CURRICULUM DOSSIER

WORLD ACADEMY™ OF CAREER PROGRAMMES

FUTURE VARSITY EDUCATION GROUP

CAREER PROGRAMMES

Artificial Intelligence

INTERNATIONAL DIPLOMA (GRADE 11) + INTERNATIONAL ADVANCED DIPLOMA (GRADE 12)

#Where Passion™ Meets Profession

CAREER PROGRAMMES
ARTIFICIAL INTELLIGENCE

CURRICULUM DOSSIER

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CAREER PROGRAMMES
ARTIFICIAL INTELLIGENCE

CURRICULUM DOSSIER

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CAREER PROGRAMMES

ARTIFICIAL INTELLIGENCE

PROGRAMME OVERVIEW

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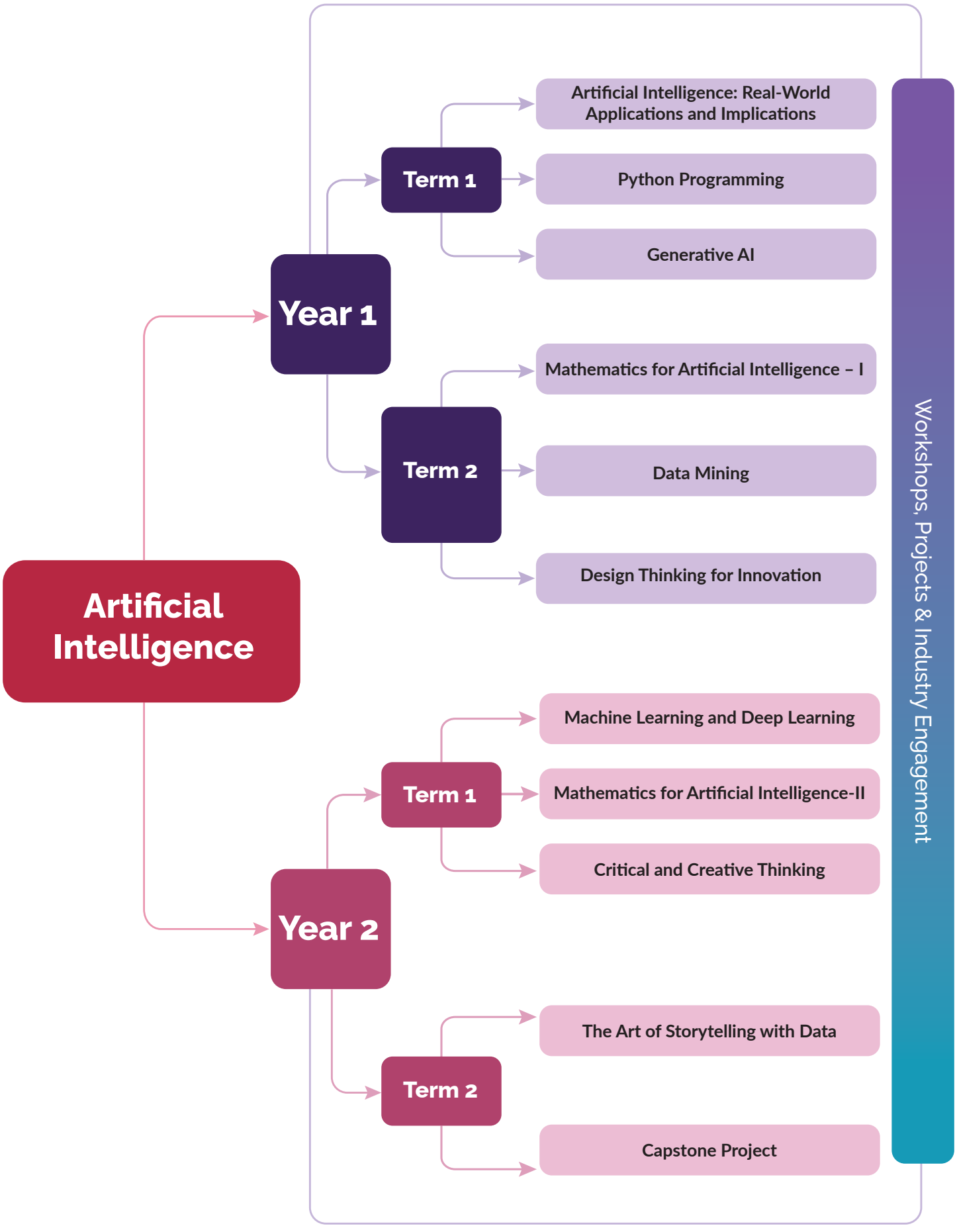
PROGRAMME OVERVIEW

Programme Description

WACP's qualification in Artificial Intelligence, encompassing the International Diploma and International Advanced Diploma, is designed for students aiming to deepen their skills in AI and related fields. The curriculum encompasses a diverse range of subjects, including Python programming, machine learning, data mining, design thinking, and critical analytical skills. Each course integrates practical projects and assessments to ensure students can apply their learning in real-world scenarios. This progressive structure ensures robust preparation for those pursuing advanced careers in AI development, data science, and technological innovation.

