CENTRE FOR AGRICULTURAL MARKET INTELLIGENCE
UNDER NAHEP-CAAST
INTERNATIONAL AGRIBUSINESS MANAGEMENT INSTITUTE
ANAND AGRICULTURAL UNIVERSITY, ANAND – 388110

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Read: Resolution of 56th meeting of the Academic Council held on 16/09/2021, Anand Agricultural University, Anand vide Item No. 56.31 has resolved as under

Introducing the Online Certificate Programme at CAMI, IABMI, AAU, Anand

Notification

It is hereby notified to all concerned that vide Item No.56.31 of the 56th meeting held on 16/09/2021, the Academic Council of the Anand Agricultural University has resolved as under.

"It is resolved that for strengthening the faculties, PG students and other stake holders, online certificate programmes are approved in principle as listed in Appendix-A with the guidelines given in Appendix-B to be offered by Centre for Agricultural Market Intelligence, International Agri-business Management Institute, Anand Agricultural University, Anand."

It is also resolved that detailed course content of a certificate programme "Data analytics using python" as listed in Appendix-C is approved in Principle.

No. AAU/IABMI/NAHEP-CAAST/ 402-405 /2021
Date: 29/10/2021

Principal & Dean

Copy F.W. Cs.to:

1. P.S. to Hon'ble Vice Chancellor, Anand Agricultural University, Anand
2. All Members of Academic Council of this University
3. All Officers of this University
4. Registrar, AAU, Anand

Copy to:

1. All Principal/Dean of this University
2. Office of Registrar Examination and Academic Branch (10 Copies)
3. Director, Information Technology, AAU, Anand with request to upload the Notification on circular section of AAU website.

Annexure - A

Centre for Agricultural Market Intelligence
under NAHEP-CAAST
Anand Agricultural University, Anand

Guidelines for Online Certificate Courses

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1) Courses:

Centre for Agricultural Market Intelligence, NAHEP-CAAST, Anand Agricultural University, Anand shall offer various online certificate courses as a part of Human Capacity Building. The courses will be of 4 to 12 weeks duration offered. The tentative Title and Duration of courses are as follows:

Sr. No.	Title of the Course and Mode	Duration
1.	Data Analytics using Python (online)	12 Weeks
2.	Agricultural Market Intelligence (online)	12 Weeks
3.	Agricultural Insurance (online)	4 Weeks
4.	Statistical Analysis using SPSS Software (online)	12 Weeks
5.	Statistical Analysis using R Software (online)	12 Weeks

2) Who should attend the courses:

- Graduate or Final year students (registered in at least 7th Semester of 4th year) from the bachelor degree program of Agriculture and allied disciplines
- Post graduate students of Agriculture and allied disciplines
- Faculties/Scientists of State Agricultural Universities, ICAR, Industries and Deemed Agricultural Universities
- Professionals of State Department of Agriculture/ Horticulture/ Animal Husbandry and allied disciplines
- Agriculture Marketing and Cooperation Professionals

3) How to apply:

- Advertisement/Brochure for each course will be issued well in advance on Anand Agricultural University and NAHEP-CAAST, AAU websites and other appropriate media along-with the details such as objectives, course contents, schedule, maximum seats available, mode of conduct, resource persons, evaluation criteria and selection criteria, etc.
- The date of commencement, the last date for accepting the applications, and the application mode will be provided in the brochure and website.
- The participants should apply online through the www.aau.in and nahep-caast.aau.in website by accessing the link.
- The candidate should check the eligibility and apply with the necessary documents. Once candidate will apply for any course, they will not allow changing the submitted information.

4) Selection Criteria:

The candidates applying for online certificate courses are advised to confirm their minimum eligibility before applying for the course. The eligible candidates should apply online. Necessary documents for eligibility of candidates should be submitted at the time of online registration. The selection of the eligible candidates for certificate course/s is purely based on the first-come-first serve basis until the requisite number of seats is filled.

The final authority of eligibility of candidates will be decided by Course Coordinator as per necessary documents submitted by candidates and reserved seats for faculties, PG students and others. The selected candidates will be notified through the designated website/ email only.

