DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/B.Sc./CBC&GS/94/2024

It is hereby inform to all concerned that, the Revised syllabi prepared by the Board of Studies/ Ad-hoc Boards & recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted** the following Syllabi under the Faculty of Science & Technology **as per Norms of Choiced Based Credit Grading System** run at the Affiliated Colleges, Dr.Babasahcb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Zoology (Optional)	Vth & VIth semester
2.	B.Sc. Statistics (Optional)	Vth & VIth semester
3.	B.Sc.Home Science (Degree)	Vth & VIth semester
4.	B.Sc.Biotechnology (Degree)	Vth & VIth semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/2024/26481-89
Date:- 20.05.2024

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

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1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit 1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, CHHATRAPATI SAMBHAJINAGAR

B.Sc. Statistics (Optional)

Vth and VIth semester

(Third Year)

Course Structure and Curriculum

Choice Based Credit & Grading System.

Professor And Head
Department of Statistics
Dr.Babasaheb Ambedkar
Marathwada University,
Chhatrapati Sambhajinagar (M.S.)

From the Academic Year 2024-25 & Onwards/-

Semester-V

STA- 511: Statistical Inference

Credits :2

Number of Lectures: 30

Unit-I: Estimation

I) Characteristics of a good estimator Viz. Consistency, Unbiasedness, efficiency and Sufficiency.
II) Standard results on above Characteristics.
III) Likelihood function, Cramer-Rao inequality (Statement)
IV) Methods of estimation; MLE and method of moments.
V) Information function.
VI) Confidence Interval.
VII) Large sample test for single mean and difference of means.

Unit II: Testing of Hypothesis

I) Introduction.
II) Statistical hypothesis- Simple and composite
III) Null hypothesis and alternative hypothesis
IV) Critical region
V) Two types of errors
VI) Level of significance
VII) Power of test
VIII) Steps involved in solving testing of hypothesis problem
IX) Most powerful test, UMP test
X) Neyman Pearson lemma (statement and withoutproof)

Unit III: Non-Parametric Method

I) Definition of order statistics
II) Introduction to non-parametric method and its necessity
III) Advantages and disadvantages of non-parametric method over parametric methods

IV) Run test

V) Sign test

VI) Median test

VII) Mann-Whitney-Wilcoxon U test

VIII) Kolmogorov- Smirnov one sample test.

STA- 512: Statistical Quality Control and Demography

Credits :2

Number of Lectures: 30

Unit-I: Statistical Quality Control

I) Introduction

II) Process Control and Product Control

III) Three-Sigma Control and Tools for SQC

IV) Control Charts for Variables $\overline{X}$ and R Chart, $\overline{X}$ and σ -Chart

V) Control Charts for Attributes

VI) p-Chart for Fraction Defectives

VII) d-Chart for number of Defectives

VIII) c-Chart for number of Defectives

Unit-II: Acceptance Sampling

I) Natural Tolerance and Specification Units

II) Modified Control Units

III) Introduction acceptance sampling by attributes.

IV) Definitions of AQL, LTPD Process, Average Fraction Defective etc.

V) OC Curve

VI) Average Sample Number (ASN)

VII) Consumers and Producers Risk

VIII) Single Sampling Plan and Double Sampling plan

Unit-III: Vital statistics

I) Uses of Vital statistics

II) Methods of Obtaining Vital statistics

III) Measurement of Mortality

IV) Crude Death rate, Specific Death rate, Age Specific Death rate, Standardized death rate

V) Infant Mortality rate,

VI) Crude Birth rate,

VII) General fertility rate, Specific fertility rate, Total fertility rate,

VIII) Construction of Life tables.

STA- 513: (SEC 3E) Statistical Computing Using R

Credits :2

Number of Lectures: 30

Unit-I: Finding Probabilities using R (z, F, t, χ^2) ,Non parametric tests using R, Run test, Sign test, median test, Man-Whitney test, Kolmogorov- Simirnov one sample test.

Unit-II: Construction of life tables using R, $\bar{x}$ and R chart P chart, d chart, c chart using R, Construction of $\bar{x}$ and σ chart using R Computation of birth rates, death rates using R.

STA- 513: (SEC 3E) Introduction to Python

Credits :2

Number of Lectures: 30

Unit-I: History of python, advantages and disadvantages of Python, Introduction to anaconda, Variables, Constants, indents in Python, data types in Python, arithmetic and logical operators, small programs based on arithmetic operators and variables.

Unit-II: Variable declaration, Data insertion and storage, data output, data frame, slicing of data, data Handling (import and export), input of matrix and its slicing and matrix operations.

STA- 521: Lab Course

Credits :1.5

Number of Lectures: 45

I) Maximum Likelihood Estimation

II) Method of Moments

III) Construction of Confidence Intervals

IV) Most Powerful Test

V) Uniformly Most Powerful Test

VI) Run test

VII) Sign – Wilcoxon test

VIII) Median test

IX) Man – Whitney test

X) Kolmogorov Simirnov one sample test

STA- 522: Lab Course

Credits :1.5

Number of Lectures: 45

I) Computation of Birth Rates

II) Computation of Death Rates

III) Computation of fertility Rates

IV) Construction of Life tables

V) Construction of $\overline{X}$ and R

VI) Construction of c charts

VII) Construction of p and d charts

VIII) Single Sampling plan

IX) Double Sampling plan

X) Construction of $\overline{X}$ and σ charts

STA- 611: Design of Experiments

Credits :2

Number of Lectures: 30

Unit-I: Introduction & Completely Randomized Design (CRD)

I) Introduction to design of experiment. Various definitions.

