DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/B.Sc./08/2022

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies and Ad-hoc Boards with recommendation of the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Regulation under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc.Electronics(Optional)	Ist and IInd semester (First Year)
2.	B.A./B.Sc.Mathematics(Optional)	Ist and IInd semester (First Year)
3.	B.Sc.Chemistry(Optional)	Ist and IInd semester (First Year)
4.	B.Sc.Physics(Optional)	Ist and IInd semester (First Year)
5.	B.Sc.Analytical Chemistry	Ist and IInd semester (First Year)
6.	B.Sc.Geology (Optional)	Ist to VIth semester (First to Third)

This is effective from the Academic Year 2022-23 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/2022/ 6852-62
Date:- 10.08.2022.

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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.**
   Copy to :-
1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**

2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
6] The Public Relation Officer, Dr.BAMU,A'bad.
7] The Record Keeper, Dr.BAMU,A'bad.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

CURRICULUM

CHOICE BASED CREDIT & GRADING SYSTEM

B.A/B.Sc. FIRST YEAR (MATHEMATICS)

SEMESTER – I and II

[Curriculum will be progressively effective from the Academic year 2022-2023 & onwards]

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Dr. Bhausaheb R. Sontakke
Chairman,
Board of Studies in Mathematics,
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad (M.S.)

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,

AURANGABAD

Choice Based Credit and Grading System

B.A. /B.Sc. First Year Syllabus

Semester I

Paper Code	Paper No. and Title of the papers	Number of Periods per week	Theory Marks (UA)	Internal Marks (CIA)	Total Marks	Credits
MAT-101	Paper-I Geometry	05	40	10	50	03
MAT-102	Paper-II Differential Calculus	05	40	10	50	03
		10	80	20	100	06

Semester II

Paper Code	Paper No. and Title of the papers	Number of Periods per week	Theory Marks (UA)	Internal Marks (CIA)	Total Marks	Credits
MAT-201	Paper-III Number Theory	05	40	10	50	03
MAT-202	Paper-IV Integral Calculus	05	40	10	50	03
		10	80	20	100	06

UA– University Assessment, CIA- Continuous Internal Assessment.

CIA: Internal Test 05 Marks (Two Internal Tests of 05 Marks each and average of the two tests will be considered) and 05 Marks for Assignment/Tutorial.

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University, Aurangabad (M.S.)

B.A./B.Sc. First Year

Semester – I

MAT-101: Geometry

(No. of Periods:60, Max.Marks: 50)

Course Description: This course provides elementary-level knowledge of Three-dimensional geometries especially plane, right line, sphere, cone,and cylinder.

Course Objectives: General objectives are to study three-dimensional geometry, plane, right line, sphere, cone and cylinder along with their properties and interpretations.

Course Outcomes: After successful completion of this course. The student will able to identify and study equation of plane. Basic idea of lines, sphere, cones and cylinders.

Unit- I. The Plane:

Equations of the first degree in x, y, z, transformation to the normal form, determination of the plane under given conditions, equations of the plane through three given points, systems of planes, length of the perpendicular from a point to a plane.   (15 Periods)

Unit-II. Right Line :

Equations of a line, equations of a straight line in terms of its direction cosines and the co-ordinates of a point on it, equations of a line through two points, symmetrical and unsymmetrical forms of the equations of a line, transformation of the equations of a line to symmetrical form, angle between a line and a plane.   (10 Periods)

Unit-III. Applications of Right Line:

The condition that a given line may lie in a given plane, the condition that two given are coplanar, number of arbitrary constants in the equations of a straight line, sets of conditions which determine a line, the shortest distance between two lines, the length and equations of the line of shortest distance two straight lines, length of perpendicular from a given point to a given line.   (10 Periods)

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Unit-IV.Sphere:

Definition and equations of the sphere, equation of the sphere through four given points, plane section of a sphere, intersection of a spheres, equations of two spheres, equation of a circle, sphere through a given circle, intersection of a sphere and a line.   (15 Periods)

Unit –V.Cones and Cylinders:

The right circular cone, equation of a right circular cone, the right circular cylinder, equation of a right circular cylinder.   (10 Periods)

Recommended Text Book:

[1] Shanti Narayan and P. K. Mittal: Analytical Solid Geometry, S. Chand and Company Ltd, New Delhi, Seventeenth Edition, 2013.

Scope:

Chapter 2: Articles 2.1, 2.3, 2.32, 2.4, 2.41, 2.42, 2.5, 2.7
Chapter 3: Articles 3.1, 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2to 3.5, 3.6, 3.61, 3.7
Chapter 6: Articles 6.1,6.1.1, 6.1.2, 6.1.3, 6.2, 6.3.1, 6.3.2, 6.4, 6.4.1, 6.5
Chapter 7: Articles 7.6.1, 7.6.2, 7.8.1, 7.8.2

Reference Books:

1. Text Book of Coordinate Geometry, By Gorakh Prasad and H. C. Gupta, Pothishala Pvt. Ltd. Allahabad, 2000.
2. The Elements of Coordinate Geometry, By S. L. Loney, Mc-Millan and Company, London, 1895.
3. A Text Book of Analytical Geometry of Three dimensions, By P. K. Jain and Khalil Ahmad, Wiley Eastern Ltd.2018.
4. Elementary Treatise on Co-ordinate geometry of three Dimensions by R.J.T. Bell, Mac Millan India Ltd.

B.A./B.Sc. First Year

Semester- I

MAT-102: Differential Calculus

(No. of Periods: 60, Max. Marks: 50)

Course Description: This course provides the basics of real sequences, functions of single variable, higher derivatives and vector derivatives.

Course Objectives: The objective of the course is to learn real sequences, functions and higher derivatives, vector differentiation and applications

Course Outcomes: After completion of the course students will be able to:
- Classify the sequences
- Check the limit and continuity of functions
- Evaluate the derivative of functions
- Find the curl divergence and gradient of functions
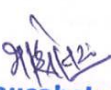
Unit-I: Sets and Real Sequences

Introduction, limit points of set, closed sets, sequences, limit point of a sequence, limit inferior and superior, convergent sequences, non-convergent sequences. (15Periods)

Unit-II: Functions of a Single Variable

Limits, Continuous functions, Functions continuous on a closed interval, Uniform Continuity, The Derivative, Increasing and Decreasing Functions, Rolle's Theorem, Lagranges Mean Value Theorem, Cauchy's Mean Value Theorem(15 Periods)

Unit-III: Successive Differentiation

Higher order derivatives, Calculation of nth derivatives: Some standard results, Determination of nth derivatives (Some Standard results), Leibnitz's Theorem. (10 Periods)

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Unit-IV: Vector Differentiation

Vector function of a single scalar variable, Continuity, Differentiability, Derivative of the Sum (or difference) of vectors, Derivative of the scalar product, Derivative of the cross product, Derivative of scalar triple product, Derivative of vector triple product, scalar and vector field, level surfaces, vector function of two or more variables, partial derivatives of vectors, geometrical interpretation of, Directional derivative, Operator del ∇, The gradient, Properties of gradient, The divergence, Properties of Divergence, Curl, Properties of Curl.

(20 Periods)

Recommended Text Books:

1. S.C.Malik, Savita Arora: Mathematical Analysis (Fifth Edition) New Age International (P) Ltd. Publishers, Reprint 2018, 2022
2. Shanti Narayan and P.K. Mital: Differential Calculus, S.Chand & Company Ltd. New Delhi, Reprint 2005.
3. N.Saran, R.Prasad: Elements of Vector Calculus (Fifth Edition), Pothishala Pvt.Ltd. 2016.

