180</td>
<td>Topics in Artificial Intelligence</td>
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<td>CSI 5311</td>
<td>Distributed Databases and Transaction Processing</td>
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<td>DTI 5175</td>
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<td>Systems and Architectures for Electronic Commerce</td>
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<td>DTI 6402</td>
<td>Affective and Persuasive Computing</td>
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<tr>
<td>ELG 5121</td>
<td>Multimedia Communications</td>
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<tr>
<td>ELG 5142</td>
<td>Ubiquitous Sensing for Smart Cities</td>
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<tr>
<td>ELG 5373</td>
<td>Data Encryption</td>
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<tr>
<td>GNG 5120</td>
<td>Technology entrepreneurship for Engineers and Computer Scientists</td>
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<tr>
<td>GNG 5121</td>
<td>Planning of Experiments in Engineering Design</td>
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<tr>
<td>GNG 5122</td>
<td>Operational Excellence and Lean Six Sigma</td>
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<td>GNG 5123</td>
<td>Enterprise Architecture</td>
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<td>GNG 5130</td>
<td>Communication and Influence for Engineers</td>
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<td>GNG 5131</td>
<td>Sales and Influence for Engineers</td>
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<td>GNG 5231</td>
<td>Sales Engineer Internship Project</td>
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<td>GNG 5300</td>
<td>Topics in Engineering</td>
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<td>GNG 5310</td>
<td>Topics in Industry Practice</td>
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<td>GNG 5314</td>
<td>Engineering Design</td>
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<td>GNG 5319</td>
<td>Creativity and Innovation</td>
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<tr>
<td>GNG 5392</td>
<td>Industry Internship Project</td>
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#### Creative Arts and Humanities Orientation

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<tr>
<td>AHL 5300</td>
<td>Creativity and Innovation</td>
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</table>
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 units)
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 preprocessing, 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)
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)
Course Component: Lecture

DTI 5389 Electronic Commerce Technologies (3 units)
Course Component: Lecture
DTI 5501 Fondements de gestion pour les affaires électroniques (3 crédits)
Volet : Cours magistral

DTI 5502 Fondements des technologies de l'information pour les affaires électroniques (3 crédits)
Volet : Cours magistral

DTI 5503 Fondements des statistiques pour les affaires électroniques (3 crédits)
Volet : Cours magistral

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 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 6170 Cyber Security Systems and Strategies (1.5 unit)
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)
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: Lecture

DTI 6240 Mobile Commerce (1.5 unit)
Course Component: Lecture

DTI 6250 Document Engineering for Digital Transf. and Innovation (1.5 unit)
Course Component: Lecture

DTI 6260 Integrated Networks for the Enterprise (1.5 unit)
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 (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 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 User Experience Principles and Practices (3 units)
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 6401 Affective and Persuasive Computing (3 units)
Course Component: Lecture
Prerequisite: CSI 5122 or DTI 6401.

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 7100 Research Methods in Digital Transf. and Innovation (3 units)
Course Component: Lecture

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