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| IQRA University (IU) | | |
| Faculty of Engineering Sciences and Technology (FEST) | | |
| Computer Science Department (CS) | | |
| Course Code | Course Name | Credit Hr |
| AIC 212 | Programming for Artificial Intelligence | 2+1 |

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| 1. Basic Information | | | |
| Instructor | Umm-e Kulsoom | Designation | Senior Lecturer |
| Prerequisite(s) | AIC 211- Artificial Intelligence | Semester | Fall 2024 |
| Email | ummekulsoom@iqra.edu.pk | Phone | 03343746539 |
| Consulting Hours | Monday 8:30-5:30 | Office Location | 8th floor |

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| 1. **Course Objective(s)** |
| This course aims to introduce standard programming practices and to help develop programming skills necessary for designing and implementing Artificial Intelligence systems. The course introduces a modern state of the art programming language for Artificial Intelligence, and builds up the necessary programming background for the main courses like Knowledge Representation & Reasoning, Machine Learning, Artificial Neural Networks, and Natural Language Processing. This course will help the students of Artificial Intelligence develop the programming acumen and style. The ultimate aim of this course is to help students in using the programming language to solve problems of interest to them. |

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| 1. **Course Contents** |
| **Introduction to Programming language (Python):** The first objective of the course is to introduce and then build the proficiency of students in the programming language. The basics include IDE for the language (e.g., Jupyter Notebook or IPython), variables, expressions, operands and operators, loops, control structures, debugging, error messages, functions, strings, lists, object-oriented constructs and basic graphics in the language. Special emphasis is given to writing production quality clean code in the programming language using version control (git and subversion).  **Introducing libraries/toolboxes necessary for data analysis**: The course should introduce some libraries necessary for interpreting, analyzing and plotting numerical data (e.g., NumPy, MatPlotLib, Anaconda and Pandas for Python) and give examples of each library using simple use cases and small case studies. |

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| 1. **Course Learning Outcomes** | | | | | | |
| **CLOs** | **CLO Statement** | **BT Level** | **Mapping** | | | **% Weight** |
| **GAs** | **ACM KA** | **SGDs** |
| CLO1 | **Explain** Python programming fundamentals to solve basic computing problems. | C2 | GA2 | #14  FPL | 4 | 34% |
| CLO2 | **Apply** object-oriented programming concepts in Python to develop modular and reusable solutions. | C3 | GA5 | 34% |
| CLO3 | **Analyze** computational and data analysis problems using Python libraries like NumPy, Pandas, and Matplotlib. | C4 | GA4 | 32% |
| ***Note: On successful completion of course GA1 (Academic Education) will automatically attain.*** | | | | | | |

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| 1. **Course Textbook / Reference Books and Supplementary Reading Material** | | | |
| **S No** | **Book Title** | **Author(s)** | **Edition/ publication year/publisher** |
| 1 | Python for everybody: Exploring data using Python 3. CreateSpace Independent Publ Platform. | Severance, C.R. | (3rd Edition, 2023) |
| 2 | Python programming in context. Jones & Bartlett Pub. | Miller, B.N., Ranum, D.L. and Anderson, J. | (3rd Edition, 2023 |
| 3 | Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. O'Reilly Media, Inc. | McKinney, W. | (2nd Edition, 2017) |

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| 1. **CLO Outcome Based Assessment (OBA) Tentative** | | | | | | |
| **Assessment Tool** | | **CLO Mapped** | **CLO Marks** | **% Weight** | **Total Marks** | **Assessment Date** |
| **Quizzes**  **10** | Quiz #1 | *CLO1* | 10 | 30% | 3 | TBD |
| Quiz #2 | *CLO2* | 10 | 40% | 3 |  |
| Quiz #3 | *CLO3* | 10 | 40% | 4 |  |
| **Total Quizzes %** | | | **100%** | 10 |  |
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| **Assignments**  **15** | Assignment #1 | *CLO1* | 10 | 20% | 3 |  |
| Assignment #2 | *CLO2* | 10 | 40% | 6 |  |
| Assignment #3 | *CLO2* | 10 | 40% | 6 |  |
|  |  | | | **100%** | 15 |  |
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| **Midterm**  **25** | Midterm Q1 | *CLO1/2/3* | **5** | 20% | 5 |  |
| Midterm Q2 | *CLO1/2/3* | 5 | 20% | 5 |  |
|  | Midterm Q3 | *CLO1/2/3* | 5 | 20% | 5 |  |
|  | Midterm Q4 | *CLO1/2/3* | 10 | 40% | 10 |  |
|  | **Total Midterm %** | | | **100%** | **25** |  |
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| **Project/CCP**  **10** | Project/CCP | *CLO1/2/3* | 10 |  |  |  |
|  | **Total Project /CCP %** | | | **100%** |  |  |
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| **Final Exam**  **40** | Final Exam Q1 | *CLO3* | 10 | 25% | 10 |  |
| Final Exam Q2 | *CLO1* | 10 | 25% | 10 |  |
| Final Exam Q3 | *CLO2* | 10 | 25% | 10 |  |
|  | Final Exam Q4 | *CLO3* | 10 | 25% | 10 |  |
|  | **Total Final Exam %** | | | **100%** | **40** |  |
| **100** | **Total Marls** | | | | **100** |  |
| ***Note: Please make sure every CLO must be assessed at least 3 time.*** | | | | | | |

