The University of Faisalabad 

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| **Course** | **Course Title** | **Contact Hrs./Week** | **Total Lectures Allocated** |
| Navttc | Artificial Intelligence (Machine Learning & Deep Learning) | 20 | 60 |

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| **Discipline** | **Commencement of the Course** | **Course Duration** | **Course Termination Date** |
| All Discipline |  | 12-Weeks |  |

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| **1. COURSE LEVEL** |
| Undergraduate and Graduate |

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| **2. PREREQUISITES** |
| There is basic python pre-requisite for this course |

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| **3. COURSE Objective:** |
| This course provides an in-depth training program focused on developing employable skills in Artificial Intelligence (AI), with a specialization in Natural Language Processing (NLP) and Microsoft Azure AI. The course aims to equip participants with both theoretical knowledge and practical skills, encouraging professional behavior and critical thinking. Delivered by a team of experienced instructors, the curriculum emphasizes hands-on learning, problem-solving, and practical assessments. It also fosters personal development traits such as responsibility, self-reliance, and adaptability. By the end of the course, trainees are expected to have a solid understanding of AI and machine learning concepts, be familiar with modern ML techniques, and gain practical experience using key tools and libraries such as scikit-learn, pandas, NumPy, TensorFlow, PyTorch, and Keras. |

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| **4. KEY SKILLS AND ATTRIBUTES TO BE DEVELOPED BY THE COURSE** | |
| Analytical Thinking and Problem-Solving | -Ability to analyze data and derive meaningful insights. Identifying the right algorithms for specific machine learning and deep Learning tasks. |
| Technical Proficiency and Critical Evaluation | - Mastery of machine learning models and frameworks, assessing model performance using evaluation metrics and improving through tuning. |
| Practical Application | - Applying ML techniques to solve real-world problems with large datasets |
| Collaboration and Communication | -Working on group projects and presenting findings effectively. |

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| **Weeks** | **Lecture No.** | **Contents** |
| **Week 1** | Day 1 | Introduction to AI, Course Overview, Career Survey, Software Installation |
| Day 2 | Linux Basics (commands, shutdown, environment variables) |
| Day 3 | Python Basics: values, expressions, string ops, input & type casting |
| Day 4 | Data Structures: lists, tuples, dictionaries, sets |
| Day 5 | Control Flow: if/else, loops, list comprehension, iterators |
| **Week 2** | Day 1 | Functions, lambda, file & exception handling |
| Day 2 | OOP concepts: classes, inheritance, access specifiers |
| Day 3 | Polymorphism, magic methods, abstract classes |
| Day 4 | Data types, quantitative/qualitative variables |
| Day 5 | Central tendency & dispersion: mean, mode, std deviation, z-score |
| **Week 3** | Day 1 | Correlation, univariate/multivariate plots, probability basics |
| Day 2 | Conditional probability, distributions, Bayesian probability |
| Day 3 | NumPy arrays: creation, reshaping, operations |
| Day 4 | NumPy indexing, broadcasting, arithmetic operations |
| Day 5 | Intro to Pandas, DataFrames, missing data handling |
| **Week 4** | Day 1 | Pandas merge/join/groupby, plotting |
| Day 2 | Seaborn plots (distplot, boxplot, heatmap, etc.) |
| Day 3 | ML Pipeline Overview |
| Day 4 | Supervised ML: Regression and Classification |
| Day 5 | Linear Regression (with/without vectorization) |
| **Week 5** | Day 1 | Multivariate Linear Regression |
| Day 2 | Polynomial Regression |
| Day 3 | Logistic Regression (Binary) |
| Day 4 | Logistic Regression (Multiclass) |
| Day 5 | Practice Day (ML models coding) |
| **Week 6** | Day 1 | NLP Introduction, preprocessing, NLTK/SpaCy |
| Day 2 | Tokenization, POS, NER, BoW |
| Day 3 | Evaluation metrics, dataset imbalance |
| Day 4 | SVM and Decision Trees |
| Day 5 | Random Forest |
| **Week 7** | Day 1 | Boosting Algorithms |
| Day 2 | MLP Neural Networks: forward/backpropagation |
| Day 3 | Neural Network implementation with TensorFlow/Keras |
| Day 4 | CNNs: 2D and 1D |
| Day 5 | Practice: Neural Network coding |
| **Week 8** | Day 1 | Recurrent Neural Networks (RNNs) |
| Day 2 | Long-Short-Term-Memory Networks (LSTM) |
| Day 3 | LSTM Code Practice |
| Day 4 | Gated Recurrent Unit Networks |
| Day 5 | GRU Code Practice |
| **Week 9** | Day 1 | Word2Vec, CBOW, Skip-gram |
| Day 2 | Gensim and Custom Training |
| Day 3 | Sequence Models |
| Day 4 | Sequence Models, 1-to-1, 1-to-Many |
| Day 5 | Many-to-1, Many-to-Many |
| **Week 10** | Day 1 | Bi-directional RNN/LSTM |
| Day 2 | Attention Mechanism |
| Day 3 | Attention Mechanism in Models |
| Day 4 | Project selection |
| Day 5 | Planning, architecture discussion |
| **Week 11** | Day 1 | Choosing Azure AI services (vision, language, decision) |
| Day 2 | Speech services, responsible AI, security |
| Day 3 | Azure resource management, cost monitoring |
| Day 4 | Deployment, CI/CD integration, anomaly detection, personalization |
| Day 5 | Image/video analysis, classification |
| **Week 12** | Day 1 | Video processing |
| Day 2 | Azure NLP: Text, speech, translation |
| Day 3 | Language understanding, Q&A bots |
| Day 4 | Knowledge mining |
| Day 5 | Conversational AI solution implementation |
| **Week 13** | **Final Exams** | |