Scope:

Chapter 2: Article 1,2,3 [1]

Chapter 3: Article 1, 2,3,4,5 [1]

Chapter 5: Article 1,2,3,4 [1]

Chapter 6: Article 1,2,3,5,6,7 [1]

Chapter 5: Article 5.1, 5.2, 5.5 [2]

Chapter 1: Article 1.1, 1.2, 1.3, 1.32, 1.61, 1.62,1.63, 1.64 [3]

Chapter 2: Article2.1,2.11,2.2,2.21, 2.22, 2.23,2.3, 2.31, 2.33, 2.4,2.41, 2.5,2.51 [3]

Reference Books:

1. Gorakh Prasad: Differential Calculus (Revised Edition), Pothishala Pvt. Ltd., 2018.
2. Shanti Narayan and P.K. Mital: A Text Book of Vector Calculus, S.Chand and Company Ltd. New Delhi.

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B.A./B.Sc. First Year

Semester-II

MAT- 201: Number Theory

(No. of Periods: 60, Max. Marks: 50)

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Course Description: This course provides an elementary knowledge of divisibility, primes, congruences, number theoretic functions and Diophantine equations.

Course Objective: A primary objective of the course is to learn elementary knowledge of number theory.

Course Outcomes: At the end of course, students will be able to

- Evaluate the greatest common divisor and solve Diophantine equations
- Understanding of divisibility concepts, prime numbers and usefulness of congruences
- Use the results to solve problems

Unit-I: Divisibility

Introduction, Divisibility, Primes (Theorem 1.19 Statement only)   (15 Periods)

Unit-II: Congruences

Congruences, Solution of Congruences, The Chinese Remainder Theorem.

(20 Periods)

Unit-III: Some Functions of Number Theory

Greatest Integer Function, Arithmetic Functions, The Mobius Inversion Formula.   (15 Periods)

Unit-IV: Some Diophantine Equations

The equation $ax+by=c$, Simultaneous Linear Equations.   (10 Periods)

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Recommended Text Books:

1. Ivan Niven, Herbert S. Zuckerman, H.L.Montgomery : An Introduction to The Theory of Numbers (Fifth Edition) Wiley India Pvt. Ltd., New Delhi (Reprint 2016).

Scope:

Chapter 1: Article 1.1, 1.2, 1.3 (Theorem 1.19 statement only)
Chapter 2: Article 2.1 (Lemma 2.13, Lemma 2.14, Theorem 2.15 Statements only), 2.2, 2.3
Chapter 4: Article 4.1 (Theorem 4.2 statement only), 4.2, 4.3
Chapter 5: Article 5.1, 5.2.

Reference Books:

1. J.S.Chahal: Topics in Number Theory, Plenum (New York),1988.
2. David M. Burton: Elementary Number Theory, McGraw-Hill (2005).
3. William J. LeVeque: Fundamentals of Number Theory, Dover Publications, 2014.
4. S.B.Malik: Basic Number Theory (Second Edition) Vikas Publishing House, New Delhi,1998.
5. J.H.Silverman: A Friendly Introduction to Number Theory, Pearson Education India, (Fourth Edition) 2014.

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MAT-201:   Integral Calculus

(No. of Periods: 60, Max. Marks: 50)

Course Description: This course provides the methods of finding integration, concept of integral, vector integration and its applications

Course Objectives: The main objective of the course is to study methods of finding integration and apply it to evaluate line integral, volume integral and surface integral.

Course Outcomes: After successful completion of the course student will be able to:

- Apply method of integration to find the integral of function
- Find the area, surface and volume of given shape

Unit-I: Integration of Rational and Irrational Algebraic Fractions

Rational fractions, Non-repeated linear factors in the denominator, Repeated linear factors, General Case, Integration of $\frac{1}{ax^2+bx+c}$, Integration of $\frac{(px+q)}{ax^2+bx+c}$, Integration of $\frac{1}{(x^2+k)^n}$, Integration of $\frac{(px+q)}{(ax^2+bx+c)^n}$, Some special cases, Integration of $\frac{1}{\sqrt{(ax^2+bx+c)}}$, Integration of $\frac{(px+q)}{\sqrt{(ax^2+bx+c)}}$, Integration of $\frac{1}{(x-k)^r\sqrt{(ax^2+bx+c)}}$.(10 Periods)

Unit-II: Reduction Formulae

Definition, Reduction formulae for $\int sin^n x dx$ and $\int cos^n x dx$, Walli's formula, Reduction formula for $\int sin^m x cos^n x dx$, Trignometrical transformations, Reduction formulae for $\int e^{ax} sin^n bx dx$ or $\int e^{ax} cos^n bx dx$.   (10 Periods)

Unit-III: Definite Integrals and Rectification
The integral as the limit of sum, Integration from definition as the limit of a sum, Areas, Length of curves, Remarks, Intrinsic equations.   (10 Periods)

Unit-IV: Volumes and Surfaces of Solids of Revolution

Definitions, Volumes of solids of revolution Cartesian form, volumes of revolution parametric form, Surface of solids of revolution Cartesian form, Surface of solids of revolution parametric form. (10 Periods)

Unit-V: Integral Transformations

Line integral, other types of line integrals, surface integral, other types of surface integral, evaluation of surface integrals, volume integral, conservative field, Gauss Divergence Theorem, Deductions from Gauss Theorem, Stoke's Theorem, More deductions from Gauss and Stokes's Theorem, Green's Theorems [Only statements]. (20 Periods)

Recommended Text Books:

1. Gorakh Prasad: Integral Calculus (Revised Edition), Pothishala Private Ltd., 2018.

2. N.Saran, R.Prasad: Elements of Vector Calculus (Fifth Edition) , Pothishala Private Ltd., 2016.

Scope:

Chapter 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9 [1]

Chapter 3:3.2, 3.3, 3.4 [1]

Chapter 4: 4.1, 4.2, 4.3, 4.4, 4.6, 4.10 [1]

Chapter 5: 5.4, 5.5, 5.7 [1]

Chapter 9: 9.1, 9.2, 9.3 [1]

Chapter 10: 10.1, 10.2, 10.3, 10.5, 10.6 [1]

Chapter 3: 3.1, 3.11, 3.2, 3.21, 3.22, 3.3, 3.4 [2]

Chapter 4: 4.1, 4.2, 4.3, 4.31, 4.4, 4.41, 4.42, 4.43 [2]

Reference Books:

1. Shanti Narayan and P.K. Mital: Integral Calculus, S.Chand& Company Ltd. New Delhi, Reprint 2005.
2. Shanti Narayan and P.K. Mital: AText Book of Vector Calculus, S.Chand and Company Ltd. New Delhi.

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डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद

परिपत्रक क्रमांक/एस.यु./विज्ञान/अभ्यासक्रम/७४/२०१४

या परिपत्रकाद्वारे सर्व संबंधीतांना सुचित करण्यात येते की, विज्ञान विद्याशाखेने शिफारस केल्यानुसार बी. एस्सी. / एम. एस्सी. प्रथम व द्वित्तीय वर्षाच्या सुधारित अभ्यासक्रमास आणि बी. एस्सी. प्रथम वर्षाच्या अभ्यासक्रमात किरकोळ बदल करण्यास विद्यापरिषदेच्या वतीने मा. कुलगुरु यांनी, त्यांना प्राप्त असलेल्या विशेष अधिकार महाराष्ट्र विद्यापीठ अधिनियम-१९९४ कलम १४(७) अन्वये मान्यता दिलेली आहे. त्या अनुषंगाने सुधारीत तयार केलेल्या अभ्यासक्रमाची प्रत या परिपत्रकासोबत आपल्या पुढील कार्यवाहीसाठी पाठविण्यात येत आहे.

