IDC4U Interdisciplinary Studies: Artificial Intelligence and Business Innovation

Grade 12, University Preparation

Credit value: 1

Course Description:

This course integrates the curriculum expectations for Interdisciplinary Studies, Grade 12, University Preparation with selected expectations from multiple other courses. These include Introduction to Computer Science, Grade 11, University Preparation (ICS3U); Mathematics of Data Management, Grade 12, University Preparation (MDM4U); Communications Technology: Digital Imagery and Web Design, Grade 12, Open (TGJ4O); and Business Leadership: Management Fundamentals, Grade 12, University/College Preparation (BOH4M).

This course aims to equip students with the essential skills and knowledge across various domains, including Artificial Intelligence (AI), computer science, data management, communication technology, and business leadership. The focus is on leveraging these interdisciplinary insights to address complex problems, make informed decisions, create meaningful personal advancements, and drive business innovation. Students will engage in inquiry and research methodologies to uncover strategies for harnessing AI's value in business contexts. The curriculum covers the potential of robotics, natural language processing, and machine learning (ML), empowering students with the understanding and confidence to integrate AI technologies into business strategies effectively. The course delves into the role of AI in fostering business innovation, preparing students to navigate and lead in the evolving digital landscape.

Prerequisites: any university or university/college preparation course

Theoretical Framework and Methodological Approach to Design

The curriculum design places a strong emphasis on problem-based learning, transitioning from traditional direct instruction towards an inquiry-based model, as detailed by Fullan (2014). This approach is further enhanced by incorporating the principles of Design Thinking, as proposed by Kelley and Kelley (2013), and by integrating the Knowledge Community and Inquiry (KCI) framework, as developed by Slotta and Najafi (2012).

Course Outline

Unit 1: Create a learning Space and Foster a learning community （6 hours）

Unit 2: Business Startups and Innovation (15 hours)

Unit 3: History of AI (9)

Unit 4: Introduction to Algorithms and Programming (12)

Unit 5: Machine Learning and its Business Application (18)

Unit 6: Natural Language Processing (NLP） and its Business Application (15)

Unit 7: Robotics for Business (18)

Unit 8: AI and Society (9)

Unit 9: The future of artificial intelligence (6)

Assessment and Evaluation

Assessment

Assessment is the process of gathering information that accurately reflects how well a student is achieving the curriculum expectations in a subject or course. The primary purpose of assessment is to improve student learning. They are ‘assessment for learning’, ‘assessment as learning’, and ‘Assessment of learning’.

Assessment for learning is the process through which teachers seek and interpret evidence to understand what students know, their interests, and their learning preferences. It helps teachers determine students' readiness to acquire new knowledge and skills. Assessment for learning occurs before instruction begins.

Assessment as learning emphasizes the explicit development of students' capacity to assess their own learning effectively over time. This type of assessment occurs frequently and continuously throughout instruction. It enables students to provide feedback to their peers, monitor their own progress toward learning goals, and make adjustments to their learning approaches.

Assessment of learning evaluates how well students have learned. It typically occurs at or near the end of a learning period and may be used to inform further instruction. This assessment is used by teachers to summarize learning at a specific point in time. The results are recorded and accumulated as part of the term evaluation mark, which constitutes 70% of the final course mark.

Evaluation

- **Term Evaluation (70%):** This portion of the grade is based on evaluations conducted throughout the course. It reflects the student's most consistent level of achievement. However, special consideration is given to more recent evidence of achievement.
- **Final Evaluation (30%):** The final grade is based on one or a combination of the following: an examination, a performance, an essay, or another method suitable to the course content. This allows students an opportunity to demonstrate comprehensive achievement of the course's overall expectations.

Credit Granting: A credit is granted if the student's final percentage mark is 50% or higher.

