



NORTHERN TECHNICAL
UNIVERSITY

Undergraduate Degree Program Catalogue | 2024-2025 |

دليل البرنامج الدراسي – قسم هندسة تقنيات الذكاء الاصطناعي

Northern Technical University

الجامعة التقنية الشمالية

بكالوريوس هندسة تقنيات الذكاء الاصطناعي

Bachelor's degree in Artificial Intelligence Techniques Engineering

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1. Vision and Mission Statement

Vision:

To impart quality education and produce industry ready professionals and achieve excellence and leadership in the field of Artificial Intelligence Technologies by preparing specialized engineering professionals with advanced scientific and practical skills, capable of developing innovative solutions to global challenges, supporting sustainable digital transformation, and fostering innovation and scientific research to build a technologically advanced future that aligns with the Fourth Industrial Revolution.

Mission:

To prepare scientifically and practically qualified engineers with advanced knowledge and skills in the field of artificial intelligence and its technologies, capable of developing innovative solutions to address technical and societal challenges. The department is committed to supporting scientific research, fostering innovation, and enhancing collaboration with industrial and academic institutions to achieve digital transformation and build a sustainable future that keeps pace with global technological advancements.

2. Graduate Objectives:

The Artificial Intelligence Department has the following graduate objectives:

1. **Advance AI Research and Development:** Foster cutting-edge research in artificial intelligence to solve complex real-world problems and contribute to the global body of knowledge in AI.
2. **Promote Interdisciplinary Collaboration:** Collaborate across diverse fields such as computer science, robotics, healthcare, and business to drive innovation and implement AI solutions effectively.
3. **Prepare Future AI Leaders:** Equip students with comprehensive knowledge and practical skills in AI technologies to prepare them for leadership roles in academia, industry, and government.
4. **Encourage Ethical AI Practices:** Develop and promote AI systems that adhere to ethical standards, prioritizing fairness, transparency, accountability, and respect for privacy.
5. **Develop Industry Partnerships:** Build strong collaborations with industry leaders to ensure the curriculum remains relevant and aligned with market demands while fostering internship and employment opportunities.
6. **Support Societal Impact Initiatives:** Create AI systems that address societal challenges such as healthcare, education, environmental sustainability, and public safety.

7. **Promote Innovation and Entrepreneurship:** Encourage students and faculty to engage in AI-based startups and innovation projects to drive economic growth and technological advancement.
8. **Integrate AI Across Disciplines:** Support the integration of AI into other engineering and scientific disciplines to enable intelligent systems across domains.
9. **Focus on Computational Efficiency:** Research and implement efficient AI algorithms and architectures to ensure sustainable and scalable AI solutions.
10. **Foster Lifelong Learning:** Provide continuing education programs, certifications, and workshops to help professionals stay updated on the latest advancements in AI.
11. **Build State-of-the-Art Infrastructure:** Develop and maintain advanced AI labs, tools, and computing resources to support academic and research excellence.
12. **Engage in Global Collaboration:** Participate in international AI initiatives and conferences to promote knowledge exchange and position the department as a global leader in AI education and research.

3. Scientific and practical description:

Scientific Description

1. Theoretical Foundations:
 - Study of algorithms, neural networks, and machine learning models.
 - Exploration of natural language processing, computer vision, and data mining.
 - Understanding cognitive science principles that influence AI behavior and decision-making.
 2. Research Areas:
 - AI models for optimization, automation, and innovation.
 - Ethical AI and bias reduction in machine learning.
 - AI-driven solutions in multi-disciplinary fields such as robotics, healthcare, and autonomous systems.
 - Investigation of AI's impact on human-computer interaction and social behavior.
 3. Technological Integration:
 - Design and improvement of intelligent systems that mimic human intelligence.
 - Research on AI's role in Internet of Things (IoT), edge computing, and big data analytics.
 - Development of sustainable AI models for energy-efficient applications.
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Practical Description

1. Skills Development:
 - Training students and researchers in programming languages like Python, R, and frameworks like TensorFlow, PyTorch.
 - Providing hands-on experience in deploying AI systems on cloud platforms like AWS, Azure, or Google Cloud.
2. Application Domains:

- Engineering intelligent solutions for real-world problems in healthcare, transportation, and manufacturing.
 - Implementing AI in predictive analytics, anomaly detection, and recommendation systems.
3. Interdisciplinary Collaboration:
- Combining AI with disciplines like mechanical engineering, biomedical engineering, and business analytics.
 - Supporting innovation in autonomous vehicles, smart cities, and adaptive learning technologies.
4. Industrial Impact:
- Building partnerships with industries for AI integration in product development and process optimization.
 - Leading initiatives in Industry 4.0, including robotics automation and AI-driven quality control.
 - Ethics and Policy Development:
 - Educating on the societal implications of AI, ensuring responsible AI usage.
 - Collaborating on policy-making for AI safety, data privacy, and equitable technology deployment.

