Course Log Template

INSTITUTION FAST-NUCES, Lahore

PROGRAM (S) TO BE EVALUATED BS Computer Science

Course Code/number	**CS4085**
Course Title/Name	**Machine Learning Operations (MLOps)**
Instructor	**Mr Usman Anwer**
Grading Mode	**Relative + Threshold**
Credit Hours/Contact hours	3+0
Degree Program	Bachelor of Science in Computer Sciences (BSCS)
Prerequisites or Co-requisites	Artificial Intelligence
Assessment Methods and Weightage	Project 10% Lab Assignments 15% Quiz 5% Mid-Term Examination 30% Final Examination 40% **Total 100**
Textbook (or **Laboratory Manual** for Laboratory Courses)	1. Building Machine Learning Powered Applications by Emmanuel Ameisen
Reference Material	1. Reliable Machine Learning by Cathy Chen 2. Machine Learning Engineering in Action by Ben Wilson. 3. Zhang, Aston, et al. "Dive into deep learning." , 19, 2020 4. Selected Research Papers & Class Notes

Week #	Lecture	Lab
1	- Introduction to MLOps: - Overview of MLOps and its significance: Key challenges in deploying and managing ML models in production - Comparison of traditional software development, DevOps and MLOps, Key components of MLOps	Overview of compilers to be used, Introduction to Python Control Statements, Loops, Collections, Functions, Lambda Expressions
2	OOP Principles in Python - Overview of Encapsulation, Inheritance, Polymorphism in python	OOP principles in Python
3	Data Analysis in Python - NumPy arrays, operations, broadcasting - Pandas DataFrames (indexing, filtering, merging, grouping).	Loading cleaning, summarizing text and images datasets using pandas and numpy
4	Intro to ML, Classification vs Regression, Train/Test Split, Evaluation Metrics (Accuracy, Precision, Recall, F1).	Implement Logistic Regression & Decision Tree on dataset, compare results.
5	TensorFlow basics (tensors, layers, activations), Build simple ANN.	Implement ANN on MNIST dataset, experiment with optimizers and layers
6	Convolution, pooling, flattening, dropout, CNN architecture.	Implement CNN on CIFAR-10 dataset, evaluate accuracy.
7	Flask basics (routes, GET/POST requests), Model serving concepts.	Deploy Scikit-Learn model with Flask, test with Postman (CRUD operations).
8	Git basics (init, add, commit, push), Branching, Merging, Conflict resolution.	Create GitHub repo, commit code, handle branch conflicts & PR merges.
9	MLflow components (Tracking, Projects, Models, Registry), logging metrics and artifacts.	Train a model and track experiments with MLflow, compare runs.
10	Integrating MLflow with ML & DL pipelines, model versioning and deployment workflows.	Train CNN with MLflow integration, register model in MLflow Registry.
11	Data versioning, Introduction to DVC and DagsHub.	Version dataset with DVC, push model and data to DagsHub repository.
12	Transformer models (BERT, GPT, DistilBERT), Hugging Face ecosystem.	Load pre-trained transformer for sentiment classification, fine-tune small dataset.
13	Docker basics (images, containers, volumes, networking), Building Dockerfiles.	Containerize ML model with Flask, run inference inside Docker container
14	Airflow basics (DAGs, tasks, scheduling), AWS overview (EC2, S3, IAM).	Build ETL pipeline in Airflow (PostgreSQL → Preprocessing → API), deploy on Astro Cloud/AWS.
15	AWS SageMaker overview (training, deployment, monitoring), Final project discussion.	Project Implementation – End-to-End MLflow Pipeline using MongoDB, Transformers, MLflow,

		Docker, AWS.

Instructor Signature Abeeda Akram

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