[1]	B.Sc. Physics	Semester-III & IV,
[2]	B.Sc. Chemistry	Semester-III & IV,
[3]	B.Sc. Botany	Semester-III & IV,
[4]	B.Sc. Zoology with minor changes	Semester-I & II,
[5]	B.Sc. Zoology	Semester-III & IV,
[6]	B.Sc. Fisheries	Semester-III & IV,
[7]	B.Sc. Electronics (Opt.)	Semester-III & IV,
[8]	B.A./B.Sc. Mathematics	Semester-III & IV,
[9]	B.Sc. Computer Science	Semester-I & II,
[10]	B.Sc. Information Technology	Semester-I & II,
[11]	B.C.A.	Semester-I & II,
[12]	B.Sc. Computer Science(Opt.)	Semester-I & II,
[13]	B.Sc. Information Technology(Opt.)	Semester-I & II,
[14]	B.Sc. Computer Application(Opt.)	Semester-I & II,
[15]	B.Sc. Computer Maintenance(Opt.)	Semester-I & II,
[16]	B.Sc. Biotechnology (Progressively)	Semester-I to VI,
[17]	B.Sc. Biotechnology (Opt.) (Progressively)	Semester-I to IV,
[18]	B.Sc. Sericulture Technology	Semester-I & II,
[19]	B.Sc. Networking Multimedia	Semester-III & IV,
[20]	B.Sc. Bioinformatics	Semester-I & II,
[21]	B.Sc. Hardware & Networking	Semester-I & II,
[22]	B.Sc. Animation	Semester-I & II,
[23]	B.Sc. Dairy Science & Technology	Semester-III & IV,
[24]	B.Sc. Biochemistry	Semester-III & IV,
[25]	B.Sc. Analytical Chemistry	Semester-III & IV,
[26]	B.Sc. Textile & Int. Decoration with minor changes	Semester-I & II,
[27]	B.Sc. Textile & Int. Decoration	Semester-III & IV,
[28]	B.Sc. Home Science with minor changes	Semester-I & II,
[29]	B.Sc. Home Science	Semester-III & IV,
[30]	B.Sc. Agro.Chem. & Fertilizers	Semester-III & IV,

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S-29 Nov., 2013 AC after Circulars from Cirular No.55 & onwards   - 42 -

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[31]	B.Sc. Geology	Semester-III & IV,
[32]	B.A. Statistics with minor changes	Semester-I & II,
[33]	B.A. Statistics	Semester-III & IV,
[34]	B.Sc. Statistics with minor changes	Semester-I & II,
[35]	B.Sc. Statistics	Semester-III & IV,
[36]	B.Sc. Industrial Chemistry	Semester-III & IV,
[37]	B.Sc. Horticultural	Semester-I & II,
[38]	B.Sc. Dry land Agriculture	Semester-I & II,
[39]	B.Sc. Microbiology	Semester-III & IV,
[40]	M.Sc. Computer Science	Semester-I to IV,
[41]	M.Sc. Information Technology	Semester-I to IV.

हा सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाचा आराखडा शैक्षणिक वर्ष २०१४-१५ करिता मर्यादित असेल व विद्यापरिषदेच्या अंतिम मान्यतेनंतर हे परिपत्रक नियमित ठेवण्याबाबत या कार्यालयाद्वारे नवीन परिपत्रक पारीत करण्यात येईल. तसेच सुधारीत व नवीन तयार केलेल्या अभ्यासक्रमाची प्रत विद्यापीठाच्या संकेतस्थळावर उपलब्ध आहे.

करिता, या परिपत्रकाची सर्व संबंधितांनी नोंद घ्यावी.

विद्यापीठ प्रांगण,
औरंगाबाद-४३१ ००४.
संदर्भ क्र.एस.यु./सा.शा./सबवि /२०१३-१४/
          ६५९९-७०२
दिनांक :- २७-०५-२०१४.

संचालक,
महाविद्यालये व विद्यापीठ
विकास मंडळ.

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या परिपत्रकाची एक प्रत :-
१) मा. परिक्षा नियंत्रक, परिक्षा विभाग,

२) मा. प्राचार्य, सर्व संलग्नीत महाविद्यालये,

३) संचालक, युनिक यांना विनंती करण्यात येते की, सदरील अभ्यासक्रम विद्यापीठाच्या संकेतस्थंळावर उपलब्ध करुण देण्यात यावेत.

४) संचालक, ई-सुविधा केंद्र, विद्यापीठ परिसर,

५) जनसंपर्क अधिकारी, मुख्य प्रशासकीय इमारत,

६) कक्ष अधिकारी, पात्रता विभाग, मुख्य प्रशासकीय इमारत,

७) कक्ष अधिकारी, बी.ए. / बी.एस्सी./ बी.सी.एस./एम.एस्सी. विभाग, परीक्षा भवन,

८) अभिलेख विभाग, मुख्य प्रशासकीय इमारती मागे,

डॉ. बाबासाहेब आंबेडकर मराठवाडा विद्यापीठ, औरंगाबाद.

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

REVISED SYLLABUS

OF

B.A./ B.Sc. Mathematics
SECOND YEAR
[Optional]

Third & Fourth Semester

[Effective for - June, 2014-15]

Dr. Babasaheb Ambedkar University, Aurangabad

Revised Syllabus

For

B.Sc. (Second Year) MATHEMATICS

WITH EFFECT FROM JUNE – 2014

Semester Third :

1. Paper No. MAT – 301	: Number Theory
2. Paper No. MAT – 302	: Integral Transforms
3. Paper No. MAT – 303	: Mechanics - I

Semester Fourth :

1. Paper No. MAT – 401	: Numerical Methods
2. Paper No. MAT – 402	: Partial Differential Equations
3. Paper No. MAT – 403	: Mechanics - II

B.A. (Second Year) MATHEMATICS

WITH EFFECT FROM JUNE – 2014

Semester Third :

1. Paper No. MAT – 301	: Number Theory
2. Paper No. MAT – 302	: Integral Transforms

Semester Fourth :

1. Paper No. MAT – 401	: Numerical Methods
2. Paper No. MAT – 402	: Partial Differential Equations

(With Effect from June - 2014)

B. A. & B.Sc. (Second Year)(Third Semester)(Mathematics)
Paper No. MAT – 301: (Number Theory)   (Max. Marks : 50)

1. Divisibility Theory in the Integers:
The Division Algorithm, The greatest common divisor, The Euclidean algorithm, The Diophantine equation $ax + by = c$.

2. Primes and their Distribution:
The Fundamental Theorem of Arithmetic

3. The Theory of Congruences:
Basic Properties of congruences, Linear congruences

4. Fermat's Theorem:
Fermat's Factorization Theorem, The little Theorem, Wilson's Theorem.

5. Number-Theoretic Functions:
The functions τ and σ, The Mobius inversion formula

6. Euler's Generalization of Fermat's Theorem:
Euler's Phi-function, Euler's Theorem, Some properties of Phi function

Recommended Text Book:
David M. Burton: *Elementary Number Theory*: (Second Edition) – 1987
Scope: Ch. (2) : Complete
          Ch. (3) : Article 3.1
          Ch. (4) : Articles 4.2, 4.4
          Ch. (5) : Articles 5.2, 5.3, 5.4
          Ch. (6) : Articles 6.1, 6.2, 6.3
          Ch. (7) : Articles 7.2, 7.3

References:
1) Ivan Niven, Herbert Zuckerman: *An introduction to the theory of Numbers*: Wiley Eastern Ltd. New Delhi.
2) S. G. Telang: *Number theory*: Tata McGraw Hills, New Delhi.
3) C. Y. Hsiung: *Elementary theory of Numbers*: Allied publishers Ltd, New Delhi.
4) S. B. Malik: *Basic Number Theory*:
5) Hari Kishan: *Theory of Numbers*: Krishna Prakshan Meerut.
6) Ajay Chaudhari: *Introduction to theory of Numbers*: New Central book Agency(P) Ltd. Calcutta.
7) Ivan Niven, Herbert Zuckerman H. L. Montgomery: *An introduction to the theory of Numbers*: John Wiley and Sons New Delhi.
8) Pundir, Pundir: *Theory of Numbers* Pragati Prakashan Meerut.
9) G. E. Andrews: *Number Theory*: Hindustan Publishing Corporation, New Delhi.