Programme Structure

Course Code	Courses	Credits	Year 1 IDAI	Year 2 IADAI
IDAI101	Artificial Intelligence: Real-World Applications and Implications	4	**60 hrs**	–
IDAI102	Python Programming	5	**75 hrs**	–
IDAI103	Generative AI	3	**45 hrs**	–
IDAI104	Mathematics for Artificial Intelligence – I	3	**45 hrs**	–
IDAI105	Data Mining	3	**45 hrs**	–
IDAI106	Design Thinking for Innovation	3	**45 hrs**	–
IADAI201	Machine Learning and Deep Learning	5	–	**75 hrs**
IADAI202	Mathematics for Artificial Intelligence – II	3	–	**45 hrs**
IADAI203	Critical and Creative Thinking	3	–	**45 hrs**
IADAI204	The Art of Storytelling with Data	4	–	**60 hrs**
IADAI205	Workshops, Projects & Industry Engagement	6	**90 hrs**	
IADAI206	Capstone Project	6	–	**90 hrs**
	Total	**48**	**720 hrs**	


Artificial Intelligence
Year 1
Term 1
Artificial Intelligence: Real-World Applications and Implications
Python Programming
Generative AI
Term 2
Mathematics for Artificial Intelligence – I
Data Mining
Design Thinking for Innovation
Year 2
Term 1
Machine Learning and Deep Learning
Mathematics for Artificial Intelligence-II
Critical and Creative Thinking
Term 2
The Art of Storytelling with Data
Capstone Project
Workshops, Projects & Industry Engagement

CAREER PROGRAMMES

ARTIFICIAL INTELLIGENCE

PROGRAMME OUTCOMES

CAREER PROGRAMMES
ARTIFICIAL INTELLIGENCE

PROGRAMME OUTCOMES

On successful completion of the Programme, a student will be able to:

PO1 Develop a comprehensive understanding of artificial intelligence, including its foundational theories, ethical considerations, and practical applications across various sectors.

PO2 Demonstrate proficiency in utilising AI tools for real-world applications, including data analysis, machine learning, and generative AI projects.

PO3 Develop research and analytical skills to work on significant projects, analyse complex datasets, and synthesise information to make informed decisions supported by data.

PO4 Apply their AI knowledge to solve complex problems and innovate new solutions, leveraging design thinking and creative approaches to address real-world challenges effectively.

PO5 Exhibit strong communication skills, capable of articulating AI concepts and manage projects to present AI-driven solutions.

Mapping of Programme Outcomes & Courses

International Diploma in Artificial Intelligence (IDAI)	PO1	PO2	PO3	PO4	PO5
Artificial Intelligence: Real-World Applications and Implications	✓	✓			✓
Python Programming		✓	✓	✓	✓
Generative AI	✓	✓	✓	✓	
Mathematics for Artificial Intelligence –I	✓	✓		✓	
Data Mining		✓	✓	✓	✓
Design Thinking for Innovation				✓	✓

International Advanced Diploma in Artificial Intelligence (IADAI)	PO1	PO2	PO3	PO4	PO5
Machine Learning and Deep Learning	✓	✓		✓	✓
The Art of Storytelling with Data	✓		✓		✓
Critical and Creative Thinking	✓	✓		✓	✓
Mathematics for Artificial Intelligence – II	✓	✓	✓	✓	✓
Workshops, Projects & Industry Engagement	✓	✓	✓	✓	✓
Capstone Project		✓	✓	✓	✓

IDAI
International Diploma in Artificial Intelligence

On successful completion of the Programme, a student will be able to:

PO1 Develop a comprehensive understanding of artificial intelligence, including its foundational theories, ethical considerations, and practical applications across various sectors.

PO2 Demonstrate proficiency in utilising AI tools for real-world applications, including data analysis, machine learning, and generative AI projects.

PO3 Develop research and analytical skills to work on significant projects, analyse complex datasets, and synthesise information to make informed decisions supported by data.

PO4 Apply their AI knowledge to solve complex problems and innovate new solutions, leveraging design thinking and creative approaches to address real-world challenges effectively.

PO5 Exhibit strong communication skills, capable of articulating AI concepts and manage projects to present AI-driven solutions.

Mapping of Programme Outcomes & Course Outcomes

Course 1: Artificial Intelligence: Real-World Applications and Implications	PO1	PO2	PO3	PO4	PO5
CO1.1 Develop a foundational understanding of Artificial Intelligence, encompassing its societal impacts and core principles.	✓				
CO1.2 Gain practical experience with leading AI tools such as IBM Watson, through hands-on experimentation in cloud labs.		✓			✓
CO1.3 Analyse ethical considerations and biases inherent in AI applications, exploring their societal implications.	✓				
CO1.4 Investigate conscious and responsible AI development principles, while understanding regulatory frameworks governing AI ethics.	✓				
CO1.5 Explore both the potential societal benefits and pitfalls of AI implementation, emphasising its impacts on individuals and communities.					

Mapping of Programme Outcomes & Course Outcomes

Course 2: Python Programming	PO1	PO2	PO3	PO4	PO5
CO2.1 Develop proficiency in Python programming through practical application.		✓			
CO2.2 Create games, interactive applications, & practical apps using Python.		✓			✓
CO2.3 Master Python data types, structures, modelling, and object-oriented programming principles.			✓		
CO2.4 Utilise Python libraries for data manipulation and application development.			✓		
CO2.5 Apply heuristics and cognitive approaches to problem-solving using programming techniques.				✓	

Course 3: Generative AI	PO1	PO2	PO3	PO4	PO5
CO3.1 Demonstrate an understanding of the fundamentals of Generative AI and Large Language Models (LLMs), understanding their capabilities and limitations for practical use.		✓			
CO3.2 Gain hands-on experience analysing different prompting techniques and effective interaction with LLMs.		✓			
CO3.3 Develop an understanding of prompt engineering, configuring LLMs for specific generative tasks, Generative adversarial networks (GANs) and Variational autoencoders (VAEs).				✓	
CO3.4 Acquire knowledge of responsible AI practices, including ethical considerations and deployment strategies, fostering ethical development and deployment of Generative AI technologies.	✓				

Mapping of Programme Outcomes & Course Outcomes

Course 4: Mathematics for Artificial Intelligence –I	PO1	PO2	PO3	PO4	PO5
CO4.1 Understand the Basics of Linear Algebra	✓				
CO4.2 Solve problems using Algebra		✓			
CO4.3 Understand Eigenvalues and Eigenvectors				✓	
CO4.4 Apply Transformation Matrices				✓	

Course 5: Data Mining	PO1	PO2	PO3	PO4	PO5
CO5.1 Apply theoretical and practical knowledge of data mining to solve real-world problems.		✓			
CO5.2 Interpret the principles of classification, association analysis, clustering, and anomaly detection				✓	
CO5.3 Develop and write efficient data mining algorithms			✓		✓
CO5.4 Critically assess data mining results to avoid false discoveries.				✓	
CO5.5 Synthesise and reflect on data mining methods to enhance decision-making in business contexts.				✓	✓

Course 6: Design Thinking for Innovation	PO1	PO2	PO3	PO4	PO5
CO6.1 Analyse design thinking as a problem-solving approach.				✓	
CO6.2 Create and assess innovative solutions, demonstrating out-of-the-box thinking.				✓	
CO6.3 Develop Leadership and entrepreneurial qualities through design thinking.					✓

On successful completion of the Programme, a student will be able to:

PO1 Develop a comprehensive understanding of artificial intelligence, including its foundational theories, ethical considerations, and practical applications across various sectors.

