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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-L | 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 | Friday 8:30-5:30 | Office Location | -- |

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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** |
| **CLO 1** | **Apply** Python's programmingfundamentals and object-oriented concepts with modern techniques to solve real-world problems. | C3 | GA5 | #9  IS | 4 | 65% |
| **CLO 2** | **Participate** in implementing of Artificial Intelligence tasks. | A2 | GA6 | 35% |
| ***Note: On successful completion of course GA 1 (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** |
|  | Python for everybody: Exploring data using Python 3. CreateSpace Independent Publ Platform. | Severance, C.R. | (3rd Edition, 2023) |
|  | Python programming in context. Jones & Bartlett Pub. | Miller, B.N., Ranum, D.L. and Anderson, J. | (3rd Edition, 2023 |
|  | 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** |
| **Lab Manual**  **5** |  | ***CLO 1*** | 5 | 100% | 5 | TBD |
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| **Total Quizzes %** | | | **100%** | 5 |  |
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| **Assignments**  **15** | Assignment #1 | *CLO1* | 10 | 30% | 5 |  |
| Assignment #2 | *CLO1* | 10 | 30% | 5 |  |
| Assignment #3 | *CLO1* | 10 | 40% | 5 |  |
|  |  | | | **100%** | 15 |  |
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| **Midterm**  **25** | Midterm Q1 | *CLO1* | 15 | **60%** | 15 |  |
| Midterm Q2 | *CLO1* | 10 | **40%** | 10 |  |
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|  | **Total Midterm %** | | | **100%** | **25** |  |
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| **Project/OEL**  **15** | Project/CCP | *CLO1/2/3* | 15 |  |  |  |
|  | **Total Project /CCP %** | | | **100%** | **15** |  |
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| **Final Exam**  **40** | Final Exam Q1 | *CLO1* | 10 | 25% | 10 |  |
| Final Exam Q2 | *CLO1* | 10 | 25% | 10 |  |
| Final Exam Q3 | *CLO1* | 10 | 25% | 10 |  |
|  | Final Exam Q4 | *CLO1* | 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**  **No** | **Lab No** | **Lab Description** | **Contact**  **Hr** | **CLO** |
| 1 | 1 | Set up Python and IDEs (e.g., PyCharm, VS Code, Jupyter Notebook) to write and run your first program. Learn Python syntax basics, interpreter use, and coding structure. | 3 |  |
| 2 | 2 | Learn Python syntax, variables, and data types with type conversion. Explore Boolean logic, operators, expressions, and basic I/O functions. | 3 |  |
| 3 | 3 | Learn control flow with conditionals (if, elif, else), loops (for, while, range()) with controls (break, continue), and nested loops. Define functions with various arguments, understand return values, variable scope, and lambda functions. | 3 |  |
| 4 | 4 | Learn to create, access, and modify lists; perform operations like concatenation, repetition, and slicing. Understand tuples' definition, properties (immutable), and usage. | 3 |  |
| 5 | 5 | **Dictionaries & Sets:** Manage dictionaries and perform set operations (union, intersection, difference).  **File Handling:** Read, write, and append to files with different modes.  **Exception Handling:** Handle errors using try, except, and raise. | 3 |  |
| 6 | 6 | **OOP Concepts:** Learn classes, objects, instance variables, methods, constructors (\_\_init\_\_()), inheritance, method overriding, polymorphism, and encapsulation. | 3 |  |
| 7 | 7 | NumPy Creating Arrays, NumPy: Arrays, 1-D, 2-D, 3-D, Searching, Shaping ,Pandas: Series, Data frames, with arrays, dictionaries, |  |  |
|  | **OEL/ Project Assignment** |  |  |
| 8 | **Midterm Exam** | | | |
| 9 | 8 | Learn NumPy array operations, random distributions, and visualize data with Seaborn. | 3 |  |
| 10 | 9 | Learn Pandas for data analysis, cleaning, handling missing values, removing duplicates, computing correlations, and visualization with scatter plots and histograms. | 3 |  |
| 11 | 10 | Explore SciPy for constants, optimizers, sparse data, graphs, spatial data, interpolation, MATLAB arrays, and significance tests. | 3 |  |
| 12 | 11 | Matplotlib: Intro, [Pyplot](https://www.w3schools.com/python/matplotlib_pyplot.asp) [,Plotting](https://www.w3schools.com/python/matplotlib_plotting.asp) [Markers](https://www.w3schools.com/python/matplotlib_markers.asp)  [Line](https://www.w3schools.com/python/matplotlib_line.asp), [Labels](https://www.w3schools.com/python/matplotlib_labels.asp)  [Grid](https://www.w3schools.com/python/matplotlib_grid.asp),  [Subplot](https://www.w3schools.com/python/matplotlib_subplot.asp)[, Scatter](https://www.w3schools.com/python/matplotlib_scatter.asp)[, Bars](https://www.w3schools.com/python/matplotlib_bars.asp)[, Histograms](https://www.w3schools.com/python/matplotlib_histograms.asp)[, Pie Charts](https://www.w3schools.com/python/matplotlib_pie_charts.asp) | 3 |  |
| 13 | 12 | Introduction to machine learning covering supervised, unsupervised, reinforcement, semi-supervised, and self-supervised learning, with an overview of scikit-learn. | 3 |  |
| 14 | 13 | Learn machine learning techniques: classification, regression, clustering, and supervised learning with Linear Regression, Logistic Regression, Decision Trees, SVM, K-NN, and Random Forests. | 3 |  |
| 15 | 14 | Unsupervised Learning Algorithms:  K-Means Clustering: | 3 |  |
| **Open Ended Lab/Project Assessment** |  |  |
| 16 | **Final Exam** | | | |

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| 1. **IU Assessment / grading Policy** | **Instructor grading for course \*** |
| Lab Manual 0-10%  Labs Task Assessment 10-20%  Projects/OEL/PBL 5-20%  Mid Semester Examination/ 20-30%  End Semester Examination 40-50% | 5  15  15  25  40 |