4. Program Specification:

Program code	AITE	ECTS	240
Duration	4 levels, 8 semesters	Method of attendance	Full time

The Artificial Intelligence Engineering program aims to produce graduates who can design, develop, and implement AI-driven solutions to address real-world challenges. The program integrates foundational principles of computer science, data science, and engineering with advanced AI techniques and applications.

The key components of Artificial Intelligence engineering department are:

- 1- Academic framework

- 2- Research and development
- 3- Practical training and skill development
- 4- Industry collaboration
- 5- Student engagement

5. Program goals

Academic Excellence: Provide Foundational Knowledge: Equip students with a strong theoretical understanding of AI, computer science, and engineering principles.

Interdisciplinary Education: Integrate AI with fields such as robotics, data science, healthcare, business, and environmental science.

Promote Lifelong Learning: Encourage continuous learning to keep pace with the rapidly evolving AI field.

2. Research Innovation

Advance AI Frontiers: Conduct groundbreaking research in machine learning, deep learning, computer vision, and natural language processing.

Solve Real-World Problems: Develop AI-driven solutions for challenges in industries like healthcare, transportation, energy, and finance.

Foster Collaborative Research: Encourage interdisciplinary and global research partnerships to advance AI applications.

3. Practical Skill Development

Hands-On Experience: Provide opportunities for students to work on real-world projects, internships, and industry collaborations.

Tool Proficiency: Train students in cutting-edge tools and platforms such as TensorFlow, PyTorch, and cloud-based AI solutions.

Capstone and Industry Projects: Enable students to apply theoretical knowledge to solve practical challenges through final-year projects and internships.

4. Ethical and Social Responsibility

Ethical AI Practices: Teach students to design AI systems that are ethical, fair, and unbiased.

Awareness of Societal Impact: Highlight the implications of AI on society, economy, and culture, promoting responsible development.

Sustainability and Inclusivity: Encourage AI solutions that support environmental sustainability and address global inequalities.

5. Industry Readiness

Career Preparation: Equip students with the skills needed to excel in AI-related roles, such as AI engineers, data scientists, and machine learning specialists.

Adaptability: Train graduates to adapt AI solutions to various domains, ensuring relevance in diverse industries.

Entrepreneurship: Encourage innovation and entrepreneurship through incubation programs and startup support.

6. Leadership and Global Impact

Develop Future Leaders: Cultivate leadership skills for students to take on pivotal roles in AI research, development, and strategy.

Contribute to Global AI Strategy: Prepare graduates to contribute to national and international AI policies, standards, and development goals.

Promote Diversity in AI: Encourage diverse perspectives and inclusivity in AI research, development, and application.

7. Community and Outreach

AI for Social Good: Promote projects that use AI to address societal challenges such as poverty, healthcare access, and education.

Public Engagement: Organize workshops, seminars, and community events to increase AI awareness and understanding.

Global Collaboration: Partner with international universities and organizations to share knowledge and foster innovation.

8. Continuous Improvement

Curriculum Enhancement: Regularly update the curriculum to reflect advancements in AI technology and industry demands.

Faculty Development: Support faculty in pursuing professional development to stay at the forefront of AI research and education.

Program Evaluation: Implement quality assurance mechanisms to assess and improve the effectiveness of the program.

6. Student learning outcomes

Foundational Knowledge

Core AI Concepts: Understand and apply fundamental principles of artificial intelligence, machine learning, deep learning, and data science.

Mathematics and Programming: Demonstrate proficiency in mathematical concepts (linear algebra, calculus, probability) and programming languages (Python, R, C++) essential for AI.

2. Technical Expertise

AI Model Development: Design, implement, and optimize machine learning and deep learning models for various applications.

Data Analysis: Collect, preprocess, analyze, and interpret large datasets for AI applications using advanced tools and frameworks.

System Integration: Integrate AI solutions with hardware and software systems, including IoT and edge devices.

3. Problem-Solving and Innovation

Critical Thinking: Identify, analyze, and solve complex real-world problems using AI methodologies.

Creativity: Develop innovative AI-driven solutions tailored to specific domains such as healthcare, robotics, finance, and smart cities.

4. Research and Development

Research Skills: Conduct independent and collaborative research to advance knowledge in AI and related fields.

Scientific Communication: Present findings effectively through technical reports, academic papers, and oral presentations.