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| **5. TEACHING AND LEARNING METHODS** |
| **Duration:** 12 weeks, 240 hours in total  **Lectures**: 60 (20 hours per week)  **Per Lecture:** 04 hours  -Live lecture sessions using Multimedia  -Question Answer Session  -Discussion on covered and continuous topics with students during the class lectures  -Case Studies  -Video links of related topics will be providing to students  - Providing hand-outs on relevant topics  - Assignments: Reading Topics and Written assignments using internet and books |

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| **6. TECHNOLOGY REQUIREMENTS** |
| -Computer System  -Learning Management System  -Supporting Software (e.g. Anaconda, Vsc, Tensorflow, Scikit-Learn, Pandas )  - Internet Facility  - Digital Library Access |

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| **7. REQUIRED LEARNING RESOURCES** | |
| Text Book(s): |  |
| Reference Book(s): |  |
| Journals/Periodicals:  (Title, Publisher) | None |
| Websites: | W3 School, |

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| **8. COURSE ASSESSMENT** |
| -Homework exercise in the form of supplementary reading materials will be given to students according to the course progress; homework will be not marked and will not be counted towards the course assessment.  -2 quiz and 3 assignments will be given during the course  -1 final exam will be performed. |

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| **9. GUIDELINES FOR SUBMISSION OF ASSIGNMENTS** |
| Read the assignment requirements carefully, including any specific instructions on length, formatting, style, etc., provided for every assignment. If no specific instructions are given, here are some general suggestions for you to follow:  -Include sufficient identification on every assignment submitted (e.g., your name; the course name, course code, and the assignment number or title).  -For assignments with multiple questions, identify the question number and restate each assignment question before providing your answer.  -Review your assignment before submitting it to make sure you have completed the assignment in full. Also, carefully proofread your work for spelling and grammatical errors that could affect your grade.  -Submit assignment on LMS till due date.  -Also, unless you have registered for an extension, assignments submitted after the due date, will be returned to you ungraded. |

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| **10. CONTRIBUTION OF COURSE TO MEET THE PROFESSIONAL COMPONENT** |
| This course prepares students to work professionally in the area of artificial intelligence and machine learning fields. Students should be able to apply knowledge of machine learning to identify and address the problems which may be solved by machine learning and artificial intelligence. |

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| **11. DISCLAIMER** |
| This course outline is tentative; I reserve the right to change the deadlines, readings, or assignments during the course. |

**Note: -**The above course outline covers all contents of the course AI (ML and DL) as prescribed by National Vocational and Technical Training Commission

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**Instructor’s name:** Muhammad Saeed  **Signature & Date**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **HOS/COS**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_