The Achievement Chart

Knowledge and understanding – disciplinary-specific contents(knowledge), and the comprehension of its meaning and significance (understanding)												
Categories	Level 1 (50 – 59%)			Level 2 (60 – 69%)			Level 3 (70 –79%)			Level 4 (80 – 100%)		
	D- (50-53%)	D (53-56%)	D+ (57-59%)	C- (60-63%)	C (63-66%)	C+ (67-69%)	B- (70-72%)	B+ (73-76%)	B (77-79%)	A- (80-86%)	A (87-94%)	A+ (95-100%)
Knowledge of content (e.g., facts, terminology, definitions)	demonstrates limited knowledge of content			demonstrates some knowledge of content			demonstrates considerable knowledge of content			demonstrates thorough knowledge of content		
Understanding of content	demonstrates limited			demonstrates some			demonstrates			demonstrates thorough		

(e.g., concepts, ideas, theories, principles, procedures, processes)	understanding of content	understanding of content	considerable understanding of content	understanding of content
Thinking and Investigation – The use of critical and creative thinking skills and inquiry and problem-solving skills and/or processes				
Use of initiating and planning skills and strategies (e.g., formulating questions, identifying the problem, developing hypotheses, scheduling, selecting strategies and resources, developing plans)	uses initiating and planning skills and strategies with limited effectiveness	uses initiating and planning skills and strategies with some effectiveness	uses initiating and planning skills and strategies with considerable effectiveness	uses initiating and planning skills and strategies with a high degree of effectiveness
Use of processing skills and strategies (e.g., performing and recording; gathering evidence and data; examining different points of view; selecting tools, equipment, materials, and technology; observing; manipulating materials; proving)	uses processing skills and strategies with limited effectiveness	uses processing skills and strategies with some effectiveness	uses processing skills and strategies with considerable effectiveness	uses processing skills and strategies with a high degree of effectiveness
Use of critical/creative thinking processes, skills, and strategies (e.g., analysing, interpreting, problem solving, evaluating, forming and justifying conclusions on the basis of evidence, developing solutions, considering diverse	uses critical/ creative thinking processes, skills, and strategies with limited effectiveness	uses critical/ creative thinking processes, skills, and strategies with some effectiveness	uses critical/ creative thinking processes, skills, and strategies with considerable effectiveness	uses critical/ creative thinking processes, skills, and strategies with a high degree of effectiveness

perspectives)				
Communication – The conveying of meaning through various forms				
Expression and organization of ideas and information in oral, visual, and/or written forms (e.g., diagrams, models, articles, project journals, reports)	expresses and organizes ideas and information with limited effectiveness	expresses and organizes ideas and information with some effectiveness	expresses and organizes ideas and information with considerable effectiveness	expresses and organizes ideas and information with a high degree of effectiveness
Communication for different audiences (e.g., peers, teachers) and purposes (e.g., to inform, to persuade) **in oral, visual, and/or written forms**	communicates for different audiences and purposes with limited effectiveness	communicates for different audiences and purposes with some effectiveness	communicates for different audiences and purposes with considerable effectiveness	communicates for different audiences and purposes with a high degree of effectiveness
Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms (e.g., symbols, formulae, International System of Units)	uses conventions, vocabulary, and terminology of the discipline with limited effectiveness	uses conventions, vocabulary, and terminology of the discipline with some effectiveness	uses conventions, vocabulary, and terminology of the discipline with considerable effectiveness	uses conventions, vocabulary, and terminology of the discipline with a high degree of effectiveness
Application – Utilizing interdisciplinary knowledge and skills to drive innovation within and across various business sectors				
Application –Employing knowledge and skills related to Artificial Intelligence (e.g., concepts and processes, tools, equipment, materials, technology, techniques, and investigative skills) to	Employing knowledge and skills to business innovation with limited effectiveness	Employing knowledge and skills to business innovation with some effectiveness	Employing knowledge and skills to business innovation with considerable effectiveness	Employing knowledge and skills to business innovation with a high degree of effectiveness

foster innovation in business.				

- Adapted and modified from Growing Success, 2010. https://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

Unit 1: Create a learning Space and Foster a learning community

Overview:

This unit focuses on establishing a strong foundational learning environment, both onsite and online, where students engage in activities designed to foster a sense of community and comfort. The goal is to create a welcoming, interactive space that encourages open communication and ongoing collaboration among learners.

Students will introduce themselves, create profiles, and participate in initial greetings, laying the groundwork for meaningful and supportive peer interactions throughout the course. Additionally, this unit will guide students in becoming familiar with the Course Road Map (KCL structure), equipping them to effectively navigate learning resources and activities. It also introduces a variety of methods and strategies for effective learning and teaching, setting the stage for a productive and engaging learning experience.

