



**Carleton**  
University

**Sprett**  
School of Business

## **BUSI 4331**

### **Industry 4.0 Technologies and Applications**

|                         |                                                                                                                                                            |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Instructor</b>       | Ahmed Doha                                                                                                                                                 |
| <b>Email</b>            | ahmed.doha@carleton.ca                                                                                                                                     |
| <b>Course format</b>    | Three hours of lecture and one hour of lab per week                                                                                                        |
| <b>Offering details</b> | Section, academic period, meeting time, room, delivery mode, teaching-assistant contacts, and all dated deadlines are published in Banner and Brightspace. |

### **Course description**

This course shows how Industry 4.0 employs the Internet of Things (IoT) and artificial intelligence technologies to achieve self-thinking supply chains. It demonstrates how Industry 4.0 transforms industries. Lectures, demonstrations, and hands-on exercises allow students to design, deploy, and manage custom IoT solutions.

**Calendar requirements:** Precludes additional credit for BUSI 4431 (no longer offered). Prerequisite: third-year standing and BUSI 2301 with a grade of C or higher. Students must confirm the current calendar entry in the Undergraduate Calendar.

### **Course overview**

Industry 4.0, also called the Fourth Industrial Revolution, connects products, services, and operations through sensor technologies and the Internet of Things. The resulting flow of operational data enables real-time communication and analysis. Data science and artificial intelligence can then support increasingly autonomous decisions and self-thinking supply chains. The course links this technical architecture to applications, business models, and managerial value.

### **Required materials**

- Textbook: Sudip Misra, Chandana Roy, and Anandarup Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0, CRC Press, 2021. Electronic access is available through the Carleton University Library, subject to the library's current licence.
- Case: Bossard AG: Enabling Industry 4.0 Logistics, Worldwide, Harvard Business Publishing.
- Case: Coda Coffee and Bext360 Supply Chain: Machine Vision, AI, IoT, and Blockchain, Harvard Business Publishing.
- Cases are provided through the library or the course site according to licensing terms.
- The instructor posts applicable slides and supplementary materials in Brightspace. The posted guidance identifies the assigned portions of each textbook chapter.

### **Assessment**

| <b>Assessment</b>                                | <b>Weight</b> |
|--------------------------------------------------|---------------|
| Three in-class project-development presentations | 30%           |
| Term paper                                       | 50%           |
| Term paper presentation                          | 10%           |

| Assessment                   | Weight      |
|------------------------------|-------------|
| Attendance and participation | 10%         |
| <b>Total</b>                 | <b>100%</b> |

## Assessment requirements

**In-class project-development presentations (30%):** The three group presentations incrementally develop the term project. Students use the presentation rubrics and submission instructions published in Brightspace.

**Term paper (50%):** Students work in instructor-formed groups to identify and describe a sharply defined problem and craft an Industry 4.0 solution. Each group documents the project in a double-spaced paper of approximately 20 pages and addresses the criteria in the Brightspace rubric.

**Term paper presentation (10%):** Each group presents its completed project for approximately 30 minutes, followed by approximately 10 minutes of questions and discussion. Every group member must understand the full project and may be evaluated on any part of it. Submission format, presentation allocation, and deadlines are published in Brightspace.

**Attendance and participation (10%):** The course depends on active engagement in discussions, demonstrations, exercises, and project work. Attendance may be recorded through the electronic method announced in Brightspace, and a connected device may be required. To earn the full attendance component, a student must miss no more than two classes and complete the announced attendance check. More than two absences results in a 50% reduction of the attendance-and-participation grade. Approved accommodations remain applicable.

## Communication and submission

- Use your Carleton email account when communicating with the instructor or teaching assistant, and include your full name and student number where appropriate.
- Brightspace is the authoritative source for dated deadlines, submission links, file-format requirements, rubrics, announcements, and any offering-specific changes.
- Students should retain a copy of every submitted item and verify that each submission was received successfully.

## Course sequence: 13 classes

The sequence below is durable across offerings. Calendar dates, breaks, room assignments, delivery arrangements, and any necessary sequencing adjustments are published in Banner and Brightspace. A university break is not counted as an instructional class.

