

Osmania University College for Women, Koti, Hyderabad.
B.Sc (Mathematics)
Under CBCS Pattern

The Course of study and scheme of examination:

Semester	Paper	Title of the Paper	hrs/w week	Credits	Internal marks	External marks	Total marks
Sem I	Paper I	Differential Calculus	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem II	Paper II	Differential Equations	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem III	Paper III	Real analysis.	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem IV	Paper IV	Algebra	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem V	Paper V	Linear Algebra	3 Th 3 Pr	3 1	10+7+5	35 18	75
Sem V	Paper VI (A)	Solid Geometry	3 Th 3 Pr	3 1	10+7+5	35 18	75
	Paper VI (B)	Integral Calculus	3 Th 3 Pr	3 1	10+7+5	35 18	75
Sem VI	Paper VII	Numerical Analysis	3 Th 3 Pr	3 1	10+7+5	35 18	75
Sem VI	Paper VIII (A)	Complex Analysis	3 Th 3 Pr	3 1	10+7+5	35 18	75
	Paper VIII(B)	Vector Calculus	3 Th 3 Pr	3 1	10+7+5	35 18	75

Osmania University College for Women, Koti, Hyderabad.
B.Sc (Mathematics)
Under CBCS Pattern (2017-2018)

The Course of study and scheme of examination:

Semester	Paper	Title of the Paper	hrs/w week	Credits	Internal marks	External marks	Total marks
Sem I	Paper I	Differential Calculus	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem II	Paper II	Differential Equations	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem III	Paper III	Real analysis.	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem IV	Paper IV	Algebra	4 Th 3 Pr	4 1	10+7+5	35 18	75
Sem V	Paper V	Linear Algebra and Multiple Integrals	3 Th 3 Pr	3 1	10+7+5	35 18	75
Sem V	Paper VI (A)	Numerical Analysis	3 Th 3 Pr	3 1	10+7+5	35 18	75
Sem VI	Paper VII	Linear Algebra and Vector Calculus	3 Th 3 Pr	3 1	10+7+5	35 18	75
Sem VI	Paper VIII (A)	Integral Transforms	3 Th 3 Pr	3 1	10+7+5	35 18	75

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc I YEAR SYLLABUS MATHEMATICS 2017-18
DIFFERENTIAL CALCULUS, SEMESTER-I, PAPER-I

Unit- I:

Successive differentiation – Calculation of n^{th} derivative of some standard results – Leibnitz theorem – n^{th} derivative of product of two functions. Expansion of functions – Taylor, Maclaurin's theorems. Concepts of limit, continuity, derivative at a point – Mean value theorems – Rolle's, Lagrange's and Cauchy mean value theorems(with Geometrical meaning and applications).

Unit – II:

Indeterminate forms – $\frac{0}{0}, \frac{\infty}{\infty}, \frac{0}{\infty}, \frac{\infty}{0}, 0 \cdot \infty, \infty - \infty$ -- L'Hospital's Rule, Definition of Curvature- Length of arc-- derivative of arc – Radius of curvature ρ (Cartesian, parametric and polar forms). Newtonian method. Generalized Newtonian formula .Centre of curvature – Evolutes and Involutives.

Unit – III:

Partial differentiation-Functions of two variables- Partial derivative at point – Partial derivatives of higher orders, Taylor's theorem for two variables. Homogeneous functions – Euler's theorem on homogeneous functions, Total derivative – Differentiation of composite and implicit functions.

Unit – IV:

Maxima and Minima of functions of two variables – conditions for the existence of maxima or minima, stationary and extreme points, Lagrange's condition for maxima or minima of two variables – method of undetermined multipliers. Asymptotes (Cartesian and polar forms), Envelopes – determination of envelopes when parameters are connected by a relations (Cartesian form & Polar form), Envelope of normals (Evolutes).

Text: Shanti Narayan and Mittal, *Differential Calculus* , S.Chand & Co.