Overall Expectations:

- C1-IDC4U.implement and communicate information about interdisciplinary endeavors, using a variety of methods and strategies; (X)
- A3 (TGJ4O): Demonstrate an understanding of and apply the interpersonal skills necessary to work effectively with clients and peers.
- B2-IDC4U.be able to access appropriate resources, using a variety of research strategies and technologies;

Learning Outcomes:

- Students will be able to effectively introduce themselves and articulate their learning and professional goals.
- Students will create detailed and engaging personal profiles that facilitate deeper connections and collaboration.
- Students will demonstrate the ability to initiate and maintain respectful and constructive communication with peers.

- Students will become familiar with the Course Road Map: KCL structure and will be able to navigate learning resources and activities effectively.

Topics Covered:

Lesson 1: Building Connections and Community (3 hours)

Objective: Foster familiarity, rapport, and a sense of community among participants.

Content:

1. Self and Peer Introduction
    - Objectives: Encourage participants to share about themselves to build familiarity and rapport.
    - Activities: Structured introductions, sharing personal and professional interests, and expectations from the course.
2. Fill Out Online Profile
    - Objectives: Ensure participants have complete, informative profiles to enhance interaction and networking.
    - Activities: Guidance on profile completion and uploading details.
3. Send Online Greetings
    - Objectives: Promote initial engagement and a friendly, inclusive online environment.
    - Activities: Exchange welcome messages, initiate discussions based on profile interests, and establish communication etiquette for the course.

Lesson 2: Orientation to Learning and Course Structure (3 hours)

Objective: Introduce course rules, structure, and effective learning strategies to prepare participants for success.

Content:

1. Introduction to Course Rules and Requirements
    - Objectives: Ensure participants understand course expectations and guidelines.
2. Introduction to Course Road Map: KCL Structure

- **KnowledgeBook:** Foundation of critical theories and essential concepts for inquiry-based learning.
- **CollaborationBook:** Enhances group engagement through collaborative learning.
- **CaseBook:** Features a collection of case studies.
- **AssessmentBook:** Incorporates various assessment strategies.
- **ExperienceNotes:** Chronicles a student's learning journey.

3. Introduce Strategies for Learning Effectively in This Course
    - Project-Based Learning
    - Inquiry-Based Learning
    - Authentic Learning
    - AI-Enhanced Learning

Unit 2: Business Startups and Innovation

Overview:

Dive into the vibrant world of startups with this introductory Unit, designed to distinguish the dynamic nature of startup companies from small businesses and large corporations. Participants will journey through the entire lifecycle of a startup, from the spark of an idea to the challenging phases of scaling up.

Through a blend of theoretical insights and practical applications, this Unit equips students with the critical tools and knowledge needed to launch and grow innovative businesses in today’s competitive landscape.

This Unit emphasizes learning by doing. Students will create their own mock startup companies, which will serve as the foundation of their learning experience throughout the course. In subsequent Units, the focus will shift towards integrating AI technologies to enhance their startups' competitiveness and innovative capacity. This hands-on approach ensures that students not only understand the theories but also apply them in practical, impactful ways.

Overall Expectations:

- A1-IDC4U. demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- A2-IDC4U. demonstrate an understanding of the different structures and organization of each of the subjects or disciplines studied;

- B2-IDC4U.be able to access appropriate resources, using a variety of research strategies and technologies;
- C1-IDC4U. implement and communicate information about interdisciplinary endeavors, using a variety of methods and strategies;
- D1-BOH4M. analyse the importance of planning to the success of an organization;
- D3-BOH4M. analyse the relationship between strategic planning and the success of an organization;
- D4-BOH4M.analyse how companies respond to internal and external pressures for change;
- A3-TGJ4O. demonstrate an understanding of and apply the interpersonal skills necessary to work effectively with clients and peers;
- B1-TGJ4O. use project management techniques effectively in the development of photographic, digital imaging, animation, 3D modelling, and web design products;
- B2-TGJ4O. apply a design process or other problem-solving processes or strategies to meet a range of challenges in creating photographic, digital imaging, animation, 3D modelling, and web design products.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- Strategically analyze and navigate the competitive business environment using Porter's insights.
- Master the practical steps for launching a startup and building a startup team.
- Understand critical methodologies such as Lean Startup and Design Thinking to optimize product development and enhance customer satisfaction.
- Recognize the role of cutting-edge technologies in shaping modern business landscapes and driving innovation.
- Develop Interpersonal Skills: Through discussions and collaborative activities, students will enhance their interpersonal skills, learning to effectively communicate and work within a team focused on AI technologies.
- Design a simple website effectively.

