DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.ACAD/SU/Sci./B.Sc. & M.Sc. Syll./5/2015

It is hereby notified for information to all the concerned that, on the recommendation of the Faculty of Science the Academic Council at its meeting held on 30-05-2015 has accepted the **revised semester-wise syllabi as mentioned against their names in the Faculty of Science as under** :-

Sr. No.	Name of the Subject	Semester
[1]	B.Sc. Computer Science Degree Course	III & IV
[2]	B.Sc. Information Technology Degree Course	III & IV
[3]	B.C.A. Science Degree Course	III & IV
[4]	B.Sc. Animation Degree Course	III & IV
[5]	B.Sc. Bioinformatics Degree Course	III & IV
[6]	B.Sc. Computer Science [Optional]	III & IV
[7]	B.Sc. Information Technology [Optional]	III & IV
[8]	B.Sc. Computer Applications [Optional]	III & IV
[9]	B.Sc. Computer Maintenance [Optional]	III & IV
[10]	B.Sc. Environmental Science [Optional]	V & VI
[11]	B.Sc. Bio-Chemistry [Optional]	V & VI
[12]	B.Sc. Forensic Science Degree Course	V & VI
[13]	B.Sc. Industrial Chemistry [Optional]	V & VI
[14]	B.Sc. Electronics [Optional]	V & VI
[15]	B.Sc. Zoology [Optional]	V & VI
[16]	B.Sc. Microbiology [Optional]	V & VI
[17]	B.Sc. Instrumentation Practice [Optional]	V & VI
[18]	B.Sc. Statistics [Optional]	V & VI
[19]	B.A. Statistics [Optional]	V & VI
[20]	B.A. / B.Sc. Mathematics [Optional]	V & VI
[21]	B.Sc. Home Science Degree Course	V & VI
[22]	B.Sc. Textile Interior Decoration Degree Course	V & VI
[23]	B.Sc. Fishery Science [Optional]	V & VI
[24]	B.Sc. Dairy Science & Technology [Optional]	V & VI
[25]	B.Sc. Botany [Optional]	V & VI
[26]	B.Sc. Physics [Optional]	V & VI
[27]	M.Sc. Computer Science	III & IV
[28]	M.Sc. I.T.	III & IV

This is effective from the Academic Year 2015-16 & onwards as appended herewith.

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

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/SU/SCI./
2015/3761-4160
Date:- 16-06-2015.

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Director,
Board of College and
University Development.

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Copy forwarded with compliments to:-

1] The Principals, affiliated concerned colleges,
Dr. Babasaheb Ambedkar Marathwada University

Copy to :-

1] The Controller of Examinations,
2] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,
3] The Superintendent, [B.Sc. Unit],
4] The Superintendent, [M.Sc. Unit],
5] The Programmer [Computer Unit-1] Examinations,
6] The Programmer [Computer Unit-2] Examinations,
7] The Record Keeper.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Syllabus of the

T.Y. B.Sc.(V and VI Semester)
In Statistics (Optional)
With effect from the academic Year 2015-2016

SYLLABII OF B.Sc. III-YEAR

STATISTICS

Semester	Paper No.	Title Of The Paper	No. of Lectures per week	Marks Univ.
V Theory	501	Operations Research	03	50
	502	Statistical Inference	03	50
VI Theory	601	R-Programming & Statistical Quality Control	03	50
	602	Design of Experiment	03	50
V Annual Practicals	503	Practicals Based on 501	03	50
	504	Practicals Based on 502	03	50
VI Annual Practicals	603	Practicals Based on 601	03	50
	604	Practicals Based on 602	03	50

SEMESTER-V
PAPER 501:Operations Research

Unit-1: Linear Programming Problem (LPP)

1.1 Meaning and Scope of OR, Uses and Limitations of OR
1.2 Elementary Theory of Convex Sets and Applications
1.3 Definition and Mathematical Formulation of General LPP
1.4 Applications of LPP
1.5 Some Definitions-Solution to LPP, Feasible Solution to LPP etc.
1.6 Graphical Solution to LPP
1.7 Simplex Method to Solve LPP
1.8 Case of Artificial Variables

Unit-2: Transportation and Assignment Problem & Game Theory

2.1 Transportation Problem: Introduction and Application
2.2 Mathematical Formulation of LPP
2.3 Necessary and Sufficient Condition for Existence of Feasible Solution to LPP
2.4 Initial Basic Feasible Solution to Transportation Problem by Different Methods
2.5 Assignment Problem (AP)
2.6 Definition of AP and Applications of AP
2.7 Assignment Algorithm
2.8 Introduction and Applications of GT
2.9 Two Person Zero-Sum Games
2.10 The Maximin Minimax Principle
2.11 Definition - Saddle Point, Games with and without Saddle Point
2.12 Graphical Solution to 2 x n and m x 2 Games.