PO2 Demonstrate proficiency in utilising AI tools for real-world applications, including data analysis, machine learning, and generative AI projects.

PO3 Develop research and analytical skills to work on significant projects, analyse complex datasets, and synthesise information to make informed decisions supported by data.

PO4 Apply their AI knowledge to solve complex problems and innovate new solutions, leveraging design thinking and creative approaches to address real-world challenges effectively.

PO5 Exhibit strong communication skills, capable of articulating AI concepts and manage projects to present AI-driven solutions.

Mapping of Programme Outcomes & Course Outcomes

Course 1: Machine Learning and Deep Learning	PO1	PO2	PO3	PO4	PO5
CO1.1 Understand modern machine learning technologies and their relationship with data, including real-world project applications.	✓	✓			
CO1.2 Analyse and address issues of generalisation, overfitting, and model selection in machine learning.		✓		✓	✓
CO1.3 Explore practical applications of Computer Vision and its significance in different fields.		✓		✓	
CO1.4 Gain knowledge of machine learning applications in Text recognition, speech systems and related technologies, along with understanding of building deep learning models.		✓		✓	

Mapping of Programme Outcomes & Course Outcomes

Course 2: The Art of Storytelling with Data	PO1	PO2	PO3	PO4	PO5
CO2.1 Demonstrate an understanding of data analytics types and stages, from data identification to visualisation.	✓				
CO2.2 Explore diverse roles within the analytics field and spark interest in pursuing it further.			✓		
CO2.3 Develop persuasive communication skills through storytelling, including rapport building, audience analysis, and using data effectively to support narratives.					✓

Course 3: Critical and Creative Thinking	PO1	PO2	PO3	PO4	PO5
CO3.1 Interpret fundamental theories on creativity to distinguish between different conceptual approaches and their implications in various contexts.	✓				
CO3.2 Develop an understanding of methods to enhance creativity in individuals or groups, assessing the effectiveness of different techniques and environments conducive to creative thinking.	✓				
CO3.3 Integrate the applications of creativity and innovation in real-world scenarios, demonstrating how these approaches can be leveraged to drive progress and change.		✓		✓	
CO3.4 Design and implement creative solutions to address business or societal problems, synthesising knowledge and techniques from the course to develop innovative and practical strategies.				✓	✓

Mapping of Programme Outcomes & Course Outcomes

Course 4: Mathematics for Artificial Intelligence – II	PO1	PO2	PO3	PO4	PO5
CO4.1 Master the application of probability and statistics in AI and machine learning contexts.		✓			
CO4.2 Utilise Python libraries such as NumPy, pandas, and scikit-learn for statistical analysis and data manipulation.		✓			
CO4.3 Analyse data using descriptive statistics, including measures of central tendency, variance, and correlation.			✓		
CO4.4 Create and interpret various data visualisations to extract meaningful insights.				✓	✓
CO4.5 Understand hypothesis testing to validate AI models and make data-driven decisions.	✓				✓

CAREER PROGRAMMES

ARTIFICIAL INTELLIGENCE

ASSESSMENT PATTERN & GRADING

ASSESSMENT PATTERN

Formative Assessments (FA)
40% Weightage

Summative Assessments (SA)
60% Weightage

a. Formative Assessments (FA): 40% Weightage

Continuous Internal Assessment (CIA)	Weightage
Assignment 1 (Individual)	20
Assignment 2 (Group)	20
Total	**40**

Formative assessments will be offered for the Continuous Internal Assessment (CIA) of the courses as it will be useful for evaluating the varied abilities of the students. WACP will be providing the Formative Assessments for each course. Student performance will be evaluated internally on a continuous basis by the respective school faculty member, who will maintain comprehensive records of student work and evidence of performance. WACP will moderate the Formative Assessments by selectively reviewing samples, ensuring the integrity and consistency of the evaluations without evaluating every submission.

The indicative list of formative assessment outputs will include:

1. Quizzes
2. Mini Projects
3. Field Work/Community Work
4. Case Studies
5. Group Discussions
6. Presentations
7. Reports
8. Audio/Video files

b. Summative Assessments (SA) : 60% weightage

The Summative Assessments for each course shall be conducted by WACP. The Summative Assessment (SA) will be assessed by WACP.

To pass a course, learners must obtain a minimum of 41% in the Formative Assessment and 41% in the Summative Assessment separately.

GRADING

Grading

A student shall be awarded a Letter Grade for the qualifications. The following Grade Scale shall be used to report the performance of the student.

Letter Grade	Percentage of Marks Obtained	Performance
O	96.00 - 100.00	Outstanding
A+	83.00 - 95.99	Excellent
A	70.00 - 82.99	Very Good
B+	56.00 - 69.99	Good
B	41.00 - 55.99	Satisfactory
C	21.00 - 40.99	Poor
D	0.00 - 20.99	Very Poor
Ab	0	Absent

The WACP International Diploma & International Advanced Diploma will be awarded subject to satisfactory completion of the following requirements by a candidate:

1. Achieve at least a minimum of 41% or above in each of the course.
2. Industry Engagement portfolio submissions (including the written tasks & reflections).
3. Submission of Capstone Project.
4. Students should not have received a penalty for academic misconduct.
5. Completion of any other submissions/workshops/masterclass as suggested in the Course.