Topics Covered:

2.1 Introduction to Startup Companies

- Definitions and Distinctions: Understand what constitutes a startup, and how it differs from other business forms such as small businesses and large corporations.

- Lifecycle of a Startup: Examine the stages of a startup from conception to scaling, highlighting key milestones and challenges encountered along the way.

2.2 Influential Methodologies: Lean Startup and Design Thinking

- Principles and Processes: Delve into the Lean Startup methodology and Design Thinking, learning how these frameworks can help rapidly test and refine business concepts.
- Case Studies: Analyze real-world examples where these methodologies have been successfully applied, drawing lessons on how they foster innovation and efficiency.

2.3 Michael E. Porter's Competitive Strategies

- Five Forces Analysis: Learn to assess the competitive landscape using Porter’s Five Forces model, an essential tool for any strategic business planning.
- Generic Strategies: Explore Porter’s three generic strategies—cost leadership, differentiation, and focus—and how startups can apply these strategies to secure a competitive edge and define their market niche.

2.4 Launching Your Own Startup and Building a Team

- Starting Your Business: Focus on the practical steps needed to launch a startup, emphasizing the role of design thinking and the importance of obtaining early customer feedback.
- Team Building: Recruit team members from your classmates who align with your startup's culture and goals.

2.5 The Role of Technology in Modern Startups

- Impact of Emerging Technologies: Examine how advancements in artificial intelligence (AI), blockchain, and the Internet of Things (IoT) are creating new opportunities and challenges for startups.
- Technology in Business Models: Discuss the integration of these technologies into business models, emphasizing their potential to revolutionize traditional practices and contribute to sustainable success.

Unit 3: History of Artificial Intelligence

This Unit delves into the rich history of Artificial Intelligence (AI), providing a comprehensive overview of the field's evolution, key terminologies, and pivotal figures whose groundbreaking work has shaped AI as we know it today. By the end of this Unit, students will have a thorough understanding of the historical context of AI, recognizing the monumental contributions of its earliest and most influential thinkers, and appreciating the ongoing developments that continue to push the boundaries of what AI can achieve.

Overall Expectations:

- A1-IDC4U. demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- C3-IDC4U. analyse and describe the impact on society of interdisciplinary approaches and solutions to real-life situations;
- D2-ICS3U. demonstrate an understanding of emerging areas of computer science research;
- A3-TGJ4O. demonstrate an understanding of and apply the interpersonal skills necessary to work effectively with clients and peers.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- Identify Key Figures and Concepts in AI such as Alan Turing, John McCarthy, and Marvin Minsky, and understand their roles in the development of artificial intelligence.
- Understand the Evolution of AI including major milestones and how the field has evolved from theoretical concepts to practical applications.
- Describe Interdisciplinary Approaches by explaining how interdisciplinary knowledge and methods contribute to advancements in AI.
- Apply Knowledge to Emerging Research understanding of current trends and emerging areas of research in AI, showing how historical advancements influence ongoing developments.
- Develop Interpersonal Skills: Through discussions and collaborative activities, students will enhance their interpersonal skills, learning to effectively communicate and work within a team focused on AI technologies.

Topics Covered:

3.1. AI Terminologies and Definitions: Gain a solid foundation in AI by understanding its core concepts and terminologies. This section clarifies commonly used terms and the principles underlying artificial intelligence.

3.2. Pioneers of AI:

- Alan Turing: Known for the Turing Test, Turing laid foundational ideas for theoretical computing and artificial intelligence, proposing that machines could simulate human thought processes.
- Marvin Minsky: Celebrated for his work on AI frameworks and cognitive theories, Minsky's contributions have profoundly influenced the development of AI.
- John McCarthy: Best known for coining the term "Artificial Intelligence" and often regarded as the "Father of Artificial Intelligence."

3.3. Godfathers of Deep Learning

- Geoffrey Hinton: Explore the contributions of Geoffrey Hinton, whose work on neural networks has catapulted the capabilities of deep learning.
- Yoshua Bengio and Yann LeCun: Alongside Hinton, Bengio and LeCun have been instrumental in advancing deep learning technologies, each contributing unique perspectives and innovations to the field.