B. A, & B.Sc. (Second Year)(Third Semester)(Mathematics)
Paper No. MAT – 302: (Integral Transforms)   (Max. Marks : 50)

1. Beta and Gamma Functions:
Euler's Integrals - Beta and Gamma functions, Elementary properties of Gamma Function, Transformation of Gamma Function, Another form of Beta Function, Relation between beta and Gamma functions, Other Transformations. [1]

2. Laplace Transform:
Piece-wise or sectional continuity, function of exponential order, Function of class A, The transform concept, Laplace Transform, Notation, Some Standard results. [2]

3. Inverse Laplace Transform:
Definition, Null function, Uniqueness of inverse Laplace transform, partial fractions, Heaviside's expansion formula, the complex inversion formula

4. Applications to Differential Equations:
Differential Equation, Notations (Problems related to Ordinary Differential Equations only) [2]

5. Fourier Transform:
Infinite Fourier sine transform of $F(x)$, Finite Fourier cosine transform of $F(x)$, Infinite Fourier transform of $F(x)$, Relationship between Fourier transform and Laplace transform, Finite Fourier sine transform, Finite Fourier cosine transform, Fourier Integral Theorem [2]

Recommended Text Books:
1. J. N. Sharma, A. R. Vasishtha : *Real Analysis* : Krishna Prakashan media Pvt. Ltd. Merrut.
Scope : Ch. (14) : Art. 9, 10, 11, 12, 13, 14, 15, 16. 17
2. J. K. Goyal, K. P. Gupta : *Laplace And Fourier Transforms* : Pragati Prakashan, Meerut – Twentieth Edition 2007
Scope: Ch. (1) : Part – I : 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.5, 1.6,
            Part – II : 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.5
            Part – III : 1.0, 1.1.
    Ch. (2) : Part – I : 2.0, 2.1, 2.2, 2.3,
            Part- II : 2.0, 2.1

References:
1. B.J.Beerends, etl : *Fourier and Laplace Transforms* : Cambridge University Press – 2003.
2. Lokenath Bebnath, Dambaru Bhatta : *Integral Transforms and their Applications* : Chapman and Hall/CRC-2007.
3. E.J.Watson : *Laplace Transforms and Applications* : Van Nostrand Reinhold Company.
4. J. Williams : *Laplace Transforms* : George Allen and Unwin Ltd, London -1973.
5. Joe L. Schiff : *The Laplace Transform*:*Theory and Applications* : Springer-Verlag NewYork – 1999.
6. M.D.Raisinghania : *Integral Transforms* : S.chand and Company, New Delhi.
7. M.D.Raisinghania : *Laplace and Fourier Transforms* : S.chand and Company, New Delhi.
8. Goyal, Gupta: *Integral Transforms*: Pragati Prakashan Meerut.

B.Sc. (Second Year) (Third Semester)(Mathematics)
Paper No. MAT – 303 : (MECHANICS – I)   (Max. Marks : 50)

1. Forces acting on a Particle:
Particle, Rigid body, Force, The force as a vector, Equilibrium, An axiom for equilibrium of two forces, Statics, Resultant of forces, Law of parallelogram of forces, Principle of the transmissibility of force, Deductions, Resultant of forces $m \cdot \overrightarrow{OA}$ and $n \cdot \overrightarrow{OB}$, Components and Resolved parts, the algebraic sum of resolved parts of two forces, To find the magnitude and direction of the resultant of any number of coplanar forces acting at a point, Resultant of parallel forces.

2. Equilibrium of Forces acting on a Particle:
Triangle law of forces, Converse of the triangle law of forces, Polygon of forces, Lami's theorem, Conditions of equilibrium of forces acting on a particle.

3. Forces acting on a Rigid Body:
Introduction, Moment of a force, Sum of vector moments of two like parallel forces, Couples, Conditions of equilibrium of forces acting on a rigid body, Trignometrical Theorems.

4. Centre of Gravity:
Centroid of weighted points, Centre of gravity, Centre of gravity of some uniform bodies.

Recommended Text Book:
V. Tulsani, T. V. Warhekar and N. N. Saste : *Mechanics and Differential Geometry:* S. Chand and Co. (Pvt) LTd, New Delhi (Second Edition) – 1987
Scope: Part (I): Statics
        Ch. (1) : Complete
        Ch. (2) : Complete
        Ch. (3) : Complete
        Ch. (4) : Articles 4.1 to 4.7

References :
1. B. R. Thakur, G. P. Shrivastava : *Mechanics* : Ram Prasad and Sons, Agra – 3.
2. M. L Khanna : *Dynamics* : Kedarnath Ramnath Prakashan, Meerut.
3. S. L. Loney : *An Elementary Tretise on Statics* : A. I. T. B. S. Publishers and Distributors, New Delhi.

B. A. & B. Sc. (Second Year)(Fourth Semester)(Mathematics)
Paper No. MAT – 401: (Numerical Methods)   (Max. Marks : 50)

1. Solution of Algebraic and Transcendental Equations:

Introduction, Bisection method, Method of false position, Newton-Raphson method,
Genralized Newton's method.

2. Interpolation:

Introduction, Finite differences, Forward differences, Backward differences, Central differences,
Symbolic relations and separation of symbols, Differences of a polynomial,
Newton's formulae for interpolation, Interpolation with unevenly spaced points, Lagrange's
interpolation formula, Hermite's interpolation formula, Divided differences and their properties,
Newton's general interpolation formula.

3. Curve Fitting and Approximations:

Introduction, Least-Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting,
Approximations of functions, Chebyshev polynomials, Economization of power series.

4. Solution of Linear System of Equations:

Solution of Linear Systems-direct methods, Gaussian elimination method, Method of
factorization, Solution of Linear Systems-iterative methods, The Eigenvalue problem,
Househoder's method, Eigenvalues of a symmetric tridiagonal matrix, The QR method

5. Numerical Solution of Ordinary Differential Equations:

Introduction, Solution by Taylor's series method, Picard's method of successive approximations,
Euler's method, Runge Kutta methods

Recommended Text Book:
S. S. Sastry : *Introductory Methods of Numerical Methods* : Third Edition, Prentice
Hall India, New Delhi.
Scope:
Chapter 2: Articles 2.1, 2.2, 2.4, 2.5, 2.5.1
Chapter 3: Articles 3.1, 3.3, 3.3.1 to 3.3.4, 3.5, 3.6, 3.9, 3.9.1, 3.9.3, 3.11, 3.11.1
Chapter 4: Articles 4.1, 4.2, 4.2.1, 4.2.2, 4.6, 4.6.1, 4.6.2
Chapter 6: Articles 6.3, 6.3.2, 6.3.4, 6.4, 6.5, 6.5.1 to 6.5.3
Chapter 7: Articles 7.1, 7.2, 7.3, 7.4, 7.5

Reference Books:
1). H.C.Saxena: Finite Differences and Numerical Analysis, S.Chand and Co.Pvt. Ltd,
New Delhi
2). M.K.Jain, S.R.K. Iyengar, R.K.Jain: Numerical Methods for Scientific and
Engineering Computation, New Age International Publishers, New Delhi.

