20 TRAINING APPROACH AND METHODOLOGY

The Pakistan MoIT is looking to partner with experienced technology education operators to create training programs to train the future of technical talent in Pakistan and enhance technical skills to match international standards and demands. The future graduates of these programs in Cloud Native Development, Data Science/AI/ML, Cybersecurity, and Blockchain will go on to compete for highly paid jobs offered by international firms who will therefore be more likely to expand their operations in Pakistan and bring new business to the country.

InfoTech and Vasona Systems International (VSi) has subcontracted Emeritus Institute of Management on this critical upskilling initiative. At Emeritus, it is believed that education has the power to fundamentally change the future of humanity. Talent and ability exist everywhere; but equal access to opportunity does not. Emeritus is on a mission to change that by making the highest-quality education accessible and affordable to individuals, companies, and governments around the world – especially education that translates directly into marketable skill sets that lead to employment.

Over the past decade, Emeritus have realized this goal by collaborating with more than 50 top-tier universities across the United States, Europe, Latin America, Southeast Asia, India and China. Short courses, degree programs, bootcamps, and senior executive programs help individuals learn new skills and transform their lives, companies and organizations.

Emeritus also recognize that traditional education, as well as modern self-paced education options, are not a great fit for many of today's learners. That's why Emeritus piloted the development of the Small Private Online Cohort, a learning model that is optimized for how adults learn. Students are given the flexibility to spend time with high-quality content, learning at the pace that works best for them – while also having an environment of peer support, interactivity, hands-on project work, career counseling, and live mentoring and coaching with expert course leaders.

The results of this model are evident in course completion rates of over 90% for Emeritus' professional learners. This unique model of state-of-the-art technology, curriculum innovation, and hands-on instruction from senior faculty, mentors and coaches has educated more than 250,000 individuals across 80 countries.

Emeritus' course leaders and curriculum designers have deep technical expertise in Data Science, Software Engineering, Cybersecurity, and Blockchain, and have built out our extensive and proprietary curriculum that teaches cutting-edge technologies and industry best practices.

20.1 TRAINING APPROACH

Emeritus' educational programs are tailored to meet the needs and business objectives of our clients. We provide educational training and human capital solutions that deliver real-world business value. The programs below have been prepared based on the needs outlined in the MoIT RfP.

Please note that all of the outlined trainings below may be customized further to meet the MoIT's educational goals.

In the following pages you will see:

- Suggested course outlines for Data Science, Machine Learning and AI
- Emeritus Pedagogy, Instruction Format, and Curriculum
- Program timeline
- How will we setup the training program for success, including assessments, pre-course work and tracking success
- Delivery Methodology

20.1.1 <mark>DATA SCIENCE, MACHINE LEARNING AND AI CUSTOM PROGRAM</mark>

About this course: Specific learning objectives and technology stack will be established when Emeritus conducts a requirements inception with MoIT. Training will be customized to fit the needs of the likely incoming student population.

This course will help technical teams enable and implement data science modeling. The course outcome will be a comprehensive capstone project that enable hands-on application of the subjects covered in the training and will allow students to build familiarity with the kind of work they will be exposed to on the job.

By the end of this training, students will be able to apply various state-of-the-art machine learning and data science techniques to transform, digest, analyze, and visualize data to enhance decision making throughout the organization.

20.1.1.1 PRE-REQUISITES

Students interested in this program will take an assessment to show their level of statistics, probability, and coding skills. Students should be familiar with Python prior to training.

20.1.1.2 WEEKLY COURSE WORK SCHEDULE

Week 1: Python and Math Essentials
Development environment, Git, Unix, Python (primatives, loops, functions, OOP), NumPy, Pandas

Week 2: Data Ingestion Pipelines
Data Visualization (matplotlib), R, MongoDB, SQL, Python SQL

Week 3: Statistics and EDA
Linear Algebra, Probability distributions, statistical inference, sampling and estimation, null hypothesis testing

Week 4: Machine Learning Essentials and Linear Models
Evaluation metrics, KNN, Cross-validation, Linear and Logistic Regression, Regularized Regression

Week 5: Supervised Learning
Decision trees, bagging, Random Forests, Gradient Descent, Boosting, Neural Networks (backpropagation, MLP)

Week 6: Unsupervised Learning and NLP
Natural Language Processing, Text Classification, Naive Bayes, Topic Models (LDA and NMF), Clustering Algorithms

Week 7: Big Data
Capstones, Docker, Spark I (SQL and Dataframes), Spark II (ML Pipelines)

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Week 8: Special Topics
Profit curves, Support Vector Machines, Kernels, Principal component analysis, Singular value decomposition

Week 9: Deep Learning
Time series, Recurrent Neural Nets, Convolutional neural networks, image analysis, Generative adversarial networks, Autoencoders, transfer learning

Weeks 10 - 12: Capstone Projects
The culmination of the program is an end-to-end data science project that students will be able to showcase to employers to demonstrate competence as a data scientist. If desired, project topics can be chosen (and relevant data sets procured) during the inception to ensure students work with data sets that are relevant for the types of industries they are likely to enter after graduation.

Potential Add-Ons:
Depending on the level of the incoming students, up to four weeks of additional content on Python, probability, and statistics fundamentals may be added.

While Business Intelligence Tools were requested in the RfP, this is not a topic that is relevant in data science. However, we do recommend a separate track in Data Engineering, since there is more job demand in this area.