3.4. Focus on Influential Figures

- Yoshua Bengio, Andrew Ng, Yuval Harari: This segment highlights how these contemporary thinkers influence AI’s narrative and application today, from academic theories to practical implementations.

3.5. AI Development Timeline - Road Map

- Visualize AI's progression through a detailed timeline that traces major milestones and developments in the field.

Unit 4: Introduction to Algorithms and Programming

This outline provides a structured approach to learning about algorithms and programming basics, supported by practical demonstrations and modern tools like Google Colab and Jupyter Notebook. This setup not only introduces theoretical concepts but also gives students hands-on experience to solidify their understanding.

Overall Expectations:

- A3-IDC4U. demonstrate an understanding of the different perspectives and approaches used in each of the subjects or disciplines studied;
- A4-IDC4U. demonstrate the skills and strategies used to develop interdisciplinary products and activities.
- B3-IDC4U. be able to process information, using a variety of research strategies and technologies;
- C1-IDC4U.implement and communicate information about interdisciplinary endeavors, using a variety of methods and strategies;
- A1-ICS3U. demonstrate the ability to use different data types, including one-dimensional arrays, in computer programs;
- A2-ICS3U.demonstrate the ability to use control structures and simple algorithms in computer programs;
- A4-ICS3U.use proper code maintenance techniques and conventions when creating computer programs.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- Grasp Basic Programming Concepts such as using conditionals, loops, and libraries to solve programming problems.
- Understand Fundamental Algorithms including Euclid's, Gale-Shapley, PageRank, sorting, and heuristic algorithms.
- Utilize Integrated Development Environments (IDEs) such as Google Colab and Jupyter Notebook.

- Critically assess the efficiency and applicability of different algorithms in solving real-world problems.
- Understand the limitations and strengths of various algorithmic approaches and when to apply them.
- Understand the evolution from Mathematical to Computational Algorithms.

Topics Covered:

4.1. Introduction to Algorithms
- Overview of Algorithms: Define what an algorithm is and discuss its role in problem-solving within computer science.
- Historical Algorithms
  - Euclid's Algorithm: Explore its importance in computing the greatest common divisor.
  - Gale-Shapley Algorithm: Understand its application in solving the stable matching problem.
- Modern Algorithms:
  - Google and PageRank: Discuss how PageRank algorithm revolutionized search technologies.
  - Search Engine Algorithms: Overview of how algorithms process and retrieve information.
  - Sorting Algorithms: Introduce different types of sorting methods and their efficiencies.
  - Heuristic Algorithms: Explain how these are used for decision making in situations with incomplete information.
- Algorithms Roadmap:
  - Evolution from Mathematical to Computational Algorithms: Trace the transition from purely mathematical algorithms to their applications in computer science.
  - Machine Learning Algorithms: Introduction to algorithms that learn from data, enhancing machine capabilities.

4.2. Programming Basics
- Introduction to Programming Concepts
  - Conditionals: Learn how to make decisions in programming using if, else, and else if statements.
  - Loops: Understand the use of for and while loops for repeating actions.
  - Libraries: Discuss the importance of libraries in extending the functionality of programs.
  - Syntax: Basics of syntax in a programming language to write error-free code.

4.3. Programming IDEs
- Google Colab
- Jupyter Notebook

4.4. Coding Demonstration
- Live Python Coding with ChatGPT: Demonstration of how ChatGPT can assist in generating code snippets.
  - Interactive Session: Engage students in an interactive coding session where they can suggest problems, and ChatGPT provides coding solutions.
  - Exploration of Code Examples: Walk through various examples to see how different algorithms and programming concepts are applied in real code.

Unit 5: Machine Learning and its Business Application

This Unit aims to equip students with a comprehensive understanding of machine learning and data science, emphasizing both the theoretical underpinnings and practical applications, particularly in business contexts. Through a blend of lectures, problem-based inquiry learning, case studies, and real-world examples, students will gain the skills needed to apply machine learning techniques to solve business challenges.