References:

Manicavachagam Pillay – *Differential Calculus*

William Anthony Granville, Percy F Smith and William Raymond Longley – *Elements of the differential and integral calculus*

Joseph Edwards – *Differential calculus for beginners*

Smith and Minton – *Calculus*

Elis Pine – *How to Enjoy Calculus*

Hari Kishan – *Differential Calculus*

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc I YEAR SYLLABUS .MATHEMATICS 2017-18
DIFFERENTIAL EQUATIONS, SEMESTER-II, PAPER-II.

Unit – I:

Differential Equations of first order and first degree: Exact differential equations – Integrating Factors – Change in variables – Total Differential Equations – Simultaneous Total Differential Equations – Equations of the form $— = — = —$

Differential Equations first order but not of first degree: Equations Solvable for y – Equations Solvable for x – Equations that do not contain x (or y) – Clairaut's equation.

Unit – II:

Higher order linear differential equations: Solution of homogeneous linear differential equations with constant coefficients – Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = bx^m, be^{ax}, e^{ax}V, b\cos(ax), b\sin(ax)$

Unit – III:

Method of undetermined coefficients – Method of variation of parameters – Linear differential equations with non constant coefficients – The Cauchy – Euler Equation, Legendre Equation, System of simultaneous linear differential equations, Degenerate case.

Unit – IV:

Partial Differential equations- Formation and solution- Equations easily integrable – Linear equations of first order – Non linear equations of first order – Charpit's method – Homogeneous linear partial differential equations with constant coefficients, Non homogeneous linear partial differential equations – Separation of variables

Text: Zafar Ahsan – *Differential Equations and Their Applications*

References:

Frank Ayres Jr. – *Theory and Problems of Differential Equations*

Ford, L.R. – *Differential Equations*.

Daniel Murray – *Differential Equations*

S. Balachandra Rao – *Differential Equations with Applications and Programs*

Stuart P Hastings, J Bryce McLead – *Classical Methods in Ordinary Differential*

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc II YEAR SYLLABUS, MATHEMATICS 2017-18
REAL ANALYSIS, SEMESTER-III, PAPER-III

Objective: The course is aimed at exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.
Outcome: After the completion of the course students will be in a position to appreciate beauty and applicability of the course.

Unit- I

Sequences: Limits of Sequences- A Discussion about Proofs-Limit Theorems for Sequences-Monotone Sequences and Cauchy Sequences.

Unit- II

Subsequences-Lim sup's and Lim inf's-Series-Alternating Series and Integral Tests.

Unit- III

Sequences and Series of Functions: Power Series-Uniform Convergence-More on Uniform Convergence-Differentiation and Integration of Power Series (Theorems in this section without Proofs).

Unit- IV

Integration: The Riemann Integral - Properties of Riemann Integral-Fundamental Theorem of Calculus.

Text:

Kenneth A Ross, Elementary Analysis-The Theory of Calculus

References:

William F. Trench, Introduction to Real Analysis
Lee Larson , Introduction to Real Analysis I
Shanti Narayan and Mittal, Mathematical Analysis
Brian S. Thomson, Judith B. Bruckner, Andrew M. Bruckner; Elementary Real analysis
Sudhir R., Ghorpade, Balmohan V., Limaye; A Course in Calculus and Real Analysis

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc II YEAR SYLLABUS, MATHEMATICS 2017-18
ALGEBRA, SEMESTER-IV, PAPER-IV

Objective: The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc. Outcome: On successful completion of the course students will be able to recognize algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects.

Unit- I

Groups: Definition and Examples of Groups- Elementary Properties of Groups-Finite Groups; Subgroups -Terminology and Notation -Subgroup Tests - Examples of Subgroups Cyclic Groups:

Properties of Cyclic Groups - Classification of Subgroups Cyclic Groups-Permutation Groups: Definition and Notation -Cycle Notation-Properties of Permutations -A Check Digit Scheme Based on D_5 .

Unit- II

Isomorphisms ; Motivation- Definition and Examples -Cayley's theorem Properties of Isomorphisms- Automorphisms-Cosets and Lagrange's Theorem Properties of Cosets 138 - Lagrange's Theorem and Consequences-An Application of Cosets to Permutation Groups -The Rotation Group of a Cube and a Soccer Ball -Normal Subgroups and Factor Groups ; Normal Subgroups-Factor Groups-Applications of Factor Groups -Group Homomorphisms - Definition and Examples -Properties of Homomorphisms -The First Isomorphism Theorem.