5) No. of seats:

Maximum no. of seats for each certificate course is as below:
Online courses: 30 to 100 seats
The Principal Investigator, Centre for Agricultural Market Intelligence, NAHEP-CAAST, AAU reserves the right to conduct or cancel the courses depending on the required number of applications from the interested candidates.

6) Registration Fee and Accommodation:

No registration fee is to be paid.

No boarding and lodging facility will be provided for online courses.

7) Platform for the Certificate course:

Certificate course/s will be held on online web portal managed by Centre for Agricultural Market Intelligence, NAHEP-CAAST, AAU, Anand. If an interaction meeting or discussion with the resource persons and candidates is required, an online session will be held on Zoom or Google Meet or similar online platform.

8) Evaluation

A) Pre and Post Evaluation:

Pre and post certificate course evaluation will be carried out to evaluate the impact of the certificate course.

B) Evaluation and Feedback:

There will be evaluation of the candidates at the end of each day, and final evaluation at the end of the course. The evaluation will be in the form of Quiz and Assignment. Based on the attendance and evaluation performance, the certificate will be issued to the participants. The criteria of attendance, Quiz and Feedback will be given with the brochure of the specific program (Average 50% in Quiz and 100%Feedback forms and assignment submitted).

9) Moderator/Facilitator:

One or more scientists/ faculties/ staff from NAHEP-CAAST, AAU, Anand will be the moderator(s) or facilitator(s) or (in-charge) or as Course Director (s)/ Course Co-coordinator (s) for each course.

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Appendix - B

Centre for Agricultural Market Intelligence
under NAHEP-CAAST
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Guidelines for Experts for Online Certificate Courses

Resource Persons shall submit following documents/ information for online certificate course/s

1. As per instruction given by Course Coordinator, Resource Persons will record their lectures by online mode on ZOOM platform up to 45 minutes. Technical assistance and zoom meeting ID will be provided well before time.
2. Study material inclusive of theory as well as practical and above material will be used for different training programs under NAHEP-CAAST, AAU, Anand.
3. Power Point Presentation and PDF copy of every lecture
4. 20 MCQs per lecture for conducting Quiz for every session and/or assignment.
5. Relevant examples with solutions for monthly Assignments
6. During the course, if any query is raised by participants, concerned faculty will discuss with the resource persons and resolve the same through online portal.
7. Remuneration to be provided as per NAHEP guidelines is as follows:

Sr. No.	Activities/ Details	Honorarium per Activity (Rs.)
1.	Lecture (with video recording)	
	1. Directors/ Industry Leaders/ MNC Executives/	5000/-
	2. Professors/ Associate Professors/Manager	4000/-
	3. Assistant Professors/ Executive	3000/-
2.	Printed materials, exam material and others	1500/-
3.	Technical Reviewer (per week)	500/-
4	Academic Reviewer (per week)	1000/-

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Appendix - C

Data Analytics using Python

Online Certification Course

Course outline:

This course includes examples of analytics in a wide variety of domain and we hope that participants will learn how one can use analytics in their research area, career and life. One of the most important aspects of this course is that hands-on experience creating analytics models will be shared.

Course duration: 12 weeks, 2-3 hours a week

Course Plan:

Week 1: Introduction to data analytics and Python

Week 2: Introduction to probability

Week 3: Sampling and sampling distributions

Week 4: Hypothesis testing

Week 5: Design of Experiment

Week 6: Linear regression

Week 7: Linear and Multiple regression

Week 8: Maximum Likelihood Estimation and Logistic regression

Week 9: Principal component analysis and Factor Analysis

Week 10: Chi Square test and Clustering analysis

Week 11: Clustering analysis

Week 12: Classification and Regression Trees (CART)

Lectures (40 minutes for each session):

Week 1: Introduction to data analytics and Python

- Fundamentals of data analysis I
    - Type of variable and measurements
    - Graphical representation and its type
    - Algebraic Average (AM, GM, HM) and its calculation for different data set
    - Positional Average (Median & Mode) and its calculation for different data set
- Fundamentals of data analysis II
    - Positional Average (Quartiles, Percentiles & Deciles) and its calculation for different data
    - Measures of Dispersion (MD, SD, Variance) and its calculation for different data set
    - Measures of Dispersion (CV & SEm) and its calculation for different data set
    - Skewness & Kurtosis
- Introduction to python fundamentals I
    - Why Python, its fundamentals and its IDE
    - Python installation steps
    - Python libraries
    - File Input/Data import (Read and Write CSV/excel Data) and identification of type of data
- Introduction to python fundamentals II
    - How to define variable in python & its basic operations
    - Python data structure (Array, List, tuple, dictionary)
    - Functions and Loops
    - Scientific Computing and Graphing (Use NumPy for Matrix Manipulation & Matplotlib for Plotting Graphs)