Overall Expectations:

- A1-IDC4U.demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- A3-IDC4U. demonstrate an understanding of the different perspectives and approaches used in each of the subjects or disciplines studied;
- A4-IDC4U. demonstrate the skills and strategies used to develop interdisciplinary products and activities.
- B1-IDC4U.be able to plan for research, using a variety of strategies and technologies;
- B2-IDC4U.be able to access appropriate resources, using a variety of research strategies and technologies;
- B3-IDC4U.be able to process information, using a variety of research strategies and technologies;
- B4-IDC4U.be able to assess and extend their research skills to present their findings and solve problems.
- C1-IDC4U.implement and communicate information about interdisciplinary endeavors, using a variety of methods and strategies;
- C2-IDC4U.evaluate the quality of interdisciplinary endeavours, using a variety of strategies;
- A1-MDM4U.solve problems involving the probability of an event or a combination of events for discrete sample spaces;

- A2-MDM4U.solve problems involving the application of permutations and combinations to determine the probability of an event.
- C1-MDM4U. demonstrate an understanding of the role of data in statistical studies and the variability inherent in data, and distinguish different types of data;
- C2-MDM4U. describe the characteristics of a good sample, some sampling techniques, and principles of primary data collection, and collect and organize data to solve a problem.
- A2-BOH4M.demonstrate the use of appropriate communication techniques related to business management;
- B2-BOH4M. demonstrate an understanding of group dynamics;
- C2-BOH4M.evaluate the strategies used by individuals and organizations to manage stress and conflict;
- D1-BOH4M.analyse the importance of planning to the success of an organization;
- D2-BOH4M.demonstrate an understanding of appropriate planning tools and techniques in a variety of situations;
- D3-BOH4M.analyse the relationship between strategic planning and the success of an organization;
- D4-BOH4M.analyse how companies respond to internal and external pressures for change.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- Evaluate Datasets for Machine Learning;
- Understand Different Types of Machine Learning;
- Recognize Machine Learning as a Transformative Technology;
- Describe Industry Applications of Machine Learning;
- Investigate Machine Learning for Business Competitive Advantage;
- Recommend Machine Learning Applications Within an Organization;
- Evaluate Aspects of Machine Learning Applications.

Topics Covered:

4.1. Data Science and Artificial Intelligence
- Introduction to Data Science.
- Data Science and Machine Learning.

4.2. Tools for Data Science and Machine Learning

- Google Colab and Kaggle- IDEs for data science.
- Processing Datasets with Python.

4.3. Datasets for Machine Learning and Data Science
- Overview of Popular Datasets such as the Stanford Dogs Dataset and The Boston Housing Dataset.
- Top Sources for Machine Learning Datasets: Discuss where to find and how to choose datasets for different machine learning problems.

4.4. Understanding Machine Learning
- Teachable Machine: Interactive demonstration using a simple machine learning model.
- Types of Machine Learning.

4.5. Machine Learning Examples: Step-by-step coding tutorial in Google Colab, focusing on a basic deep learning model.

4.6. Case Studies in Business Applications
- Use case of Machine Learning in Business such as Uber, Airbnb.
- Growing Your Startups with Machine Learning: Practical strategies for Your startups to leverage machine learning for growth and competitive advantage.

Unit 6: NLP and Its Business Applications

This Unit provides a comprehensive overview of Natural Language Processing (NLP), practical techniques, use cases, and strategic business applications. It ensures that students not only learn about NLP but also apply their knowledge in practical, business-driven scenarios, enhancing their strategic and technical skills. students will gain the skills needed to apply NLP techniques to solve business challenges.

Overall Expectations:

- A1-IDC4U.demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- A3-IDC4U. demonstrate an understanding of the different perspectives and approaches used in each of the subjects or disciplines studied;
- A4-IDC4U. demonstrate the skills and strategies used to develop interdisciplinary products and activities.
- B1-IDC4U.be able to plan for research, using a variety of strategies and technologies;

- B2-IDC4U.be able to access appropriate resources, using a variety of research strategies and technologies;
- B3-IDC4U.be able to process information, using a variety of research strategies and technologies;
- B4-IDC4U.be able to assess and extend their research skills to present their findings and solve problems.
- C1-IDC4U.implement and communicate information about interdisciplinary endeavors, using a variety of methods and strategies;
- C2-IDC4U.evaluate the quality of interdisciplinary endeavours, using a variety of strategies;
- A2-BOH4M.demonstrate the use of appropriate communication techniques related to business management;
- C2-BOH4M.evaluate the strategies used by individuals and organizations to manage stress and conflict;
- D1-BOH4M.analyse the importance of planning to the success of an organization;
- D3-BOH4M.analyse the relationship between strategic planning and the success of an organization;
- D4-BOH4M.analyse how companies respond to internal and external pressures for change.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- identify and explain the key features of NLP that classify it as a transformative technology in various sectors.
- understand how organizations can leverage NLP to gain competitive advantages.
- assess the suitability of NLP applications within an organization, considering factors like data availability, organizational needs, and potential ROI.
- gain the skills to implement and utilize NLP applications for educational purposes, such as creating personalized learning experiences and automating administrative tasks.
- design and optimize prompts to enhance the performance of NLP models.