The grading scale and overall grading system published in any WACP document may be subject to change where this is necessary to maintain standards. Our grading system is straightforward and we do not currently envisage the need to change this. However, should a change become necessary, the change would be published in an updated version of the document with a new 'valid from' date. We will write to all institutions in good time to inform them of this change so that plans for any changes can be made to the programme delivery, internal assessment and quality assurance arrangements.

CAREER PROGRAMMES

ARTIFICIAL INTELLIGENCE

YEAR 1 (GRADE 11)

IDAI

INTERNATIONAL DIPLOMA IN ARTIFICIAL INTELLIGENCE

ARTIFICIAL INTELLIGENCE: REAL-WORLD APPLICATIONS AND IMPLICATIONS

Course Credits: 4
Recommended Guided & Independent Learning Hours: 60 hrs

Course Description

This course provides a comprehensive introduction to the world of AI, offering students a glimpse into its capabilities and limitations. Through exploration of various AI functions and applications, students are prompted to contemplate the pervasive influence and future trajectory of AI technologies. Hands-on experience with Watson, a prominent AI tool, equips students with foundational practical skills. Additionally, discussions delve into the societal impacts of AI, emphasising both its contributions and ethical considerations. Students will gain awareness of the ethical and moral dimensions of AI, including issues of fairness in data collection and distribution, fostering a holistic understanding of AI's implications for society.

Course Outcomes

1. Develop a foundational understanding of Artificial Intelligence, encompassing its societal impacts and core principles.
2. Gain practical experience with leading AI tools such as IBM Watson, through hands-on experimentation in cloud labs.
3. Analyse ethical considerations and biases inherent in AI applications, exploring their societal implications.
4. Investigate conscious and responsible AI development principles, while understanding regulatory frameworks governing AI ethics.
5. Explore both the potential societal benefits and pitfalls of AI implementation, emphasising its impacts on individuals and communities.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				100

ARTIFICIAL INTELLIGENCE: REAL-WORLD APPLICATIONS AND IMPLICATIONS

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Foundations and Applications of AI** • Meaning and Definition of AI • Real-World Applications of AI across industries • Introduction to Machine Learning and Neural Networks • Basics of Natural Language Processing (NLP), Speech, and Vision	15
Unit 2	**Ethics, Bias, and Responsible AI** • AI Ethics and impact on jobs and society • Understanding and identifying algorithmic and ethical bias • Responsible AI frameworks and persuasive technologies	15
Unit 3	**AI Tools** • Overview of Latest AI Tools used in industry • Creating our own chatbot (Deployment, and platform integration) • Case studies • Formative Assessment Project	30
Total		60

ARTIFICIAL INTELLIGENCE: REAL-WORLD APPLICATIONS AND IMPLICATIONS

References

- Coeckelbergh, M. (2020). AI Ethics. The MIT Press.
- Dr. Alfio Gliozzo, Ackerson, C., Bhattacharya, R., Goering, A., Jumba, A., Seung Yeon Kim, Krishnamurthy, Littera,McIntosh,Murthy,Ribas, & IBM Redbooks. (2017), Building Cognitive Applications with IBM Watson Services: Volume 1 Getting Started, IBM Redbooks.
- Martijn Verhoeven. (2018). Getting started with artificial intelligence : managing your first AI bot. Prefer Limited.
- S Matthew Liao. (2020). Ethics of artificial intelligence. Oxford University Publication.

PYTHON PROGRAMMING

Course Credits: 5
Recommended Guided & Independent Learning Hours: 75 hrs

Course Description

This course offers a comprehensive introduction to Python programming—an open-source language known for its accessibility and versatility in modern application development. Employing a gamified learning methodology, participants delve into Python and its libraries, applying programmatic strategies to AI and data-centric challenges. Furthermore, the course advocates a computational thinking approach to problem-solving, empowering students with the tools to dissect real-world challenges and devise programmatic remedies. Encouraging systematic thinking and an algorithmic mindset, it steers individuals towards constructing robust programs and innovative solutions tailored to domain-specific predicaments.

Course Outcomes

By the end of this course the learner will be able to:

1. Develop proficiency in Python programming through practical application.
2. Create games, interactive applications, and practical apps using Python.
3. Master Python data types, structures, modelling, and object-oriented programming principles.
4. Utilise Python libraries for data manipulation and application development.
5. Apply heuristics and cognitive approaches to problem-solving using programming techniques.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				100

PYTHON PROGRAMMING

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Introduction to Python Programming** • Introduction • Variables in Python • Logic building through conditional statements • Lists and dictionaries in Python • Functions in Python	15
Unit 2	**Programming and Problem Solving** • Understanding and Solving Problems • Programmatic Solutions • Heuristics and decision making • Problem solving and decision making Use cases	15
Unit 3	**Fundamentals of Programming** • Definition and examples • Flowcharts and Pseudocode • Representing conditions and decisions • Concept of Data Structures • Contiguous and non-contiguous memory allocation	15
Unit 4	**Libraries and Data Handling** • Libraries, Modules and Packages in Python • File Operations in Python • Basic Data Analysis Operations • Use of APIs with Python	6
Unit 5	**Graphics in Python and Use of Python in AI** • Turtle Class in Python • Canvas • Drawing on the canvas • Building the timer App • Using Python for Artificial Intelligence	12
Unit 6	**Low Code / No Code Applications Development** • What is Low code development? • What is No code development? • Features	12
Total		75

TOOLS

Python IDE, Jupyter Notebook/Google colab

References

- Chudnovsky, D. V., & Chudnovsky, G. V. (2023). Search Theory. CRC Press.
- Gaddis, T. (2019). Starting out with Python®. Pearson India Education Services.
- Gries, P., Campbell, J., & Montojo, J. (2017). Practical programming : an introduction to computer science using Python 3.6. The Pragmatic Bookshelf.
- Miller, B. N., & Ranum, D. L. (2011). Problem solving with algorithms and data structures using Python. Franklin, Beedle & Associates.

