**MASTER OF SCIENCE IN ANALYTICS 2024**
**PROGRAM CONTENT**

## SUMMER I

### 01 Primer
1. Fundamental Statistical Concepts
2. Probability
3. Distributions
4. Sampling Distributions
5. Confidence Intervals
6. Hypothesis Testing
7. Correlation and Linear Regression
8. Analysis of Variance
9. Categorical Data Analysis

## SUMMER II

### 00 Orientation
1. MSA Program Overview
2. Technical Communication Overview
3. Policies, Rules & Regulations: MSA 2024 Handbook
4. Intercultural Communication
5. Coaching Overview

### 01 Analytics Foundations
1. Introduction to Statistics
2. Introduction to ANOVA and Regression
3. More Complex ANOVA Regression
4. Model Selection
5. Diagnostics
6. Categorical Data Analysis
7. Model Building and Scoring for Prediction

### 02 Introduction to Python

### 03 R Programming
1. Chapter 1 Introduction to R
2. Chapter 2 Data Structures
3. Chapter 3 Programming Fundamentals
4. Chapter 4 Data Wrangling
5. Chapter 5 Resources
6. Cheat Sheet 1 data wrangling-dplyr-tidyr
7. Cheat Sheet 2 stringr

### 03 Technical Communication
1. Technical Communication Introduction
2. Power of the Three
3. Virtual Presentations
4. Slide Creation Resources
5. Introduction to Technical Writing
6. Thanks for the Feedback Reading Guide
7. Critical and Creative Thinking Questions for Feedback
8. OneNote Useful Shortcuts

### 04 Professional Development
1. Coaching for Professional and Personal Development
2. LinkedIn 1
3. LinkedIn 2
4. Emotional Intelligence EQ-i Debrief
5. Emotional Intelligence EQ-i Self-Assessment
6. Myers-Briggs Type Indicator MBTI Introduction
7. Myers-Briggs Type Indicator MBTI Appreciating Differences
8. Peer Feedback Process

### 05 Data Visualization
1. Introduction to Graphs, Maps and Visualization
2. Guidelines on the Use of Graphs
3. Guidelines on the Use of Thematic Maps

### 06 Computer Security
1. Foundational Computer Security Lecture 1
2. Foundational Computer Security Lecture 2

### 07 Linear Algebra

### 08 Summer Practicum Project

## FALL I

**01 Logistic Regression**
1. Review of Logistic Regression
2. Binary Logistic Regression
3. Data Considerations
4. Subset Selection and Diagnostics
5. Model Assessment
6. Ordinal Logistic Regression
7. Nominal Logistic Regression
8. Logistic Regression Workflow Chart

**02 Time Series I**
1. Introduction to Time Series
2. Exponential Smoothing Models
3. Stationarity
4. Correlation Plots
5. AR and MA
6. ARIMA, Trend and Forecasting
7. Overall Example
8. Additional Topics: BSTS & Change Point

**03 Additional Seminars in Statistics**
1. Count Data
2. Continuous vs Ordinal
3. Unit Root Testing Dr. David Dickey
4. Introduction to Bayesian Statistics

**04 Python**

**05 SQL**
1. Introduction to Data Bases
2. What is SQL
3. Overview
4. Displaying Query Results
5. Joins
6. Subqueries
7. Set Operators
8. Creating Tables and Views
9. Python + SQL
10. Python + Postgres

**06 Technical Communication**
1. Writing and Blogging
2. Ethical Considerations for Data Professionals
3. Homework Report Slides
4. Story Telling with Data - Impromptu

**07 Professional Development**
1. Resumes for the IAA
2. Program Liaison Overview
3. The New Rules of Engagement Mary Crane
4. Tips for Business Dinning
5. Tips for Networking

**08 Project Management**
1. Practicum Overview
2. Project Management Basics Review
3. Leadership Models
4. Analytics Project Management
5. Confidentiality Agreements