Topics Covered:

6.1. Features of Natural Language Processing (NLP)
- Explore the core components and transformative features of Natural Language Processing (NLP)

6.2. Techniques of Prompt Engineering
- Learn practical techniques for designing and optimizing prompts to enhance the performance of NLP models.

6.3. NLP Applications

- Explore a diverse range of NLP applications such as Sentiment Analysis, Summarization, Story Generation, Image Generation, and Audio Generation.

6.4. NLP Use Cases

- Examine specific use cases such as ChatGPT, chatbots, AI Avatar, and Robotic Process Automation (RPA), focusing on their implementation and business impact.

6.5. Implementing NLP Strategies in Startups

- Discover strategies for integrating NLP into startup environments to drive innovation and competitive advantage.

Unit 7: Robotics for Business

This Unit provides a structured approach to exploring robotics and their applications in business contexts. It focuses on various types of robots, real-world use cases, and strategic implications. Students will learn how to apply robotics techniques to enhance the competitive edge of their startup companies.

Overall Expectations:

- A1-IDC4U.demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- A3-IDC4U. demonstrate an understanding of the different perspectives and approaches used in each of the subjects or disciplines studied;
- A4-IDC4U. demonstrate the skills and strategies used to develop interdisciplinary products and activities.
- B1-IDC4U.be able to plan for research, using a variety of strategies and technologies;
- B2-IDC4U.be able to access appropriate resources, using a variety of research strategies and technologies;
- B3-IDC4U.be able to process information, using a variety of research strategies and technologies;
- B4-IDC4U.be able to assess and extend their research skills to present their findings and solve problems.
- C2-BOH4M.evaluate the strategies used by individuals and organizations to manage stress and conflict;
- D4-BOH4M.analyse how companies respond to internal and external pressures for change.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- understand different types of robotics and physical Robots.
- gain knowledge of how robots are currently being deployed in different industries and organizations.
- evaluate and implement robotics in a business setting to gain a competitive advantage, including case studies of successful integrations.
- gain knowledge of how robots can be used as educational tools, including their impact on teaching methodologies and learning outcomes.
- analyze whether the implementation of robotics is suitable for their specific organizational needs, considering factors such as cost, infrastructure, and expected benefits.
- assess the strategic, technical, and operational factors involved in implementing robotics, understanding the challenges and requirements for successful deployment.

Topics Covered:

7.1. Introduction to Robotics
- Key Functions: Overview of primary robotics functions.
- Types of Robotics: Different categories and their roles in business.

7.2. Types of Physical Robots
- Categories: Industrial Robots, Humanoid Robots, etc.

7.3. Robots in Teaching and Learning
- Educational Impact: Exploring how robots are transforming education.
- NAO robot in educational settings.

7.4. Robotics Use Cases:
- ABB IRB 6700, robots from Boston Dynamics, BYD Auto, etc.

7.5. Build Your Own Robot
- Activity: Guide to creating your own robot.

7.6. Strategic Application of Robotics

- How robotics and RPA solutions can boost competitiveness for businesses.

Unit 8. AI and Society

This Unit explores the multifaceted impacts of Artificial Intelligence (AI) on business and society. It addresses how AI technologies influence the future of work, ethical considerations, and the dynamics of human-machine partnerships. This Unit aims to enhance understanding and critical thinking regarding the broader implications of AI, preparing students to engage thoughtfully with these transformative technologies.