5. Ethical and Social Responsibility

Ethical AI Practices: Understand and apply ethical principles to ensure fairness, transparency, and accountability in AI systems.

Societal Impact: Assess the societal, economic, and environmental implications of AI technologies.

6. Practical and Technical Skills

Hands-On Proficiency: Use state-of-the-art AI tools and platforms such as TensorFlow, PyTorch, MATLAB, and cloud-based AI services.

Project Implementation: Design, execute, and evaluate projects that address real-world challenges using AI techniques.

Testing and Validation: Perform rigorous testing, validation, and evaluation of AI models to ensure reliability and effectiveness.

7. Communication and Collaboration

Effective Communication: Communicate technical concepts clearly to diverse audiences, including peers, stakeholders, and non-experts.

Teamwork: Work effectively in multidisciplinary teams, collaborating with professionals from various fields to achieve common goals.

8. Lifelong Learning

Adaptability: Stay current with emerging trends, tools, and advancements in AI through continuous learning.

Self-Directed Learning: Demonstrate the ability to acquire new knowledge independently and integrate it into professional practice.

9. Industry Readiness

Professional Skills: Apply AI knowledge to solve industry-specific challenges and meet organizational needs.

Entrepreneurship: Exhibit entrepreneurial skills by identifying opportunities and creating innovative AI-based solutions or startups.

10. Leadership and Global Competence

Leadership: Demonstrate the ability to lead AI projects, teams, or initiatives in academic or professional settings.

Global Perspective: Apply AI knowledge and skills to contribute to global challenges, policies, and sustainable development goals.

7. **Academic staff**

NORTHEN TECHNICAL UNIVERSITY
 TECHNICAL ENGINEERING COLLEGE FOR COMPUTER AND ARTIFICIAL INTELLIGENCE
 ARTIFICIAL INTELLIGENCE ENGINEERING TECHNIQUES DEPARTMENT

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8. Credits, Grading and GPA:

Credits in the Computer Techniques Engineering Department are following the Bologna Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is 240, 30 ECTS per semester. 1 ECTS is equivalent to 27 student workloads, including structured and unstructured workload.

Grading: Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

Grading Scheme			
Group	Grade	Marks%	Definition
Success Group (50-100)	Excellent	Outstanding Performance	
	Very Good	Above average with some errors	
	Good	Sound work with notable errors	
	Satisfactory	Fair but with major shortcomings	
	Sufficient	Work meets minimum criteria	
Fail Group (0-49)	FX-Fail	More work required but credit awarded	
	F - Fail	Considerable amount of work required	
NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The university has a policy NOT to condone “near-pass fails” so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.			

Calculation of the Grade Point Average (GPA)

The GPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

GPA of 4-year B.Sc. degrees:

$$\text{GPA} = [(1\text{st module score} \times \text{ECTS}) + (2\text{nd module score} \times \text{ECTS}) + \dots] / 240$$

1. Undergraduate Courses / Modules 2024-2025:

Level 1 - First Semester							Bachelor of Artificial Intelligence Techniques Engineering
CODE	TITLE	المواد الدراسية	T	P	C	ECTS	
BAITE101-S1	Digital Logic	منطق رقمي	2	2	3	6	
BAITE102-S1	Mathematics	رياضيات	3	0	3	5	
BAITE103-S1	Artificial Intelligence	ذكاء صناعي	2	0	2	5	
BAITE104-S1	Computer Programming	برمجة الحاسوب	2	2	3	5	
BAITE105-S1	DC Circuit Analysis	تحليل دوائر التيار المستمر	2	2	3	5	
NTU100	Democracy and Human Rights	ديمقراطية وحقوق انسان	2	0	1	2	
NTU101	English Language	اللغة الانكليزية	2	0	1	2	
T:Theoretical, P:Practical, C:Credit			15	7	16	30	

Level 1 - Second Semester							Bachelor of Artificial Intelligence Techniques Engineering
CODE	TITLE	المواد الدراسية	T	P	C	ECTS	
BAITE101-S2	Digital Circuits	دوائر منطقية	2	2	3	6	
BAITE102-S2	Engineering Mathematics	رياضيات هندسية	3	0	3	6	
BAITE103-S2	Mechanics Engineering	الميكانيك الهندسي	2	2	3	5	
BAITE104-S2	Engineering Workshop	ورشة هندسية	0	2	1	3	
BAITE105-S2	AC Circuit Analysis	تحليل دوائرالتيار المتناوب	2	2	3	5	
NTU-102	Arabic Language	اللغة العربية	2	0	2	2	
NTU-103	Computer	حاسوب	2	1	2	3	
T:Theoretical, P:Practical, C:Credit			13	9	17	30	

1. Contacts:

Undergraduate Degree Program

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