B. A. & B. Sc. (Second Year)(Fourth Semester)(Mathematics)
Paper No. MAT – 402: (Partial Differential Equations)   (Max. Marks : 50)

1. Prerequisites:

Derivation of a Partial Differential Equation by the elimination of arbitrary constants, Derivation of a Partial Differential Equation by the elimination of arbitrary functions,

2. Partial Differential Equations of Order One (Linear Equations) :

Definition of Partial Differential Equations, Lagrange's Linear Partial Differential Equation, Geometrical interpretation of the Lagrange's Linear Partial Differential Equation $Pp + Qq = R$.

3. Non-linear Partial Differential Equations of Order One:

Complete and Particular Integrals, General Integral, Singular Integral, Special method, Standard form I, Standard form II, Standard form III, Standard form IV, Charpit's method, Non-linear Partial Differential Equations of order one with three or more independent variables, Jacobi's method.

4. Linear Partial Differential Equations:

Definitions, Linear Homogeneous Partial Differential Equations with constant coefficients, Non-Homogeneous Linear Partial Differential Equations, Equations reducible to Linear form with constant coefficients.

5: Partial Differential Equations of Second Order:

Equations that can be integrated by inspection, Monge's method to solve the equation $Rr + Ss + Tt = V$, Method of Transformations (Canonical Forms)

Recommended Text Book:

P.P. Gupta, G.S.Malik, S.K.Mittal : *Partial Differential Equations* (Second Revised Edition – 2003) Pragati Prakashan, Meerut, ISBN-81-7556-518-7

Note: **Questions on Prerequisite may not be asked**
Scope:
        Chapter 4: Articles 4.1, 4.4-4.5
        Chapter 5: Complete Chapter (5.1-5.10)
        Chapter 6: Articles 6.1- 6.4
        Chapter 7: Artices 7.1, 7.2, 7.3, 7.5, 7.6

Reference Books:

1. H.K.Dass : *Advanced Engineering Mathematics* : S. Chand and Co. Ltd, New Delhi.
2. N. Ch. S. N. Iyengar : *Differential Equations* : Anmol Publications Pvt. Ltd. New Delhi.
3. M. L. Khanna : *Partial Differential Equations* : Kedarnath and Ramnath Prakahan, Meerut.

B.Sc. (Second Year)(Fourth Semester)(Mathematics)
Paper No. MAT – 403 : (Mechanics – II)   (Max. Marks : 50)

1. Kinematics and Dynamics of a Particle in Two Dimensions:

Introduction, Definitions, Velocity and acceleration in terms of vector derivatives, Tangent and unit vector along the tangent, Rate of change of unit vector moving in a plane, Curvature principal normal, Tangential and normal components of velocity and acceleration, Angular speed and angular velocity, Radial and transverse components of velocity and acceleration, Areal speed and areal velocity.

2. Kinetics of a Particle:

Introduction, Newton's law of motion, Matter, Linear momentum, Angular momentum, An Impulsive force and its impulse, Conservation of linear momentum, Impact of two bodies, Work, Energy, Scalar point function, Vector point function, Field of force, Conservative field of force.

3. Motion of a Projectile and Motion in a Resisting Medium:

Rectilinear Motion, Motion under gravity, Projectile, Motion of projectile, Range on an inclined plane, Parabola of Safety, Projectile to pass through a given point, Motion in a resisting medium, Motion of a body moving under gravity and in a medium whose resistance varies as velocity.

4. Central Orbits:

Definitions, Areal velocity in Central Orbit, Differential equation of central orbit, Apses, Law of Force, Pedal equation of some curves

Recommended Text Book:
V. Tulsani, T. V. Warhekar and N. N. Saste : *Mechanics and Differential Geometry:*
S. Chand and Co. (Pvt) Ltd, New Delhi (Second Edition) – 1987
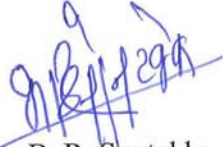Scope: Part (I): Dynamics of a Particle
        Ch. (1) : Complete
        Ch. (2) : Complete
        Ch. (3) : Complete
        Ch. (4) : Articles 4.01 to 4.10

References :
1. B. R. Thakur, G. P. Shrivastava : *Mechanics* : Ram Prasad and Sons, Agra – 3.
2. M. L Khanna : *Statics* : Kedarnath Ramnath Prakashan, Meerut.
3. S. L. Loney : *An Elementary Tretise on Dynamics of a particle and of Rigid Bodies* : A. I. T. B. S. Publishers and Distributors, New Delhi.

Dr. B. R. Sontakke
Chairman,
B. O. S. in Mathematics

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,
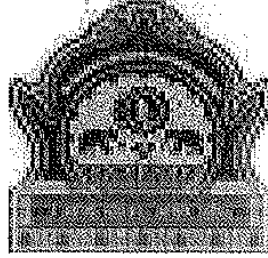Dr. Babasaheb Ambedkar Marathwada University

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 B. A. /B. Sc. Third
year (Mathematics)** (Optional)
With Effect from June – 2015

DR . BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD
BOARD OF STUDIES IN MATHEMATICS
REVISED SYLLABUS FOR THIRD YEAR B.Sc. (MATHEMATICS)
(With Effect From June -2015)

Semester V

Compulsory Papers:
  Paper – MAT 501: Real Analysis – I
  Paper – MAT 502: Abstract Algebra – I

Optional Papers (Any One):
  Paper – MAT 503: Mathematical Statistics – I
  Paper – MAT 504: Ordinary Differential Equations – I
  Paper – MAT 505: Programming in C – I

Semester VI

Compulsory Papers:
  Paper – MAT 601: Real Analysis – II
  Paper – MAT 602: Abstract Algebra – II

Optional Papers (Any One):
  Paper – MAT 603: Mathematical Statistics – II
  Paper – MAT 604: Ordinary Differential Equations – II
  Paper – MAT 605: Programming in C – II

REVISED SYLLABUS FOR THIRD YEAR B.A. (MATHEMATICS)
(With Effect From June -2015)

Semester V

Main Papers:
>   Paper – MAT 501: Real Analysis – I
>   Paper – MAT 502: Abstract Algebra – I

Subsidiary Papers:
>   Paper – MAT 503: Mathematical Statistics – I
>   Paper – MAT 504: Ordinary Differential Equations – I

Semester VI

Main Papers:
>   Paper – MAT 601: Real Analysis – II
>   Paper – MAT 602: Abstract Algebra – II

Subsidiary Papers:
>   Paper – MAT 603: Mathematical Statistics – II
>   Paper – MAT 604: Ordinary Differential Equations – II

B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Paper – MAT 501: Real Analysis – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets and elements, Operations on sets.