GENERATIVE ARTIFICIAL INTELLIGENCE

Course Credits: 3
Recommended Guided & Independent Learning Hours: 45 hrs

Course Description

The course begins with an introduction to Generative AI, exploring how these models operate and their transformative impact across various domains. Students will delve into the capabilities of Large Language Models (LLMs), understanding their potentials and limitations. They will learn different Prompting techniques including text and image generation. Additionally, students will implement Generative AI in software applications, covering project lifecycles, cost considerations, and advanced techniques such as Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs).

Course Outcomes

By the end of this course the learner will be able to:

1. Demonstrate an understanding of the fundamentals of Generative AI and Large Language Models (LLMs), understanding their capabilities and limitations for practical use.
2. Gain hands-on experience analysing different prompting techniques and effective interaction with LLMs.
3. Develop an understanding of prompt engineering, configuring LLMs for specific generative tasks, Generative adversarial networks (GANs) and Variational autoencoders (VAEs).
4. Acquire knowledge of responsible AI practices, including ethical considerations and deployment strategies, fostering ethical development and deployment of Generative AI technologies.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				100

GENERATIVE ARTIFICIAL INTELLIGENCE

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Introduction to Generative AI and Large Language Models (LLMs)** • Understanding Generative AI: How it works, applications, and impact. • Large Language Models (LLMs): Your Creative Collaborator • LLM Capabilities: What LLMs can and cannot do. • Industrial Use cases	7
Unit 2	**Prompt Engineering** • What is Prompt and Prompt engineering • Prompting Tips: Effective interaction with LLMs • Prompt Engineering Techniques	7
Unit 3	**Generative AI Projects: Lifecycle and Techniques** • Using generative AI in software applications • Lifecycle of a Generative AI Project. • Cost Considerations: Understanding resources. • Retrieval Augmented Generation (RAG): Enhancing generative models. • Fine-tuning and Pretraining: Techniques to optimise LLMs. • Model Selection and Tool Use: Choosing and utilising LLMs effectively.	10
Unit 4	**Generative AI in Business and Society** • Transforming Business with Generative AI • Task Analysis using Generative A.I • Creating New Workflows and Opportunities • Exploring Automation Across Sectors • Addressing Generative AI Concerns	7
Unit 5	**Advanced Generative Models** • Generative Adversarial Networks (GANs) • Variational Autoencoders (VAEs) • Stable Diffusion in Generative AI	7
Unit 6	**Case studies** • Image Generation and Synthesis • Natural Language Processing (NLP) • Healthcare and Medical Imaging • Entertainment and Creative Industries	7
Total		45

GENERATIVE ARTIFICIAL INTELLIGENCE

References

- An exclusive KPMG survey shows how top leaders are approaching this transformative technology Generative AI: From buzz to business value. (n.d.). https://kpmg.com/kpmg-us/content/dam/kpmg/pdf/2023/generative-ai-survey.pdf
- Exploring opportunities in the generative AI value chain. (n.d.). https://www.mckinsey.com/~/media/mckinsey/business%20functions/quantumblack/our%20insights/exploring%20opportunities%20in%20the%20generative%20ai%20value%20chain/exploring-opportunities-in-the-generative-ai-value-chain.pdf
- Generative AI is all the rage at Deloitte AI Institute. (n.d.). https://www2.deloitte.com/content/dam/Deloitte/us/Documents/deloitte-analytics/us-ai-institute-gen-ai-for-enterprises.pdf
- Practical Applications and Use Cases of Generative AI. (n.d.). https://ai.gov.ae/wp-content/uploads/2023/04/406.-Generative-AI-Guide_ver1-EN.pdf

MATHEMATICS FOR ARTIFICIAL INTELLIGENCE – I

Course Credits: 3
Recommended Guided & Independent Learning Hours: 45 hrs

Course Description

This course introduces mathematical skills necessary for AI, including calculus and algebra, specific to applications of AI and Machine Learning. The course assumes that students come with basic maths skills of high school level (tenth grade).

Course Outcomes

By the end of this course the learner will be able to:

1. Understand the Basics of Linear Algebra
2. Solve problems using Algebra
3. Understand Eigenvalues and Eigenvectors
4. Apply Transformation Matrices

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

MATHEMATICS FOR ARTIFICIAL INTELLIGENCE – I

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Matrices and their applications** • Introduction to Matrices • Types of Matrices • Using Matrices in Real Life • Python for Matrices	7
Unit 2	**Linear Algebra and Vector Spaces** • Introduction to Vectors and Vector Spaces • Linear Equations and Solutions • Using Linear Algebra in Real Life • Python for Linear Algebra	7
Unit 3	**Eigenvalues and Eigenvectors** • What are Eigenvalues and Eigenvectors? • Using Eigenvalues and Eigenvectors in AI • PageRank examples • Python for Eigenvalues and Eigenvectors	7
Unit 4	**Introduction to Calculus** • Understanding Functions • Differentiation • Integration • Using Calculus in Real Life • Python for Calculus	10
Unit 5	**Gradient descent method** • What is Optimisation? • Understanding Gradient Descent • Using Gradient Descent in AI • Python Basics for Gradient Descent	7
Unit 6	**Regression** • Introduction to Regression • Linear Regression • Using Regression in Real Life • Python for Regression	7
Total		45

References

- Marc Peter Deisenroth, A Aldo Faisal, & Cheng Soon Ong. (2020). Mathematics for machine learning. Cambridge University Press.