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| 1. **Weekly Plan** | | | | |
| **Week** | **Lecture No** | **Topic Covered** | **CLO** | **Assessment Tool** |
| 1 | 1 | Introduction to Python and Setting Up the Environment:  Install Python and set up an IDE (e.g., PyCharm, Visual Studio Code, Jupyter Notebook). | CLO-1  (GA-2) |  |
| 2 | Understand the Python interpreter and its basic syntax (indentation, case sensitivity). | CLO-1  (GA-2) |  |
| 2 | 3 | Basic Python Syntax, Data Types, Boolean, Operators, and Expressions: Understand basic Python syntax, including variables, constants, and type casting. | CLO-1  (GA-2) |  |
| 4 | Explore Python's data types, type conversion, I/O functions, Booleans, operators, and expressions. | CLO-1  (GA-2) |  |
| 3 | 5 | Control Flow, Loops, and Functions in Python:  Use if, elif, and else statements for conditional logic and nested conditions. Apply logical and comparison operators. | CLO-1  (GA-2) |  |
| 6 | Implement loops with range() and control statements, define functions with various arguments, handle return values, manage variable scope, and use lambda functions. | CLO-1  (GA-2) |  |
| 4 | 7 | Lists and Tuples, Strings  Creating, accessing, and modifying lists, List operations (concatenation, repetition, slicing). | CLO-1  (GA-2) |  |
| 8 | List methods Tuples: definition, properties (immutable), and usage | CLO-1  (GA-2) |  |
| 5 | 9 | Work with dictionaries, sets, and file handling for data operations, file reading, writing, appending, and managing file modes. | CLO-1  (GA-2) |  |
| 10 | Handle errors using try, except, else, finally, manage common exceptions, and raise custom errors with raise. | CLO-1  (GA-2) |  |
| 6 | 11 | Understand OOP concepts like classes, objects, instance variables, constructors, inheritance, and method overriding. | CLO2  (GA-5) |  |
| 12 | Explore polymorphism and encapsulation to enhance code modularity and reusability. | CLO2 |  |
| 7 | 13 | NumPy: Arrays, 1-D, 2-D, 3-D, Searching, Shaping  Pandas: Series, Data frames, with arrays, dictionaries | CLO3  (GA-4) |  |
|  | 14 | **Assignment of CCP/ Project** |  |  |
| 8 | **Mid Tern** | | | |
| 9 | 15 | Learn NumPy for array operations, random data generation, distributions, and permutations, alongside data visualization with libraries.. | CLO3  (GA-4) |  |
| 16 | Integrate NumPy with libraries such as Seaborn and Matplotlib to create visualizations, including distplots and distribution analysis with the Seaborn module. | CLO3  (GA-4) |  |
| 10 | 17 | Learn Pandas for reading CSV files, data analysis, cleaning (handling missing data, correcting formats, and removing duplicates). | CLO3  (GA-4) |  |
| 18 | Explore data correlations and use visualization techniques like scatter plots and histograms for insights. | CLO3  (GA-4) |  |
| 11 | 19 | Matplotlib: Introduction to Plotting and Visualizations  Learn Pyplot for creating plots and customizing visualizations. | CLO3  (GA-4) |  |
| 20 | Explore chart types like scatter plots, bar charts, histograms, and pie charts, customizing with markers, labels, grids, and subplots for detailed visualizations.. | CLO3  (GA-4) |  |
| 12 | 21 | Introduction to Machine Learning:  Explore supervised, unsupervised, reinforcement, semi-supervised, and self-supervised learning techniques. | CLO3  (GA-4) |  |
| 22 | Gain an overview of machine learning tools, focusing on the scikit-learn library for implementation. | CLO3  (GA-4) |  |
| 13 | 23 | Machine Learning Techniques Overview:  Key tasks include classification, regression, and clustering. | CLO3  (GA-4) |  |
| 24 | Learn supervised learning models: Linear Regression, Logistic Regression, Decision Trees, SVM, K-NN, and Random Forests. | CLO3  (GA-4) |  |
| 14 | 25 | Unsupervised Learning Algorithms (Cont…) | CLO3  (GA-4) |  |
| 26 | K-Means Clustering | CLO3  (GA-4) |  |
| 15 | 27 | Revision week |  |  |
| 28 |  |  |
| 16 | 29 | **CCP/ Presentation/ Assessment** | CLO3  (GA-4) |  |
| 30 |  |  |
| **17** | **Final Exam** | | | |

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| 1. **IU Assessment / grading Policy** | **Instructor grading for course \*** |
| Quizzes 10-15%  Assignments 10-15%  Projects/Presentation/CCP 0-10%  Mid Semester Examination/ 20-30%  End Semester Examination 40-50% | 10  15  10  25  40 |