Overall Expectations:

- A1-IDC4U.demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- B4-IDC4U.be able to assess and extend their research skills to present their findings and solve problems.
- C4-IDC4U. analyse and describe how interdisciplinary skills relate to personal development and careers.
- A3-BOH4M. evaluate the impact of issues related to ethics and social responsibility on the management of organizations.
- D4-BOH4M.analyse how companies respond to internal and external pressures for change;
- E2-BOH4M. assess the ways in which organizational structures have changed to adapt to the changing nature of work;
- C1-MDM4U. demonstrate an understanding of the role of data in statistical studies and the variability inherent in data, and distinguish different types of data;
- C2-MDM4U. describe the characteristics of a good sample, some sampling techniques, and principles of primary data collection, and collect and organize data to solve a problem.
- E2-MDM4U. communicate the findings of a culminating investigation and provide constructive critiques of the investigations of others.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- Articulate key concepts and issues concerning AI's impact on various societal and business sectors.
- Evaluate AI's Influence on the Future of Work.
- Analyze Ethical Considerations in AI Deployment.
- Investigate Human-Machine Partnerships.

- Explore AI's Impact on Social Media and Society.
- Connect Interdisciplinary Skills to Personal and Professional Development.
- Discuss Organizational Adaptation to AI.

Topics Covered:

8.1. **Introduction to AI and Its Societal Impacts**
- Overview of AI's role in modern society.
- Broad impacts of AI on business ecosystems and societal structures.

8.2. **AI and the Future of Work**
- How AI is reshaping job markets and employment trends.
- Skills that are increasing in demand due to AI integration.
- Adaptation of workforce strategies in response to AI technologies.

8.3. **Ethical Considerations in AI**
- Overview of ethical dilemmas and concerns in AI deployment.
- AI in workplace surveillance and privacy issues.
- Understanding 'transparency' in AI systems and its ethical significance.
- Strategies for assessing and addressing ethical risks in AI projects.

8.4. **Risks and Benefits of Human-Machine Partnerships**
- Exploration of potential risks and opportunities in human-machine collaboration.
- Impact of AI systems trained on biased data and potential mitigation strategies.
- Significance of explainable AI (XAI) and its role in enhancing system transparency.

8.5. **AI and Social Media**
- Examination of AI's influence on social media dynamics.
- The phenomenon of filter bubbles and its implications for information diversity.

8.6. **AI and sustainability**
- Technological Innovations and Environmental Impact.
- Ethical Considerations and Social Responsibility

Unit 9: The future of artificial intelligence

This Unit is designed to provide a comprehensive overview of the potential and challenges of AI, fostering critical thinking and informed discussions about the role of technology in shaping our future. It combines insights from leading thinkers and current research to explore potential trajectories of AI development, ethical considerations, and the role of AI in shaping societal and organizational structures.

Overall Expectations:

- A1-IDC4U.demonstrate an understanding of the key ideas and issues related to each of the subjects or disciplines studied;
- C4-IDC4U. analyse and describe how interdisciplinary skills relate to personal development and careers.
- D4-BOH4M.analyse how companies respond to internal and external pressures for change.

Learning Outcomes:

By the end of this Unit, participants will be able to:

- Demonstrate an understanding of key ideas and future projections about AI development.
- Develop the ability to present, argue, and critique ideas effectively in interactive sessions focused on AI's influence on personal lives and career opportunities.
- Critically examine and discuss insights from thought leaders like Yuval Noah Harari and others on the broader implications of AI for humanity's future.
- Engage with ethical considerations of AI development, especially the implications of AI surpassing human intelligence and its impact on societal norms and personal privacy.

Topics Covered:

9.1. Introduction to Future AI Predictions

- Overview of AI's potential future developments and the pace of technological progress.
- Exploration of predictions by experts on how AI will evolve by 2050.

9.2. Impact of AI on Society

- Insightful discussions from Yuval Noah Harari and others on how AI will shape humanity’s future.
- Analysis of significant talks like Yann LeCun's keynote on ChatGPT and its societal impacts.

9.3. AI and Superintelligence

- Examination of viewpoints from Demis Hassabis and others on AI and superintelligence.
- Discussing the implications of developing AI technologies that may surpass human intelligence.

9.4. AI's Role in Personal and Professional Lives

- Predictions on how life might look like in 2050 with AI integration in daily activities.
- Future skills that will be in demand as AI technologies become more integrated into the workplace.

9.5. Discussion and Reflection

- Opportunities for students to share their predictions and concerns about the future of AI.
- Interactive sessions to discuss how AI might personally and professionally impact their futures.