DATA MINING

Course Credits: 3
Recommended Guided & Independent Learning Hours: 45 hrs

Course Description

This course introduces students to the Data and Decision process and applications in Artificial Intelligence. Students will learn how to evaluate potential data mining solutions for various types of business problems. Aside from learning how to explore and prepare data for mining, they will also be equipped with the fundamental skills and knowledge needed to construct, interpret, and evaluate data mining results or models

Course Outcomes

By the end of this course the learner will be able to:

1. Apply theoretical and practical knowledge of data mining to solve real-world problems.
2. Interpret the principles of classification, association analysis, clustering, and anomaly detection
3. Develop and write efficient data mining algorithms
4. Critically assess data mining results to avoid false discoveries.
5. Synthesise and reflect on data mining methods to enhance decision-making in business contexts.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

DATA MINING

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Data and Data Mining** • Introduction • Attributes and Objects • Types of Data • Data Quality • Similarity and Distance • Data Preprocessing	7
Unit 2	**Classification** • Basic Concepts • Decision Trees • Model Overfitting • Alternative Classification Techniques	7
Unit 3	**Association Analysis** • Basic Concepts • Mining Rules • Pruning • Algorithms	7
Unit 4	**Clustering** • Applications and types of cluster Analysis • More on types of clusters • Prototype-based • Density-based • Graph-based	10
Unit 5	**Anomaly Detection** • Anomalies and their importance • Causes of anomalies • Types of anomalies • Statistical Approaches • Evaluation of Anomaly detection	7
Unit 6	**False Discoveries** • Statistical Background • Significance Testing • Hypothesis Testing • Multiple Hypothesis Testing	7
Total		45

TOOLS

Jupyter Notebook/Google colab, Python

References

- Pang-Ning Tan, Steinbach, M., & Vipin Kumar. (2006). Introduction to Data Mining. Pearson Education.

CAREER PROGRAMMES
ARTIFICIAL INTELLIGENCE

DESIGN THINKING FOR INNOVATION

Course Credits: 3
Recommended Guided & Independent Learning Hours: 45 hrs

Course Description

In this course, an overview of design thinking and work with a model containing four key questions and several tools to help students understand design thinking as a problem-solving approach. Students will see design thinking in action. They will learn about small and big design thinking solutions to problems. They will then be asked to provide compelling solutions to problems through innovative solutions.

Course Outcomes

By the end of this course the learner will be able to:

1. Analyse design thinking as a problem-solving approach.
2. Create and assess innovative solutions, demonstrating out-of-the-box thinking.
3. Develop Leadership and entrepreneurial qualities through design thinking.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

DESIGN THINKING FOR INNOVATION

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Introduction to Design Thinking** • Definition and applications • Case Study • Real world challenges	7
Unit 2	**Science of Innovation** • The science of innovation • Training your mind for innovation • Is innovation always needed? • Case Studies and analysis	7
Unit 3	**Application of Design Thinking** • Stakeholder Mapping • Studying projects in design thinking • Application of Design thinking in project management	7
Unit 4	**Design Thinking Mindset** • Analysing the Design Tools used in Research • Pinwheels • Persona Creation • Developing Insights from Research by Using Mind Mapping Tool	7
Unit 5	**Experimentation and Application** • Experimentation and Ideation • Crucial Factors to be considered • Risks and Experiments • Working on an application and a Project on Design Thinking	7
Unit 6	**Prototyping and Storyboarding** • The Apple Case Study • Storyboarding and Co-creation • Strategic opportunity principles • Learning Launches and quick wins	10
Total		45

DESIGN THINKING FOR INNOVATION

TOOLS

Storyboarding tools like Canva

References

- Berengueres, J. (2015). The Brown Book of Design Thinking.
- Lewrick, M., Link, P., & Leifer, L. (2018). The design thinking playbook : Mindful digital transformation of teams, products, services, businesses and ecosystems. John Wiley & Sons, Inc.

CAREER PROGRAMMES

ARTIFICIAL INTELLIGENCE

YEAR 2 (GRADE 12)

IADAI

INTERNATIONAL ADVANCED DIPLOMA IN ARTIFICIAL INTELLIGENCE

MACHINE LEARNING AND DEEP LEARNING

Course Credits: 5
Recommended Guided & Independent Learning Hours: 75 hrs

Course Description

This course provides students with a comprehensive introduction to artificial intelligence. It begins with an overview of machine learning, covering regression, neural networks, and the differences between supervised and unsupervised learning. The course addresses generalisation, overfitting, and model selection, emphasising their importance in AI. Students will explore deep learning, including neural networks, optimisation, and various deep learning models. Applications in computer vision, text recognition, and natural language processing are examined through practical case studies and Python implementations. The course also covers the evolution of speech recognition, highlighting the role of deep learning and discussing current limitations and future trends.

Course Outcomes

By the end of this course the learner will be able to:

1. Understand modern machine learning technologies and their relationship with data, including real-world project applications.
2. Analyse and address issues of generalisation, overfitting, and model selection in machine learning.
3. Explore practical applications of Computer Vision and its significance in different fields.
4. Gain knowledge of machine learning applications in Text recognition, speech systems and related technologies, along with understanding of building deep learning models.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

MACHINE LEARNING AND DEEP LEARNING

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Introduction to Machine learning (AI and ML)** • Overview of Machine Learning and Examples • Supervised Machine learning: Regression and Classification • Unsupervised Machine learning • Reinforcement Learning	15
Unit 2	**Generalisation, Overfitting and Model Selection** • Importance of Generalisation in AI/ML • Overfitting and Underfitting • Choosing the Right Model	6
Unit 3	**Deep Learning** • Neural Networks and Optimisation • Deep Learning Models • Applications of Deep Learning	15
Unit 4	**Applications of Machine learning and Deep learning in Vision** • Computer Vision Fundamentals • Applications and Case Studies in Computer Vision • Deep Learning Techniques in Computer Vision using Python	15
Unit 5	**Text Recognition** • Introduction to Computer Text Recognition • Techniques and Challenges in Computer Text Recognition • Implementing Text Recognition Systems • NLP and Language Representation	12
Unit 6	**Speech Systems** • Introduction to Speech Systems • Evolution and Case Studies of Speech Recognition • Deep Learning for Automatic Speech Recognition • Limitations and New Frontiers	12
Total		75

References

- Shai Shalev-Shwartz, & Shai Ben-David. (2015). Understanding machine learning : from theory to algorithms. Cambridge University Press.
- Vasilev, I. (2019). Python deep learning : exploring deep learning techniques and neural network architectures with PyTorch, Keras, and TensorFlow. Packt Publishing.
- Eisenstein, J. (2019). Introduction to natural language processing. The Mit Press.