2) Functions:
Functions, Real-valued functions, Equivalence, Countability, Real numbers, Least upper bounds.
[1]
3) Sequences of Real Numbers:
Definition of sequence and subsequence, Limit of a sequence, Convergent sequences, Divergent sequences, Bounded sequences, Monotone sequences, Operations on convergent sequences, Operations on divergent sequences, Limit superior and limit inferior, Cauchy sequences. [1]
4) Series of Real Numbers:
Convergence and divergence, Series with non-negative terms, Alternating series, Conditional convergence and convergence, Test for absolute convergence. [1]
5) Jacobians:
Definitions, Case of function of functions, Jacobian of implicit functions, Necessary and sufficient condition for a Jacobian to vanish. [2]

Recommended books:
1] R. R. Goldberg : *Methods of Real Analysis* : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.
Scope:
Chapter 1 : 1.3(A, B, C, D, E, F, G, H, I), 1.4(A, B, C, D, E), 1.5(A, B, C, D, E, F, G, H, I), 1.6(A, B, C, D, E), 1.7(A, B, C, D, E).
Chapter 2 : 2.1(A, B, C, D), 2.2(A, B), 2.3(A, B, C, D), 2.4(A, B, C), 2.5(A, B), 2.6(A, B, C, D, E), 2.7(A, B, C, D, E, F, G, H, I, J), 2.8(A, B, C, D), 2.9(A, B, C, D, E, F, G, I, J, K, L, M), 2.10(A, B, C, D, E), 2.12(A, B).
Chapter 3 : 3.1(A, B, C, D), 3.2(A, B, C, D, E), 3.3(A, B), 2.4(A, B, C), 3.6 (A, B, C, D, E, F, G, H, I,)
2] J. N. Sharma and A. R. Vashistha : *Real Analysis* : Krishna Prakashan Media (P), Ltd. Meerut.
Scope:
Chapter 13 : Articles 1, 2, 3, 4, 5, 6, 7

References:
1) D. Somasundaram and B. Choudhary : *A first Course in Mathematical Analysis* : Narosa Publishing House, New Delhi.
2) Hari Kishan *: Real Analysis* : Pragati Prakashan, Meerut.
3) S. K. Mittal and S. K. Pundir : *Real Analysis* : Pragati Prakashan, Meerut.

Note : Questions on prerequisite should not be asked.

B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Paper – MAT 502: Abstract Algebra – I

Periods : 60
Marks : 50

1) Prerequisite:
Sets, Functions, Integers.

2) Group Theory:
Definition of a group, Some examples of groups, Some preliminary lemmas Subgroups, A counting Principle, Normal subgroups and quotient groups Homomrphism, Automorphism. [1]

3) Ring Theory:
Definition and examples of rings Some special classes of ring, Ideals and quotient rings More ideals and quotient rings, Polynomial ring. [1]

Recommended books:
1] I. N. Herstein : *Topics in Algebra* : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:
Chapter 2 : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7(Cauchy's Theorem for Abelian Groups and Cauchy's Theorem for Abelian Groups are without proof), 2.8.
Chapter 3 : 3.1, 3.2, 3.3, 3.5, 3.9(Omit Theorem 3.9.1)

References:
1) A. R. Vasishtha : *Modern Algebra* : Krishna Prakashan Media Pvt. Ltd. Meerut.
2) M. L. Khanna : *Modern Algebra* : Jai Prakash Nath and Co. Meerut.
3) Vijay K. Khanna and S. K. Bhambri : *A course in Abstract Algebra* : Vikas Publishing House Pvt.Ltd. New Delhi.
4) Surjeet Singh and Qazi Zameeruddin : *Modern Algebra* : Vikas Publishing House Pvt. Ltd. New Delhi.
5) Bhupendra Singh : *Advanced Abstract Algebra* : Pragati Prakashan Meerut.
6) Shanti Narayan and Sat Pal : *A Text book of Modern Abstract Algebra* : S. Chand and Co. Ltd. New Delhi.
7) I. N. Herstein : Abstract Algebra (Third Edition): Prentice-Hall, Upper Saddle River, New Jersey 07458.
8) Joseph A. Gallian : Contemporary Abstract Algebra (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.
9) Goyal J. K. and K. P. Gupta : *Advanced course in Abstract Algebra* : Pragati Prakashan, Meerut.
10) J. N. Kapoor and K. R. Kalra : *Modern Algebra* (Volume I and II): R. Chand and Co. New Delhi.
11) S. Nanda : *Topics in Algebra*: Allied publishers Pvt. Ltd., New Delhi.

Note : Questions on prerequisite should not be asked.

Optional Papers (any ONE)
B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Paper – MAT 503: Mathematical Statistics – I

Periods : 60

Marks : 50

1) Frequency Distribution and Measures of Central Tendency:
Frequency distribution, Continuous frequency distribution, Graphical representation of a frequency distribution, Histograms, Frequency Polygon, Measures of Central Tendency, Arithmetic mean, Properties of arithmetic mean, merits and demerits of Arithmetic mean, Weighted mean, Median, Merits and demerits of Median, Mode Merits and demerits of mode, Geometric mean, Merits and demerits of Geometric mean, Harmonic mean, partitions [1]

2) Measures of Dispersion Skewness and Kurtosis:
Dispersion, Characteristic for an ideal measure of dispersion, Measures of dispersion, Range, Quartile deviation, Mean deviation, Standard deviation and root mean square deviation, Relation between and s, Different formulae for calculating variance, Variance of the combined series, Coefficient of dispersion, Coefficient of variations, Moments, Relation between moments about mean in terms of moments about any point and vice versa, Effect of change of Origin and scale on moments, Pearson's and coefficients, Skewness and kurtosis. [1]

3) Theory of Probability:
Introduction, Definition of various terms, Mathematical or Classical Probability, Statistical Probability, Axiomatic approach to probability, Random experiments, Sample space, Events, Some illustrations, Algebra of events, Probability – Mathematical Notion, Probability function, Theorems on Probability of events, Law of addition of Probability, Multiplication law of probability and conditional probability, Independent events, Pairwise independent events, Conditions for mutual independence of n events. [1]

4) Random Variables and Distribution Functions:
Random Variable, Distribution function, Properties of distribution function, Discrete random variables, Probability mass function, Discrete distribution function, Continuous random variable, Probability density function, Various measures of Central tendency, Continuous distribution function. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : *Fundamentals of Mathematical Statistics* (Nineth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 2: 2.1, 2.1.1, 2.2, 2.2.1, 2.2.2, 2.3, 2.4, 2.5, 2.5.1, 2.5.1, 2.5.2, 2.5.3, 2.6, 2.6.1, 2.7, 2.7.1, 2.8, 2.8.1, 2.9, 2.9.1, 2.11.

Ch – 3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.7.1, 3.7.2, 3.7.3, 2.8, 2.8.1, 3.9, 3.9.1, 3.9.2, 3.10, 3.13, 3,14.

Ch – 4: 4.1, 4.3, 4.3.1, 4.3.2, 4.5, 4.5.1, 4.5.1, 4.5.2, 4.5.3, 4.5.4, 4.6, 4.6.1(omit Thm 4.1), 4.6.2, 4.7, 4.7.2, 4.7.3, 4.7.4, 4.7.5

Ch – 5: 5.1, 5.2, 5.2.1, 5.3, 5.3.1, 5.3.2, 5.4, 5.4.1, 5.4.2, 5.4.3

B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Paper – MAT 504: Ordinary Differential Equations – I

Periods : 60

Marks : 50

Prerequisite: Complex numbers

1) Preliminaries:
Introduction, Functions, Polynomials, Complex series and the exponential function, Determinants. [1]

2) Linear Equations of First Order:
Introduction, Differential Equations, Problems associated with differential equations, Linear equations of the first order, The equation $y' + ay = 0$, The equation $y' + ay = b(x)$, The general linear equation of the first order. [1]

3) Linear Equations with Constant Coefficients:
Introduction, The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for Wronskian, The non-homogeneous equation of order two. [1]