**09 Computer Security**
1. Practicum Security Policy
2. Computer & Data Security Policy and Guidelines

## FALL II

**01 Data Mining**
1. Data Mining Dr. David Dickey
2. Introduction to Data Mining
3. CART
4. Clustering
5. KNN and Some Other Ideas
6. Review of Data Mining Topics
7. Review Sheet for Data Mining

**02 Time Series II**
1. Seasonal Models
2. Dynamic Regression Models
3. Prophet Models
4. Neural Network Models
5. Weighted and Combined Models
6. Hierarchical and Grouped Time Series
7. Continuous vs Ordinal Variables
8. Load Forecasting Workshop

**03 Text Analytics**

**04 Tableau**

**05 R Shiny**

**06 Plotly & Dash**

## FALL III

**01 Machine Learning**
1. Resampling, Model Selection and Regularization
2. Generalized Additive Models
3. Tree-Based Methods
4. Neural Network Models
5. Naïve Bayes Models
6. Model Agnostic Interpretability

**02 Survival Analysis**
1. Censoring, Survival and Hazards
2. Accelerated Failure Time
3. Important Facts to Keep in Mind
4. Cox Regression Model
5. Cox Regression Model 2
6. Competing Risks
7. Repeated Events
8. Extras

**03 AWS**
1. Introduction to AWS – EC2 & S3
2. Introduction to AWS – RDS

**04 R Bookdown**
1. Introduction to R Bookdown

**05 Technical Communication**
1. Online Midpoint Presentation

**06 Professional Development**
1. Interviewing 101

**07 Leadership**
1. Lesson Plan
2. Followership
3. In Praise of Followers
4. Courageous Followers
5. What Every Leader Needs to Know about Followers
6. Putting Followership on the Map – Examining Followership Styles
7. Followership and Performance

**08 Beginning of Practicum Project**

## SPRING I

**01 Financial Analytics**
1. Introduction to Credit Scoring and Data Preparation
2. Variable Grouping and Selection for Scorecard
3. Scorecard Creation
4. Gini Calculation Example

**02 Optimization**
1. Introduction to Linear Programming & GUROBI
2. Linear Programming
3. Mixed and Integer Linear Programming
4. Facility Example
5. Network Models
6. Portfolio Optimization

**03 Simulation & Risk Analytics**
1. Main Concepts of Simulation
2. Theory and Model Assessment Through Simulation
3. Introduction to Risk Management
4. Estimation and Confidence Intervals for VaR and ES
5. Recent Developments

**04 Customer Analytics**
1. Introduction to Customer Analytics

**05 Panel Data**
1. Panel Data

**06 Hadoop**
1. Hadoop – HDFS – Map Reduce – Spark
2. AWS – EMR
3. Hive & Pig
4. Hive & Pig Hands-on

**07 Spark**
1. Spark
2. Creating a Spark EMR Cluster
3. Spark Hands-on
4. Spark – PySpark
5. Spark – Mllib
6. Example Predicting Flight Delays

**08 SQL Refresher**
1. SQL Refresher

**09 Technical Communication**
1. Practicum Report

**10 Professional Development**
1. Unconscious Bias
2. OPT

## SPRING II

**01 Fraud Analytics**
1. Introduction to Fraud
2. Data Preparation
3. Anomaly Models
4. Fraud Supervised Models
5. Clusters and Implementation

**02 Bayesian Statistics**
1. Bayesian Terminology & STAN
2. Markov Chain Montecarlo MCMC
3. Bayesian Linear Regression

**03 ARCH & GARCH Models**
1. ARCH & GARCH Models

**04 Deep Learning**

**05 Advanced Big Data**
1. Introduction to Big Data
2. Distributed Databases
3. Spark for Distributed Machine Learning
4. Generative AI
5. Cloud Machine Learning
6. Cloud Services & Serverless

**06 Natural Language Processing (NLP)**
1. Natural Language Processing Introduction
2. Transformers – Embeddings & LLMs

## SPRING III

**01 End of Practicum Project**