| Class | Topic                                          | Focus                                                                                                                                                   | Preparation                | Milestone               |
|-------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------------|
| 1     | Industry 4.0 foundations                       | Internet of Things (IoT), Industry 4.0 history and trends, technology infrastructure, solution architecture, and value creation in smart supply chains. | Misra et al., Chapters 1–4 | —                       |
| 2     | Data science and analytics for Industry 4.0    | Analytics capabilities for extracting operational insight and supporting business decisions.                                                            | Misra et al., Chapter 12   | —                       |
| 3     | Cloud services and practical solution building | IoT cloud services, platform capabilities, and a hands-on connected-device solution exercise.                                                           | Misra et al., Chapters 6–7 | —                       |
| 4     | Project development presentation 1             | Groups present the first stage of their Industry 4.0 project using the rubric in Brightspace.                                                           | Presentation rubric        | In-class presentation 1 |

| Class | Topic                                        | Focus                                                                                                                                                           | Preparation                  | Milestone                   |
|-------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------|
| 5     | Industry 4.0 in healthcare                   | Applications in healthcare, including sensor deployment and data collection strategies.                                                                         | Misra et al., Chapter 14     | —                           |
| 6     | Inventory management and quality control     | Applications in logistics, inventory management, and quality control; sensor deployment and data collection in smart logistics.                                 | Misra et al., Chapter 15     | In-class presentation 2     |
| 7     | Plant safety and security                    | IoT applications in safety and security, including sensing and data collection in smart production.                                                             | Misra et al., Chapter 16     | —                           |
| 8     | Analytics and insight in smart supply chains | Hands-on analysis of Industry 4.0 data, artificial intelligence for business insight, and the path from real-time sensing to self-thinking supply chains.       | Misra et al., Chapter 13     | —                           |
| 9     | Industry 4.0 business models                 | Stakeholders, value propositions, revenue models, and strategies for an Industry 4.0 venture or transformation.                                                 | Misra et al., Chapter 5      | In-class presentation 3     |
| 10    | Case: Bossard AG                             | Business analysis of Industry 4.0 logistics and the organizational value of connected operations.                                                               | Bossard AG case              | Case preparation            |
| 11    | Case: Coda Coffee and Bext360                | Business analysis of machine vision, artificial intelligence, IoT, and blockchain in a supply chain.                                                            | Coda Coffee and Bext360 case | Case preparation            |
| 12    | Term paper presentations I                   | Groups assigned to this meeting present and defend their completed Industry 4.0 projects. Group allocation and submission details are published in Brightspace. | Presentation rubric          | Term paper and presentation |
| 13    | Term paper presentations II                  | The remaining groups present and defend their completed Industry 4.0 projects. Group allocation and submission details are published in Brightspace.            | Presentation rubric          | Term paper and presentation |

## Group work

Group assignments develop interpersonal, communication, leadership, followership, and integrative problem-solving skills. Students are responsible for contributing to the full group deliverable and for understanding which activities are collaborative and which must be completed independently. Assignment-specific collaboration rules appear in Brightspace and in the applicable rubric.

## Course materials and intellectual property

Materials created for this course—including presentations, notes, labs, cases, assignments, and assessments—remain the intellectual property of their author or rights holder. They are provided for students' personal course use and may not be reproduced or redistributed without prior written permission.

## Grading scale

| Grade | Range    | Grade | Range |
|-------|----------|-------|-------|
| A+    | 90–100   | B+    | 77–79 |
| A     | 85–89    | B     | 73–76 |
| A–    | 80–84    | B–    | 70–72 |
| C+    | 67–69    | D+    | 57–59 |
| C     | 63–66    | D     | 53–56 |
| C–    | 60–62    | D–    | 50–52 |
| F     | Below 50 |       |       |

Registrar notation includes WDN (withdrawn) and DEF (deferred). All final grades are subject to the Dean's approval.

## Academic regulations and integrity

Students are responsible for complying with Carleton University's current academic regulations, including registration, withdrawal, appeals, and conduct requirements. Consult the Undergraduate Calendar:  
<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/>

Academic integrity applies to every course activity. Misconduct includes presenting another person's ideas, words, images, code, or analysis as one's own; using unauthorized material or tools; misrepresenting research data; unauthorized collaboration; or completing work for another student. Students must follow the current Student Academic Integrity Policy and the assignment-specific rules published in Brightspace: <https://carleton.ca/registrar/academic-integrity/>

## Academic accommodation

Students who require academic accommodation should use the current university process and contact the instructor as early as possible. This includes disability-related accommodation, religious obligations, pregnancy and family-status needs, and eligible student activities. The authoritative processes and timelines are maintained by Carleton University:  
<https://students.carleton.ca/course-outline/> and <https://carleton.ca/pmc/>

Carleton is committed to a learning environment where sexual violence is not tolerated and survivors are supported. Information and support are available at <https://carleton.ca/sexual-violence-support/>

## Student support

- Sprott Student Services provides academic advising and support: <https://sprott.carleton.ca/students/undergraduate/>
- The Centre for Student Academic Support provides learning and writing support: <https://carleton.ca/csas/>
- For all current university services, policies, and course-outline information, use <https://students.carleton.ca/course-outline/>