THE ART OF STORYTELLING WITH DATA

Course Credits: 4
Recommended Guided & Independent Learning Hours: 60 hrs

Course Description

This course integrates communication skills with storytelling techniques to effectively convey data insights. Students will master the art of engaging communication and data visualisation, learning to captivate audiences with compelling storylines supported by evidence, analytics, and facts. Building on foundational concepts from Data and Decisions, this course guides students through the complete stages of data analytics projects: from data preparation and processing to insightful analysis for informed decision-making in business and beyond. Additionally, students will develop skills in creating visualisations that depict past and present findings while also exploring predictive analytics for future projections.

Course Outcomes

By the end of this course the learner will be able to:

1. Understand data analytics types and stages, from data identification to visualisation.
2. Explore diverse roles within the analytics field and spark interest in pursuing it further.
3. Develop persuasive communication skills through storytelling, including rapport building, audience analysis, and using data effectively to support narratives.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

THE ART OF STORYTELLING WITH DATA

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Exploring Data Analytics** • Introduction to Data Analytics • All about Data • Collecting Data • Analysing Data	10
Unit 2	**The Art of Effective Communication** • Introduction • Knowing What to Say • The Art of Persuading • Saying it with an Impact • Authenticity: Building Trust While Persuading	10
Unit 3	**Authenticity** • Building Trust while persuading audience • Building Rapport • Verbal communication • Using the body language	10
Unit 4	**Impression Management and Resistance** • Group Meetings • Influencing and Leading • Overcoming resistance	10
Unit 5	**Data Visualisation (Tableau/PowerBI)** • Introduction to Data Visualisation • Exploring Tableau/PowerBI Interface • Basic Visualisation Techniques • Advanced Visualisation Features • Data Integration and Collaboration	10
Unit 6	**Storytelling with Data** • Introduction • The Perfect Pitch-Preparing and Planning • Presenting Data • Guided Project	10
Total		60

THE ART OF STORYTELLING WITH DATA

TOOLS

Tableau/PowerBI

References

- Dykes, B. (2020). Effective Data Storytelling: How to Drive Change with Data, Narrative and Visuals. John Wiley and Sons, Inc.
- Eckert, H.-W. (2022). Storytelling With Data. Springer Nature.

CRITICAL & CREATIVE THINKING

Course Credits: 3
Recommended Guided & Independent Learning Hours: 45 hrs

Course Description

This course introduces critical thinking, informal and formal logic. It covers and helps students to improve their cognitive skills, analytical and reasoning skills and creative thinking. It builds upon the computational skills and provides a more holistic view on how to approach the world with a reason and support your arguments and decisions by careful analysis of past and present data.

Course Outcomes

By the end of this course the learner will be able to:

1. Interpret fundamental theories on creativity to distinguish between different conceptual approaches and their implications in various contexts.
2. Develop an understanding of methods to enhance creativity in individuals or groups, assessing the effectiveness of different techniques and environments conducive to creative thinking.
3. Integrate the applications of creativity and innovation in real-world scenarios, demonstrating how these approaches can be leveraged to drive progress and change.
4. Design and implement creative solutions to address business or societal problems, synthesising knowledge and techniques from the course to develop innovative and practical strategies.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Component 1	Project Based		**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

CRITICAL & CREATIVE THINKING

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Creativity** • Define creativity • Creativity and Innovation – Similarity and difference • The mindset of creativity • Critical Thinking	7
Unit 2	**Facilitating Creativity** • Why creative thinking is in demand • Different Tools used • Brainstorming • Charting • Case Studies	7
Unit 3	**The Mindset** • Definition of mindset and thinking style • How is it formed? • How to identify and switch to the right mindset of critical and creative thinking	7
Unit 4	**Idea generation** • Systematic Approach • Morphological Analysis • Tools and applications	7
Unit 5	**The Theory of Inventive Problem Solving (TRIZ)** • What is TRIZ • Meaning and Principals • The TRIZ Contradiction Matrix • Success Stories • Solving everyday problems • Case Studies	7
Unit 6	**SCAMPER and out of the box thinking** • Creativity tool SCAMPER • What does it mean to think out of the box • Case Studies • Implement SCAMPER in an area of interest • Real world project	10
Total		45

TOOLS

Canva and Scamper tool

References

- Chaffee, J., & Carlson, S. (2015). Critical thinking, thoughtful writing : rhetoric with readings. Cengage Learning.

MATHEMATICS FOR ARTIFICIAL INTELLIGENCE – II

Course Credits: 3
Recommended Guided & Independent Learning Hours: 45 hrs

Course Description

This course is introduced to bridge the gap between mathematical theory and practical implementation in artificial intelligence and machine learning. This course covers essential topics such as probability, statistics, and hypothesis testing, providing a solid foundation in these critical areas. Students will explore descriptive statistics, probability theory, and data visualisation, using popular Python libraries like NumPy, pandas, and scikit-learn. Through practical examples, case studies, and hands-on projects, learners will gain a deep understanding of how these mathematical concepts apply to AI, enabling them to develop robust, data-driven models and insights.

Course Outcomes

By the end of this course the learner will be able to:

1. Master the application of probability and statistics in AI and machine learning contexts.
2. Utilise Python libraries such as NumPy, pandas, and scikit-learn for statistical analysis and data manipulation.
3. Analyse data using descriptive statistics, including measures of central tendency, variance, and correlation.
4. Create and interpret various data visualisations to extract meaningful insights.
5. Understand hypothesis testing to validate AI models and make data-driven decisions.