Unit-3: Network Scheduling by PERT & CPM

3.1 Introduction
3.2 Basic Concepts: Activities, Nodes, Network and Critical Path
3.3 Constraints in Network
3.4 Construction of Network and Time Calculations in Network
3.5 Critical Path Method

Paper 502: STATISTICAL INFERENCE

Unit -1: Testing of hypothesis

1. Introduction
2. Statistical hypothesis – Simple and composite
3. Null hypothesis and alternative hypothesis
4. Critical region
5. Two types of errors
6. Level of significance
7. Power of test
8. Steps involved in solving testing of hypothesis problem
9. Most powerful test
10. Neyman pearson lemma(statement and proof)

Unit -2: Sequential Analysis

1. Introduction
2. Wald's probability ratio test
3. Power function –Operating characteristics
4. Wald's Identity
5. Average Sample Number
6. Sampling Inspection
7. OC and average sample size

Unit- 3:Non-Parametric Methods

1. Definition of order statistics
2. Introduction to non- parametric methods and its necessity
3. Advantages and disadvantages of non- parametric methods over parametric methods
4. Run test
5. Sign test
6. Median test
7. Mann-Whitney-Wilcoxon U test
8. Spearman's rank correlation test
9. Kolmogorov - Smirnov one sample test

SEMESTER-VI
Paper 601: SQC and R Programming

Unit-1: Statistical Quality Control

1.1 Introduction
1.2 Process Control and Product Control
1.3 Three-Sigma Control and Tools for SQC
1.4 Control Charts for Variables $\bar{x}$ and R-Chart, $\bar{x}$ and σ Chart
1.5 Control Charts for Attributes
1.6 p-Chart for Fraction Defectives
1.7 d-Chart for number of Defectives
1.8 c-Chart for number of Defects

Unit-2: Acceptance Sampling

2.1 Natural Tolerance and Specification Units
2.2 Modified Control Units
2.3 Introduction to Acceptance Sampling by Attributes
2.4 Definitions of AQL, LTPD Process, Average Fraction Defective etc.
2.5 OC Curve
2.6 Average Sample Number (ASN)
2.7 Consumers and Producers Risk
2.8 Single Sampling Plan and Double Sampling Plan

Unit-3: Fundamentals of R-Programming

3.1 Introduction to R, Features of R, Installation of R, Starting and Ending R Sessions, Getting Help in R, R Commands and Case Sensitivity
3.2 Types: Logical, Numeric and Complex, Vectors and Vector Arithmatic
3.3 Creation of Vectors Using Function c, Assign, seq, rep
3.4 Arithmetic Operations on Vectors Using Operators +, -, *, /, ^.
3.5 Numerical Functions: Log 10, Log, sort, max, min, unique, range, length, var, prod, sum, summary, fivenum Data etc.
3.6 Accessing Vectors
3.7 Alternative Ways to Create Vectors by Scan Function
3.8 Data Frames: Creation Using Data, Frame, Subset and Transform Commands.
3.9 Resident Data Sets: Accession and Summary
3.10 Interactive Graphic Function

Paper 602:Design of Experiment

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

1.1 Introduction to design of experiment. Various definitions.
1.2 Principles of Design of Experiment.
1.3 One way classification of data, CRD, it's advantages & disadvantages.
1.4 Analysis of variance (ANOVA) of one way classified data
1.5 Statistical analysis of CRD
1.6 Least square estimates of various effects.
1.7 Variances of the estimates.
1.8 Expectation of various sums of squares.
1.9 Critical difference.

Unit II : **Randomized Block Design (RBD)**

2.1 Two way classification of data, RBD & it's layout.
2.2 It's advantages & disadvantages.
2.3 Mathematical model & statistical analysis of RBD.
2.4 Least square estimates of various effects in RBD.
2.5 Variances of the estimates.
2.6 Expectation of various sums of squares.
2.7 Efficiency of RBD relative to CRD.
2.8 Missing plot technique (one & two missing values)

Unit III: **Latin Square Design (LSD)**

3.1 Introduction to LSD.
3.2 Layout of LSD , standard Latin Square.
3.3 Advantages & disadvantages of LSD.
3.4 Mathematical model & Statistical analysis m x m LSD (one observation per experimental unit)
3.5 Least square estimates of parameters in LSD.
3.6 Variances of the estimates.
3.7 Expectation of various sums of squares.

PAPER 603:Project Report

Project report based on collection of data and analysis of data & use of tools in R.

PAPER 604:PRACTICAL

Practical on Design of experiment & SQC

1. Carry out analysis of variance in CRD
2. Carry out analysis of variance in RBD
3. Estimation of One Missing value in RBD
4. Estimation of Two Missing Value in RBD 5 Efficiency of RBD with respect to CRD 6 Carry out analysis of variance in RBD
5. $\bar{x}$ and R-Chart & $\bar{x}$ and σ Chart
6. p-Chart
7. c-Chart

List of recommended books.

[1] Fundamentals of Mathematical Statistics S C Gupta & V K Kapoor

[2] Statistical Inference,H.C.Saxena,P.U.Surendran

[3] Operations Research, Kanti Swaroop & P K Gupta
[4] Operations Research & Introduction , H A Taha

[5] PERT & CPM, Shree Nath

[6] Fundamentals of Applied Statistics, S C Gupta & V K Kapoor

[7] Quality Control & Industrial Statistics ,A J Duncan

[8] Statistics Using R , S G Purohit, S D Gore & S R Deshmukh

[9] Experimental Designs,W.G.Cochran and G.M.Cox
[10] Design and Analysis of experiment M.N.Das and Giri

[11] Design and Analysis of experiment O.Kempthorne

[12] Linear Programming Method , E.Gass