II) Principles of Design of Experiment.

III) One way classification of data. CRD, it's advantages & disadvantages.

IV) Analysis of variance (ANOVA) of one way classified data.

V) Statistical analysis of CRD.

VI) Least square estimates of various effects.

VII) Variances of the estimates.

VIII) Expectation of various sums of squares.

IX) Critical difference

Unit-II: Randomized Block Design (RBD)

I) Two way classification of data, RBD and layout.

II) Advantages & disadvantages of RBD

III) Mathematical model & statistical analysis of RBD.

IV) Least square estimates of various effects in RBD.

V) Variances of the estimates.

VI) Expectation of various sums of squares

VII) Efficiency of RBD relative to CRD.

VIII) Missing plot technique (one & two missing values)

Unit-III: Latin Square Design (LSD)

I) Introduction to LSD.

II) Layout of LSD, standard Latin square.

III) Advantages & disadvantages of LSD.

IV) Mathematical model & statistical analysis m x m LSD (one Observation per experimental unit)

V) Least square estimates of parameters in LSD.

VI) Variances of the estimates.

VII) Expectation of various sums of squares.

VIII) 2^2 and 2^3 Fractional Experimental Design

STA- 612: Operations Research

Credits :2

Number of Lectures: 30

Unit-I: Linear Programming Problem (LPP)

i) Meaning and Scope of OR, Uses and Limitations of OR

ii) Elementary Theory of Convex Sets and Applications

iii) Definition and Mathematical Formulation of General LPP

iv) Applications of LPP

v) Some Definitions-Solution to LLP, Feasible Solution to LPP etc

vi) Graphical Solution to LPP

vii) Simplex Method to Solve LPP

viii) Case of Artificial Variables

Unit-II: Transportation and Assignment Problem

I) Transportation Problem: Introduction and Applications

II) Mathematical Formulation of TP to LPP

III) Necessary and Sufficient Condition for Existence of Feasible Solution in TP

IV) Initial Basic Feasible Solution to Transportation Problem by Different Methods

Assignment Problem (AP)

V) Definition of AP and Applications of AP

VI) Unbalancedness in AP

VII) Assignment Algorithm (Optimum Solution of AP)

Unit-III: Network Scheduling by PERT, CPM and Game Theory

I) Introduction

II) Basic Concepts: Activities, Nodes, Network and Critical Path

III) Constraints in Network

IV) Construction of Network and Time Calculations in Network

V) Critical Path Method

VI) PERT

VII) Introduction to Game Theory

VIII) Two Person Zero-Sum Games

IX) The Maximin Minimax Principle

X) Definition-Saddle Point, Games with and without Saddle Point

XI) Graphical Solution to 2xn and mx2 Games

STA- 613: (SEC 4G) Python Programming

Credits :2

Number of Lectures: 30

Unit-I:

I) Conditions (If , If-else)

II) Loop (for-while)

III) Programming using conditions and loop

Unit-II

i) Inbuilt Data sets

ii) Introduction To different libraries in python

iii) Panda

iv) Num PY

v) SK Learn

vi) Programs using inbuilt data sets and libraries.

STA- 613: (SEC 4H) Actuarial Statistics

Credits :2

Number of Lectures: 30

Unit-I:

I) Introduction to insurance business, working of insurance business motion of utility, utility function, survival function and life tables,

Unit-II:

Simple and compound interest rates, nominal and effective rates of interest, discount and accumulating factors, Life insurance, endowment insurance, deferred insurance.

1) Deshmukh S.R. (2009): Actuarial Statistics: in introduction using R, University press
2) Dixit S.R, Modi C.S. and Joshi R.V. (2000) Mathematical Bisis of Life Assurance: Insurance institute of India, Bornboy

STA- 621: Lab Course

Credits :1.5

Number of Lectures: 45

I) Carry out analysis of variance of CRD

II) Carry out analysis of variance of RBD

III) Estimation of one missing value in RBD

IV) Estimation of two missing value in RBD

V) Carry out analysis of variance of LSD

VI) Efficiency of RBD and LSD over CRD

VII) Estimation of one missing value in LSD

VIII) Carry out analysis of variance of CRD Non-normal data (Kruscal-Wallies)

IX) Carry out analysis of variance for 2^2 Factorial Design

X) Carry out analysis of variance for 2^3 Factorial Design

STA- 622: Lab Course

Credits :1.5

Number of Lectures: 45

I) Solution of LLP by graphical method

II) Simplex Method (Minimization)

III) Simplex Method (Maximization)

IV) Initial Basic Feasible Solution by NWCR / LCM / VAM

V) Optimum solution of TP (MODI) method

VI) Assignment algorithm

VII) CPM

VIII) PERT

IX) Solution by Graphical method for mx2, 2xn games

X) Determination of Value of game

XI) Solution of non saddle point games.