Assessment at a Glance

Type of Assessment	Details			Weightage of Final Grade (%)
Summative	Project based			**60**
Formative	Component 1	Assignment 1 (Individual)	20	**40**
	Component 2	Assignment 2 (Group)	20	
Total				**100**

MATHEMATICS FOR ARTIFICIAL INTELLIGENCE – II

Overview of Units

Units	Unit Content	Recommended No. of Hours
Unit 1	**Introduction to Probability and Statistics** • Introduction • Link between AIML and Mathematics of Probability and Statistics • Examples	7
Unit 2	**Python Libraries for Statistics** • Python Libraries Recap • Python Libraries for Data Science • Other languages and Tools used	7
Unit 3	**Descriptive Statistics** • Measures of Central tendency • Mean, Median and Mode • Variance and standard deviation • Applications • Correlation and Regression	10
Unit 4	**Visualising Data** • Introduction and use of data visualisation • Underlying Statistics • Latest tools used and their features • Gaining insights from Charts and Visuals	7
Unit 5	**Probability Theory** • Introduction • Distributions and types • Events • Applications of Probability theory	7
Unit 6	**Hypothesis testing** • Relation between data • Forming Hypothesis • Testing Hypothesis • Various Tests and their uses	7
Total		45

References

- Fabio Nelli. (2015). Python Data Analytics : Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language. Apress.
- Marc Peter Deisenroth, A Aldo Faisal, & Cheng Soon Ong. (2020). Mathematics for machine learning. Cambridge University Press.

WORKSHOPS, PROJECTS & INDUSTRY ENGAGEMENT

Course Credits: 6
Recommended Guided & Independent Learning Hours: 90 hrs

Course Outcomes

By the end of this course, the learner will be able to:

1. Develop soft skills and work- related competencies.
2. Apply all the concepts learnt in this programme in the real world and prepare a portfolio.

Details	Hours
1. Case Studies (5 cases) Case Studies will be taught as a part of the respective courses	**30 hrs**
2. Online Modules	**20 hrs**
3. Workshops & Projects Every student must attend the workshop. After completing the workshop, students will get a completion certificate which is a prerequisite for CRS completion.	**25 hrs**
4. Masterclass (Online) Every student must complete a minimum of 3 Masterclasses every year and a minimum of 6 Masterclasses in two years. After completing every Masterclass, the student will get a completion certificate which is a prerequisite for CRS completion.	**15 hrs**

This course will provide students an opportunity to explore different aspects of the industry by applying knowledge and skills learned in the classroom. Students will attend Masterclass & Workshops in various skill areas which will help them develop additional career-enhancing capabilities.

References

- Bhuvan Unhelker, Hari Mohan Pandey, & Raj, G. (2022). Applications of Artificial Intelligence and Machine Learning. Springer Nature.
- Choudhary, A. (2021). Applications of artificial intelligence and machine learning : select proceedings of ICAAAIML 2020. Springer.

CAPSTONE PROJECT

Course Credits: 6
Recommended Guided & Independent Learning Hours: 90 hrs

Course Description

This project serves as the culmination of the learning process and offers the chance to integrate lessons from the entire course, think back on one's own experiences as a student, and comprehend what it means to work in teams.

Course Outcomes

By the end of this course the learner will be able to:

1. Develop and exhibit problem-solving skills by identifying, analysing, and proposing solutions to challenges using artificial intelligence.
2. Apply Full Stack development AI skills to real-world projects in various domains like healthcare, education, banking, or e-commerce.
3. Develop proficiency in identifying and analysing relevant datasets, along with feature engineering for effective solution development.
4. Acquire hands-on experience with frontend and backend development tools and techniques.
5. Demonstrate the ability to innovate and apply creative solutions, considering current trends and future shifts.
6. Enhance communication skills by effectively presenting business solutions to diverse stakeholders.

Assessment at a Glance

Type of Assessment	Details	Weightage of Final Grade (%)
Capstone Project	Project Report & Presentation	**100**

CAPSTONE PROJECT

Overview

The Capstone project is an opportunity for students to apply and integrate the knowledge obtained from academic studies, as well as industry exposure. The Capstone project represents a bridge between the institution and actual employment. This course is project-oriented, as well as team-based.

In this course, students select a specific industry, such as healthcare, education, banking, gaming, e-commerce, or fintech, identify a problem statement and create a Proof of Concept (POC) of their AI powered project. They will work on various aspects, such as data source discovery, feature engineering, and building innovative solutions using frameworks like Streamlit to develop interactive applications. The course will also emphasise testing and refinement, ensuring the reliability and usability of the developed solutions. Finally, students will focus on real-world implementation, presenting their projects and pitching their ideas to potential investors or industry experts. This course aims to provide students with an intermediate level of expertise, preparing them for future career opportunities or advanced studies with a special focus on AI applications tailored to their chosen industry.

To be successful in the course, students must demonstrate utmost independence, intellectual curiosity, be good at managing information and time, as well as exhibit a superior level of work ethics and professionalism. Students will be working in groups (upto 5 members).

Overview

Problem Statement and Industry Exploration
- Collaborate with faculty to explore industries like healthcare, education, banking, or e-commerce, etc.
- Identify and articulate a problem statement in a chosen industry.
- Plan your project steps and create a Proof of Concept (POC).

Selecting the ML Area and Application Focus
- Choose an ML area like Text Analysis, Computer Vision, or Speech Recognition.
- Apply it to your industry's specific needs for your project.

Data Source Discovery and Feature Engineering
- Identify and gather relevant datasets.
- Ingest, explore, and identify key features.

Building Innovative Solutions
- Develop the AI/ML model or solution.
- Use Streamlit or a similar platform to create an interactive application showcasing the POC of your AI project.

Testing and Refinement
- Set performance metrics and error tolerance levels.
- est and refine the model, incorporating user feedback.

Real-World Implementation and Presentation
- Identify real-life applications of your project.
- Present your POC using Streamlit and pitch to potential investors or industry experts.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