

COURSE NAME: AMD150 Introduction to Industry 4.0

Credit Value: 3
Total Course Hours: 42
Prerequisite Course(s): None
Corequisite Course(s): None

COURSE DESCRIPTION

The fourth wave of industrialization is driving the era of smart manufacturing, and emerging technologies played a crucial role in its growth. In this course, students will study applications of big data, artificial intelligence, machine learning, data analytics, Internet of Things (IoT), augmented reality (AR), virtual reality (VR), cyber-physical systems, cloud computing, and 5G within the industrial and manufacturing processes. With applications and case studies ranging from smart factories, autonomous manufacturing, predictive maintenance, sustainable manufacturing, supply chain automation, and other applications, students would learn to assess technologies required to shape the intelligent, adaptive, and connected manufacturing landscape of tomorrow.

LAND ACKNOWLEDGEMENT

Canadore College resides on the traditional territory of the Anishinaabeg and within lands protected by the Robinson Huron Treaty of 1850. This land is occupied by the people of Nipissing First Nation since time immemorial.

PLAR INFORMATION

This course is eligible for Prior Learning Assessment and Recognition. Students are advised to discuss options with their program coordinator.

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will have reliably demonstrated the ability to:

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| <p>1.0 Analyze the developments within Industry 4.0 and their impact on industrial and large-scale deployments.</p> <ul style="list-style-type: none">1.1 Differentiate between the four industrial revolutions and articulate their core technological shifts.1.2 Define Industry 4.0 and its key components, including IoT (Internet of Things), AI (Artificial Intelligence), Augmented Reality (AR), Virtual Reality (VR), Big Data, Cloud computing, 5G, and Automation.1.3 Identify the drivers and challenges of digital transformation in modern businesses.1.4 Analyze case studies to understand how Industry 4.0 technologies transformed traditional industries. <p>2.0 Discuss advanced technologies (e.g., artificial intelligence, IoT, cloud computing, AR/VR, 5G) associated with Industry 4.0 to determine the types of data they generate to</p> | <p>inform system integration decisions.</p> <ul style="list-style-type: none">2.1 Describe the role of sensors, RFID, big data, cloud systems, IoT, AI, AR, VR, and 5G in Industry 4.0.2.2 Identify different types of operational data collected in smart environments.2.3 Explain the function and data output of cyber-physical systems and edge computing systems.2.4 Describe data flow processes within a smart manufacturing system. <p>3.0 Assess how Industry 4.0-based technologies drive business transformations and inform strategic decision-making in smart industries.</p> <ul style="list-style-type: none">3.1 Explain the concept of industry transformation in the context of Industry 4.0.3.2 Describe the role of data analytics and its influence in smart manufacturing.3.3 Identify smart business tools enabled by |
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- Industry 4.0 technologies.
- 3.4 Analyze the shift from traditional focused to smart industry models.
- 3.5 Evaluate industry case studies that leverage Industry 4.0 tools.
- 4.0 Evaluate product quality and reduce defects through real-time data to improve production efficiency and minimize waste.
- 4.1 Describe the process of collecting real-time data from production lines.
- 4.2 Apply statistical tools to analyze real-time quality data.
- 4.3 Identify root causes of defects using data visualization and dashboards.
- 4.4 Evaluate the effectiveness of predictive maintenance in reducing production flaws.
- 4.5 Recommend process improvements based on defect trend analysis.
- 5.0 Evaluate the significance of cybersecurity in an Industry 4.0 context to identify and mitigate risks that compromise data integrity and system reliability.
- 5.1 Identify common cybersecurity threats specific to smart factories and IoT devices.
- 5.2 Explain security risks posed by interconnectivity and cloud-based platforms.
- 5.3 Assess vulnerabilities in data transmission and storage in Industry 4.0 systems.
- 5.4 Compare cybersecurity frameworks applicable to industrial networks.
- 5.5 Assess the suitability of different cybersecurity measures for mitigating risks in the smart manufacturing systems.
- 6.0 Analyze automation and resource efficiency strategies to identify cost-saving opportunities in Industry 4.0 systems.
- 6.1 List automation tools commonly used in manufacturing (e.g., robotics, enterprise resource planning (ERP)).
- 6.2 Describe how energy and materials can be optimized through smart systems.
- 6.3 Apply lean manufacturing principles in identifying waste reduction areas.
- 6.4 Analyze the return on investment (ROI) in the implementation of Industry 4.0 technologies for reducing operational costs.
- 6.5 Select appropriate cost-saving strategies using data-driven insights from production data.
- 7.0 Formulate Industry 4.0 strategies aligned with organizational goals to drive digital transformation and competitive advantage.
- 7.1 Identify the strategic objectives of an organization related to digital transformation.
- 7.2 Develop an implementation roadmap including technologies, training, and KPIs.
- 7.3 Analyze the integration of Lean Manufacturing principles with Industry 4.0 technologies.
- 7.4 Align technology choices with operational and business outcomes.
- 7.5 Evaluate success metrics post-implementation and recommend continuous improvement strategies.
- 8.0 Assess the ethical implications related to Industry 4.0, such as data privacy, job impact, and sustainability.
- 8.1 Identify ethical concerns such as data surveillance, algorithmic bias, and job displacement.
- 8.2 Explain legal frameworks and regulatory standards around data privacy (e.g., GDPR).
- 8.3 Analyze the impact of automation on workforce structures and labor rights.
- 8.4 Evaluate corporate sustainability efforts linked to smart technologies.