Week 2: Introduction to probability

- Introduction to Probability
    - Basics of Probability (Definition, Rule, types of events)
    - Probability operations (Union, Intersection, complementary)
    - Laws of probability
    - Bayes rule

- Distribution
    - Probability distribution and its type
    - PMF, PDF, CDF
    - Marginal, Joint & Conditional probability distribution
    - Expected value, Variance, Covariance and their properties
    - Calculation of Expected value/mean and variance using PDF/PMF
- Discrete & Continuous Probability Distribution (Properties, PMF, Use, probability calculation)
    - Binomial Distribution
    - Poisson Distribution
    - Uniform Distribution
    - Normal & Exponential Distribution
- Practical demo on Python
    - Importing libraries
    - Codes for calculating PMF, PDF, CDF
    - Codes for calculating Expected value/mean and variance
    - Codes for calculating Marginal, Joint & Conditional probability

Week 3: Sampling and sampling distributions

- Fundamentals of sampling techniques and its types
    - Basics of sampling (definition & types of sample)
    - Concept of Sampling distribution
    - Determine the mean and SD for sampling distribution of sample mean
    - Types of sampling technique
- Distribution of Sample means & Variance
    - Simple random sampling with & without replacement
    - Stratified random sampling
    - Multistage sampling
    - Systematic sampling
- Interval Estimation I
    - Point Estimate & interval estimate
    - Construct CI for one population mean when σ^2 is known
    - Construct CI for one population mean when σ^2 is unknown
    - Construct CI for one population Variance

- Numerical example for estimating mean and variance of sample
    - Simple random sampling with & without replacement
    - Stratified random sampling
    - Multistage sampling
    - Construction of CI for one population mean & Variance in SRSWOR

Week 4: Hypothesis testing

- Fundamentals of Hypothesis testing
    - Why Hypothesis testing, Null & Alternate Hypothesis
    - Types of Alternate Hypothesis
    - Types of Error & Region
    - Steps involved in testing of Hypothesis
- Hypothesis testing I
    - One sample t & Z test
    - 2 sample t test with equal variance
    - 2 sample t test with unequal variance
    - Paired t test
- Hypothesis testing II
    - F test
    - Chi Square test for testing of homogeneity of variance
    - Chi Square test for Independence of Attribute
    - Goodness of fit
- Practical demo on Python
    - Importing libraries, Finding p value, test statistic value
    - Code for calculating alpha, beta & power of test
    - Code for one & two sample t & Z test
    - Code for F test & Chi Square test

Week 5: Design of Experiment

- Fundamentals of Design of Experiment
    - Basics of DoE
    - Principal of Experimental Design
    - Experimental error, precision, accuracy, Uniformity trail
    - ANOVA & its types

- Types of Design of Experiment (Purpose, Layout, ANOVA, Numerical Example)
    - CRD
    - RBD
    - LSD
    - Factorial Concept
- Post Hoc test
    - Critical Difference
    - Duncan's multiple range test
    - Bonferroni Procedure
    - Tukey's Test
- Python Code
    - Importing libraries & data set
    - 1 way ANOVA
    - 2 way ANOVA
    - Post hoc test

Week 6: Linear regression

- Linear Regression I
    - Basics of regression
    - Types of Regression
    - Properties of regression coefficient
- Linear Regression II
    - Simple linear regression
    - Assumption of SLR
    - Coefficient of determination
    - Principal of least square method
    - Model estimation
- Linear Regression III
    - Testing of significance
    - Point & interval estimation
    - Model performance score
    - Residual check
- Practical Demo of Linear regression on Python
    - Library import & training and testing split

- Linear regression equation & Plot
- Point & Interval estimation
- Plot for residual check & MSE & Reg score