Recommended Book:
1] Earl A. Coddington : *An Introduction to Ordinary Differential Equations* : Prentice Hall of India Learning Private Limited, New Delhi-110001, (2009)

Scope:
Chapter 0. - Article 1, 3, 4, 5, 6
Chapter 1. - Article 1, 2, 3, 4, 5, 6, 7
Chapter 2. - Article 1, 2, 3, 4, 5, 6

Reference Books:

1) E.A.Coddington and Levinson Norman : *Theory of Ordinary Differential Equations* : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : *A First Course in Differential Equations with Applications* : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : *Advanced Engineering Mathematics* (Second Edition) : Jones and Bartlett Publishers, (2000)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Paper – MAT 505: Programming in C – I

Periods : 45

Marks : 40

1) Overview of C :
Introduction, Importance of c, Sample C Programs, Basic structure of C programs, programming style, Executing a C program. [1]

2) Constants, Variables and Data Types :
Introduction, Character set, C tokens, Keywords and identifies, Constants, variables, Data types, Declaration of Variables, Storage class Assigning values to variables, Defining symbolic constants, case studies. [1]

3) Operators and Expressions:
Introduction, Arithmetic of operators , Relational operators, Logical operators, Assignment operators, Increment and decrement operators, Conditional operators, Bitwise operators, Special operators, Arithmetic expression, Evaluation of expressions, Precedence of arithmetic operators, Some computational problems, Type conversions in expression, Operators precedence and Associativity, mathematical functions. [1]

4) Managing Input and Output Operators:
Introduction, Reading a character, Writing a character, Formatted input, Formatted output. [1]

Recommended Book :

1] E. Balagurusamy : *Programming in ANSI C* (Fourth Edition) :Tata McGraw Hill

Scope:
Ch.1 :1.1,1.2, 1.3,1.4,1.5,1.6, 1.8 to 1.10
Ch.2 : 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10, 2.11
Ch.3 : 3.1 to 3.16
Ch.4 : 4.1 to 4.5

References:
1) Y.P. Kanetkar : *Let us C* : BPB Publication
2) Gottfried : *Programming in C* : Schaum's Series
3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : *Programming in C* : New-Age International Publisher
5) J.B.Dixit :*Mastering C Programs*
6) Pradip D Y and Manas Ghosh : *Fundamentals of Computing and Programming in C*
7) V.Rajaraman : *Computer Programming in C* : PHI Pvt Ltd, New Delhi(2005)

B.Sc. (Third Year)(Mathematics)(Fifth Semester)
Practical Paper – MAT-PR- 505(Based on MAT 505)

Periods : 15
Marks : 10

List of Experiments/Programs:

1. Program to find Maximum between two numbers using conditional operator.

2. Program to convert Temperature in Farad into Celsius. (C=0.5(F-32))

3. Program to find addition of two numbers.

4. Program to find square root of a number using *sqrt()* function.

5. Program to find m^n using *pow()* function.

6. Program to find simple interest (Si=(p+n+r)/100).

7. Program to find Area of Circle ($A=\pi r^2$)

8. Program to find Circumference of Rectangle (C= 2(length+breadth))

9. Program to find root of Quadratic Equation $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

10. Program to find Area of Rectangle (A = w x h)

11. Program to find circumference of circle

12. Program to find Area of Triangle. (A= ½ x b x h)

13. Program to find Area of Square (A = a2)

14. Program to find Area of Sphere (A = 4 π r2√)☐

15. Program to Find Area of Cone (A= π r (r + 2+r2)

Note: University Practical Examination will be conducted annually.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 601: Real Analysis – II

Periods : 60

Marks : 50

1) Limits in Metric Spaces:

Metric spaces, Limits in metric spaces. [1]

2) Continuous Functions on Metric Spaces:

Functions continuous on metric spaces, open sets, Closed sets. [1]

3) Connectedness, Completeness and Compactness:

More about open sets, connected sets, bounded sets and totally bounded sets, Complete metric spaces, Compact metric spaces, Continuous functions on compact metric spaces, Uniform continuity. [1]

4) Calculus:

Sets of measure zero, Definition of Riemann Integral, Existence of Riemann Integral, Fundamental Theorem of Calculus. [1]

5) Fourier Series:

Introduction. [2]

Recommended books:

1] R. R. Goldberg : *Methods of Real Analysis* : Oxford and IBH Publishing Co. Pvt. Ltd. NewDelhi.

Scope:

Chapter 4 : 4.2(A, B, C), 4.3(A, C, D).

Chapter 5 : 5.3(A, B, C, D, E, F, G, H), 5.4(A, B, C, D, E, F, G), 5.5(A, B, C, D, E, F, G, H, I, J, L, M).

Chapter 6 : 6.1(A, B), 6.2(A, B), 6.3(A, B, C, D, E), 6.4(A, B, C, D, E, F), 6.5 (A, B, C, D, E), 6.6(A, B, C, D), 6.8(A, B, C, D, E)

Chapter 7 : 7.1(A, B, C, D), 7.2(A, B, C, D, E, F, G), 7.3(Theorem and Lemma are without Proof), 7.4(A, B, C, D, E, F), 7.8(A, B, C, D, E, F, G)

2] D. Somasundaram and B. Choudhary : *A first Course in Mathematical Analysis* : Narosa Publishing House, New Delhi.

Scope:

Chapter 10 : Articles 10.1

References:

1) J. N. Sharma and A. R. Vashistha : *Real Analysis* : Krishna Prakashan Media (P), Ltd. Meerut.

2) Hari Kishan *: Real Analysis* : Pragati Prakashan, Meerut.

3) S. K. Mittal and S. K. Pundir : *Real Analysis* : Pragati Prakashan, Meerut.

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 602: Abstract Algebra – II

Periods : 60

Marks : 50

1) Vector Spaces and Modules:

Elementary basic concepts, Linear independence and bases, Dual Spaces, Inner product spaces, Modules. [1]

Recommended books:

1] I. N. Herstein : *Topics in Algebra* : Willey Eastern Pvt. Ltd., NewDelhi.

Scope:

Chapter 4 : 4.1, 4.2, 4.3, 4.4, 4.5

References:

1) A. R. Vasishtha : *Modern Algebra* : Krishna Prakashan Media Pvt. Ltd. Meerut.

2) M. L. Khanna : *Modern Algebra* : Jai Prakash Nath and Co. Meerut.

3) Vijay K. Khanna and S. K. Bhambri : *A course in Abstract Algebra* : Vikas Publishing House Pvt.Ltd. New Delhi.

4) Surjeet Singh and Qazi Zameeruddin : *Modern Algebra* : Vikas Publishing House Pvt. Ltd. New Delhi.

5) Bhupendra Singh : *Advanced Abstract Algebra* : Pragati Prakashan Meerut.

6) Shanti Narayan and Sat Pal : *A Text book of Modern Abstract Algebra* : S. Chand and Co. Ltd. New Delhi.

7) P. N. Chatterjjee : *Linear Algebra* : Prentice-Hall, Upper Saddle River, New Jersey 07458.

8) Joseph A. Gallian : *Contemporary Abstract Algebra* (Seventh Edition) : Brooks/Cole 10 Davis Drive Belmont, CA 94002 – 3098 USA.

9) Goyal J. K. and K. P. Gupta : *Advanced course in Abstract Algebra* : Pragati Prakashan, Meerut.

10) J. N. Kapoor and K. R. Kalra : *Modern Algebra* (Volume I and II): R. Chand and Co. New Delhi.

11) S. Nanda : *Topics in Algebra*: Allied publishers Pvt. Ltd., New Delhi.