GENERAL EDUCATION

This is not a General Education course.

PROGRAM OUTCOMES

This course contributes to the following Ministry of Colleges and Universities approved program learning outcomes (PLO):

Advanced Manufacturing, Design & Management

7. Develop and implement strategies for personal and professional growth to enhance performance, maintain industry relevance and adapt to emerging technologies and trends.

9. Integrate robotics and automation technologies to optimize manufacturing processes and enhance system connectivity.

12. Integrate digital manufacturing tools to streamline workflows and support production goals in advanced manufacturing environments.

EXTERNAL COURSE ACCREDITATIONS AND CONDITIONS

There are no external accreditations or conditions identified for this course.

COURSE EVALUATION

Evaluation Item	Weight
Case Study Assessment 1	10%
Case Study Assessment 2	10%
Case Study Assessment 3	10%
Case Study Assessment 4	10%
In-class activity 1	5%
In-class activity 2	5%
In-class activity 3	5%
Project Proposal [Report and Presentation]	15%
Final Project Report	15%
Final Project Presentation	15%

COURSE PASS GRADE

50

GRADING SYSTEM

A+: 90-100%	B+: 77-79%	C+: 65-69%	D: 50-54%	S - Satisfactory
A: 85-89%	B: 73-76%	C: 60-64%	F: 0-49%	I - Incomplete
A-: 80-84%	B-: 70-72%	D+: 55-59%		F- Repeat Course, included in GPA
				FS- Failure Supplemental
				FR- Repeat course, excluded from GPA

*For a complete chart of grades and descriptions, please see the Grading Policy.

LEARNING RESOURCES

Course Textbooks:

Recommended:

Title: 1. Implementing Industry 4.0 in SMEs: Concepts, Examples and Applications
Author: Dominik T. Matt, Vladimr Modrk, Helmut Zsifkovits
Publisher: Palgrave Macmillan
Edition: First
Print ISBN: 978-3-030-70515-2
eBook ISBN: 978-3-030-70516-9

Title: 2. Industry 4.0 for SMEs: Challenges, Opportunities and Requirements
Author: Dominik T. Matt, Vladimr Modrk, Helmut Zsifkovits
Publisher: Palgrave Macmillan
Edition: First
Print ISBN: 978-3-030-25424-7
eBook ISBN: ISBN 978-3-030-25425-4

Additional Learning Resources:

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Please see the [Campus Bookstore](#) to verify the current textbook costs and your [program page](#) for additional program fees and/or learning material requirements (see the "Tuition Fees" and "What You Need" sections).