Week 7: Multiple Regression

- Multiple Linear Regression I
  - Basics
  - Assumptions
  - OLS method
  - Multiple coefficient of determination
- Multiple Linear Regression II
  - Building MLR model
  - Test of overall model significance
  - Test of significance for parameters
- Multiple Linear Regression III
  - R square & Adjusted R square
  - Point & interval estimation
  - Model performance score
  - Residual check
- Practical Demo of Multiple Linear regression on Python
  - Library import & training and testing split
  - Linear regression equation & Plot
  - Point & Interval estimation
  - Plot for residual check & MSE & Reg score

Week 8: Maximum likelihood Estimation (MLE) and Logistic regression

- Categorical variable and its analysis
  - Definition, types and use
  - Dummy variable and its purpose
  - Creating regression equation using Dummy variable
  - Interpreting parameters
- Introduction to MLE
  - Concept of MLE
  - Difference between MLE & OLS
  - Finding MLE for all parameters of normal distribution

- Examples of MLE

- Logistic Regression
  - Concepts and Applications
  - Logistic regression equation, Probit & logit
  - Parameter estimation of Logistic regression model
  - Confusion matrix/Model accuracy
- Practical Demo of Logistic regression on Python
  - Creating dummy variable
  - Dummy regression parameter estimation & interpretation
  - Problem on parameter estimation by MLE
  - Logistic regression

Week 9: Principal component analysis and Factor Analysis

- Principal component analysis
  - Definition and its purpose
  - Variance Covariance Matrix/ Correlation Matrix
  - SVD, Eigen value, Eigen vector
  - Creating a feature vector and recast the data along PC axes
- Factor Analysis
  - Introduction to Exploratory Factor Analysis
  - Extracting factors
  - Rotation methods
  - Generating factor scores
- Practical Demo of Principal component analysis
  - Importing libraries, Loading data
  - Feature selection & & standardization of data
  - Decomposition code for PCA
  - Visualize 2D Projection
- Practical Demo of Factor Analysis
  - Installing & importing factor analyzer library, Loading data
  - Eigen values and its plot
  - Factor rotation
  - Checking of reliable factor

Week 10: Cluster Analysis

- Introduction to Cluster Analysis
    - Different type of data and their measurement
    - Understanding of cluster analysis & its purpose
    - Types of distance
    - Similarity and dissimilarity matrix
- Hierarchical method of Cluster Analysis
    - Agglomerative clustering
    - Divisible clustering
    - Examples on Agglomerative clustering
    - Examples on Divisible clustering
- Non-Hierarchical method of Cluster Analysis
    - K means clustering
    - Centroid calculation
    - Cluster formation steps
    - Examples on K means clustering
- Practical demo of cluster analysis
    - Computing different types of distance
    - Calculating dissimilarity matrix
    - Hierarchical clustering
    - K means clustering

Week 11: Classification and Regression Trees (CART)

- Introduction to CART
    - Entropy, Information gain, Gini index
    - Calculation of Entropy, Information gain, Gini index
    - Split information, Gain ratio
    - Numerical problems on Split information, Gain ratio
- Decision tree
    - Definition & Purpose & Types of decision tree
    - Decision tree regression & its criteria
    - Decision tree Classification & its criteria
    - Pruning & Split stop criteria
- Random forest
    - Ensemble methods & purpose

- Types of Ensemble methods
- Random forest classifier
- Random forest regressor

- Practical demo of Decision Tree
  - Importin libraries and dataset
  - Label encoding & structuring data frame
  - Building, Visualizing and interpretation of Decision Tree
  - Building of random forest

Week 12: Artificial Neural Network (ANN)

- Fundamentals of ANN
  - Intuition behind Neural networks
  - Single & Multi-Layer Perceptrons
  - Activation Functions
  - Types of activation function
- Learning Algorithm
  - Supervised learning (classification & Regression)
  - Unsupervised learning (Clustering & Association)
  - Reinforcement learning
  - Conclusion
- Weight adjustment Algorithm
  - Gradient descent.
  - Newton method
  - Quasi-Newton method
  - Levenberg-Marquardt algorithm
- Practical demo of ANN
  - Importing Keras and dataset
  - Scaling, feature selection train test split
  - Building Neural network
  - Checking performance of model