Optional Papers (any ONE)
B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 603: Mathematical Statistics – II

Periods : 60

Marks : 50

1) Mathematical Expectation, Generating Functions:
Mathematical expectation, Expectation of a function of a random variable, Addition theorem of expectation, Multiplication theorem of expectation, Expectation of linear combination of random variables, Covariance, Correlation coefficient, Variance of a linear combination of random variables. [1]

2) Theoretical Discrete Probability Distributions:
Binomial distribution, moments, Recurrence relation for the moments of Binomial distribution, Moment generating function of Binomial distribution, Additive property of Binomial distribution, Cumulants of Binomial distribution, Recurrence relation for cumulants of Binomial distribution, Poission distribution, Moments of Poission distribution, Recurrence relation for moments of Poission distribution, Moment generating function of Poission distribution, cumulants of Poission distribution, Additive property of independent Poission variates, Geometric didtribution, Lack of memory, Moment of geometric distribution, Moment generating function of Geometric distribution. [1]

3) Theoretical Continuous Distributions:
Rectangular or Uniform distribution, Moments of rectangular distribution, Moment generating distribution of rectangular distribution, Normal distribution, Normal distribution as a limiting case of a binomial distribution, Mode of Normal distribution, Median of Normal distribution, moment generating function of Normal distribution, Cumulant generating function of Normal distribution, moments of Normal distribution, Gamma distribution, Moment generating function of Gamma distribution, Cumulant generating function of Gamma distribution, additive property of Gamma distribution, Exponential distribution, Moment generating function of exponential distribution. [1]

4) Correlation and Regression:
Bivariate distribution, Correlation, Scatter diagram, Karl Pearson's coefficient of correlation, limits for correlation coefficient, Assumptions underlying Karl Pearson's correlation, Regression, Lines of regression, regression curves, Properties of regression coefficients, Angle between two lines of regression. [1]

Recommended Book:
1] S. C. Gupta and V. K. Kapoor : *Fundamentals of Mathematical Statistics* (Ninth Edition) : Sultan Chand and Sons, New Delhi.

Scope:
Ch – 6: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.6.1, 6.7

Ch – 7: 7.2, 7.2.1, 7.2.2, 7.2.6, 7.2.7, 7.2.9, 7.2.10, 7.3, 7.3.2, 7.3.4, 7.3.5, 7.3.7, 7.3.8, 7.5, 7.5.1, 7.5.2, 7.5.2

Ch – 8: 8.1, 8.1.1, 8.1.2, 8.2, 8.2.1, 8.2.3, 8.2.4, 8.2.5, 8.2.6, 8.2.7, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.6, 8.6.1

Ch – 10: 10.1, 10.2, 10.3, 10.3.1, 10.3.2, 10.7, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 604: Ordinary Differential Equations – II

Periods : 60
Marks : 50

1) Linear Equations with Variable Coefficients:
Introduction, Initial value problems for the homogeneous equation, Solution of homogeneous equation, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The nonhomogeneous equation, Homogeneous equation with analytic coefficients, The Legendre equation. [1]

2) Linear Equations with Regular Singular Points:
Introduction, The Euler equation, Second order equations with regular singular points- an example, Second order equations with regular singular points- the general case, The Bessel equation. [1]

Recommended Book:
1] Earl A. Coddington : *An Introduction to Ordinary Differential Equations* : Prentice India Learning Private Limited, New Delhi-110001, (2009)

Scope:

Chapter 3.- Article 1,2,3,4,5,6,7,8
Chapter 4.- Article 1,2, 3, 4, 7

Reference Books:

1) E. A. Coddington and Levinson Norman : *Theory of Ordinary Differential Equations* : McGraw Hill New York, (1955)
2) A.H.Siddiqi and P. Manchanda : *A First Course in Differential Equations with Applications* : Macmillan India Ltd., (2006)
3) D.G.Zill and M.R.Cullen : *Advanced Engineering Mathematics* (Second Edition) : Jones and Bartlett Publishers, (2000)

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B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Paper – MAT 605: Programming in C – II

Periods : 45
Marks : 40

1) Decision Making and Branching:
Introduction, Decision making with if statement, Simple if statement, The ifelse statement, Nesting of ifelse statement, The elseif ladder, The switch statement, The ?: Operator, The goto statement [1]

2) Decision Making and Looping:
Introduction, The while statement, The do statement, The for statement, Jumps in loops [1]

3) Arrays:
Introduction, One dimensional arrays, Declaration, Initialization, Two dimensional arrays, Initializing two-dimensional arrays, Multidimensional arrays. [1]

Recommended Book :
1] E. Balagurusamy : *Programming in ANSI C* (Second Edition) : Tata McGraw Hill

Scope:
Ch – 5 : 5.1 to 5.9
Ch – 6 : 6.1 to 6.5
Ch – 7 : 7.1 to 7.7

References:
1) Y.P. Kanetkar : *Let us C* : BPB Publication
2) Gottfried : *Programming in C* : Schaum's Series
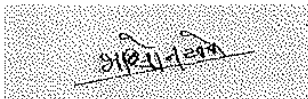3) Moolish Kooper : *Spirit of "C"*
4) D. Ravichandran : *Programming in C* : New-Age International Publisher
5) J.B.Dixit :*Mastering C Programs*
6) Pradip D Y and Manas Ghosh : *Fundamentals of Computing and Programming in C*
7) V.Rajaraman : *Computer Programming in C* : PHI Pvt Ltd, New Delhi(2005)

Note: (i) There should be annual practical based on Paper : MAT 505 and MAT 605 of 20 Marks in Mar/Apr Practical Examination
(ii) There should be separate passing for Theory and Practical.

Dr. B. R. Sontakke
(Chairman, Board of Studies in Mathematics)

B.Sc. (Third Year)(Mathematics)(Sixth Semester)
Practical Paper -- MAT-PR 605(Based on MAT 605)

Periods : 15

Marks : 10

List o f Experiments/Programs:

1. Program to find minimum between two number using if.

2. Program to Calculate factorial of a number.

3. Program to check given number is prime or not.

4. Program to check given number is Armstrong or not. ($153 = 1^3 + 5^3 + 3^3$)

5. Program to find n terms of Fibonacci Series (1 1 2 3 5 8 13 21 …..)

6. Program to find n terms of the Series.

$$\sum_{n=1}^{\infty} \frac{1}{2^n} = \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots.$$

7. Program to Sort any 10 Array Elements.

8. Program to Calculate Addition/Subtraction of two Matrices.

9. Program to calculate multiplication of two matrices.

10. Program to calculate Determinant of Matrix.

11. Program to Find Transpose of a Matrix.

12. Program to check given year is leap or not.

13. Program to find sum of series 1 to n.

14. Program to Calculate Grade of Student by inputting Percenta ge of the student.

15. Program to C heck given number is palindrome or not (ex. 12321)

Note: University Practical Examination will be conducted ann ually.
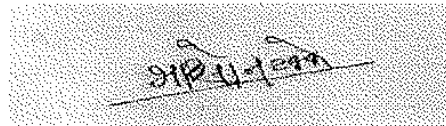
PRACTICAL QUESTION FORMAT

(MAT-PR-505 &605)   (20 Marks)   Max.Time : Three Hours

Q.1. Record Book   05 Marks.

Q.2. Oral (Viva)   05 Marks.

Q. 3. Write/Edit/Print a program in C   10 Marks.
**   (Based on MAT-505& 605)**

OR

Q. 4. Write /Edit/Print a program in C   10 Marks.
**   (Based on MAT-505& 605)**

Dr. Bhausaheb Sontakke
Chairman,
BOS in Mathematics