Resources listed on the course outline support the achievement of learning outcomes, and may be used throughout the course to varying degrees depending on the instructor's teaching methodology and the nature of the resource.

Technology requirements - <https://www.canadorecollege.ca/BYOD>

The Harris Learning Library's staff can help you find resources to support your learning - <https://www.canadorecollege.ca/harris-learning-library>.

LEARNING ACTIVITIES

Instructor-led lectures, assigned readings from textbooks, journals, and case studies, video tutorials, simulations or animations explaining lean workflows, group discussions, real-world case studies, identify outcomes, hands-on demonstrations, collaborative/group projects, quizzes

DELIVERY MODE

This course may be delivered, in whole or in part, in a number of modalities, including In-Person, Remote (synchronous and/or asynchronous), hybrid, or Hyflex, as per accreditation and/or regulatory standards where appropriate. This information is identified on the course schedule (student and faculty).

RECORDING GUIDELINES

This class may be recorded by faculty of the College. Faculty will inform students when recording of the class commences and ceases. 'Recorded' means that the audio-visual and chat portions of the class will be recorded and then be stored on the College or vendor provider server. They will be made available to students, but only for the express and sole use of those registered in this course. If you have any questions or concerns about this recording, please contact your instructor or the College's privacy officer at privacy.officer@canadorecollege.ca. Full recording guidelines can be found at: <https://cdn.agilitycms.com/canadore-college/academic-centre-of-excellence/Canadore%20Recording%20Guidelines.pdf>. Recordings are to be managed (or removed) as per the College's Recording Guidelines following the completion of the course.

EXPERIENTIAL LEARNING

All full-time programs of study at Canadore College strive to provide students with the opportunity for experiential learning. This course provides students with an experiential learning opportunity through:

Workplace/Lab Simulation (EL)

ACADEMIC POLICIES

Canadore College is committed to the highest standards of academic integrity, and expects students to adhere to these standards as part of the learning process in all environments. The College's Academic Integrity policy seeks to ensure that all students understand their rights and responsibilities in upholding academic integrity and that students receive an accurate and fair assessment of their work. Please review the Academic Integrity policy (A-18) and other academic policies found on our website: <https://www.canadorecollege.ca/about/policies>.

COLLEGE POLICIES

- Protecting human rights in support of a respectful college community

For college policies please see: <http://www.canadorecollege.ca/about-us/college-policies>.

Accessibility Learning Services for Students with Disabilities - Student Success Services

Student Success Services provides comprehensive support to students. We aim to ensure that all students have equal access to educational opportunities and can succeed in their academic journey. Our services focus on reducing and eliminating barriers related to education through individualized accommodations and support. If you are a student with a disability, we encourage you to register with Accessible Learning by completing the Student Success – Accessible Learning Services Form (https://canadorecollege-accommodate.symplicity.com/public_accommodation/).

For more detailed information about the services offered, please visit our webpage: <https://isucceed.canadorecollege.ca/students>. To connect with Student Success Services email

studentsuccessnow@canadorecollege.ca or call 705.474.7600 ext 5205.

FIRST PEOPLES' CENTRE:

A culturally supportive and comfortable environment where you can study, socialize, and access a wide range of resources and confidential student focused services.

- Counselling services
- Elders on Campus and Cultural Advisors
- Cultural and Spiritual Wellness
- Peer tutoring/Peer Mentorship
- wholistic support network
- Social events and workshops on study skills, self-care & life skills

Drop by our offices at C254 College Drive, W103 Commerce Court or Call 705-474-7600 Ext. 5961

<https://www.canadorecollege.ca/first-peoples-centre>

WAIVER OF RESPONSIBILITY

Every attempt is made to ensure the accuracy of this information as of the date of publication. The college reserves the right to modify, change, add, or delete content.

HISTORICAL COURSE OUTLINES

Students use course outlines to support their learning. Students are responsible for retaining course outlines for future use in applications for transfer of credit to other educational institutions.