Unit- III

Introduction to Rings: Motivation and Definition -Examples of Rings -Properties of Rings - Subrings-Integral Domains : Definition and Examples {Characteristics of a Ring -Ideals and Factor Rings, Ideals -Factor Rings -Prime Ideals and Maximal Ideals.

Unit- IV

Ring Homomorphisms: Definition and Examples-Properties of Ring- Homomorphisms -The Field of Quotients Polynomial Rings: Notation and Terminology.

Text:

Joseph A Gallian, Contemporary Abstract algebra (9th edition)

References:

Bhattacharya, P.B Jain, S.K.; and Nagpaul, S.R, Basic Abstract Algebra
Fraleigh, J.B, A First Course in Abstract Algebra.
Herstein, I.N, Topics in Algebra
Robert B. Ash, Basic Abstract Algebra
I Martin Isaacs, Finite Group Theory
Joseph J Rotman, Advanced Modern Algebra

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc III YEAR MATHEMATICS SYLLABUS 2017-18

LINEAR ALGEBRA & MULTIPLE INTEGRALS

SEMESTER-V PAPER-V

Objectives:

This course aims to study the Algebraic structures of Vector Spaces and to understand several important concepts in linear algebra, linear independence of vectors; subspaces, bases, and dimension of vector spaces; linear transformations and establishes different dimension theorems. This course also gives the concepts of integration in $\mathbb{R}$ and $\mathbb{R}^n$ and the technique to compute the length of curves and area of surfaces.

Linear Algebra

UNIT-I:

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, linear combination of vectors. Linear span, linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vector space.

UNIT-II:

Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace. Linear transformations, linear operators, Range and null space of linear transformation, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation. Matrix of linear transformations.

Prescribed text book:

Linear Algebra by J.N.Sharma and A.R.Vasista, Krishna Prakasham Mandir, Meerut-250002

Reference Books:

1. Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education (low priced edition), New Delhi
2. Linear Algebra by Stephen H. Friedberg et al Prentice Hall of India Pvt. Ltd. 4th edition 2007

Multiple integrals

UNIT-III:

Multiple integrals, Introduction, the concept of a plane, Curve, line integral- Sufficient condition for the existence of the integral. The area of a subset of $\mathbb{R}^2$, Calculation of double integrals, Jordan curve, Area, Change of the order of integration.

UNIT-IV:

Double integral as a limit, Change of variable in a double integration. Lengths of Curves, surface areas, Integral expression for the length of a curve, surfaces, surface areas.

Prescribed text Book:

Vector Analysis by Murray. R.Spiegel, Schaum Series Publishing Company.

Reference Books:

1. Text book of vector Analysis by Shanti Narayana and P. K. Mittal, S. Chand & Company Ltd, New Delhi.
2. Mathematical Analysis by S.C. Mallik and Savitha Arora, Wiley Eastern Ltd.

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc III YEAR MATHEMATICS SYLLABUS 2017-18
NUMERICAL ANALYSIS
SEMESTER-V PAPER-VI (A)

Objectives:

This course introduces students to numerical methods of solving differential equations and general interpolation.

UNIT-I:

Errors in Numerical Computations: Numbers and their Accuracy, Errors and their Computation, Absolute, Relative and percentage errors, a general error formula
. Solution of Algebraic and Transcendental Equations. The bisection method, The iteration method, The method of false position, Newton-Raphson method, Generalized Newton-Raphson method, order of convergence, Ramanujan's method.

UNIT-II:

Interpolation: Definition, Forward differences, Backward differences, Central Differences, Symbolic relations, Detection of errors by use of D.Tables. Differences of a polynomial. Newton's forward and backward interpolation formulae, central difference interpolation, Gauss central difference formula, Stirling's central difference formula..

UNIT-III:

Interpolation: Interpolation with unevenly spaced points, Lagrange's formula, divided differences and their properties, Newton's general interpolation
Numerical Differentiation & Integration: Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's $1/3$ – rule, Simpson's $3/8$ – rule.

UNIT-IV:

Numerical solution of ordinary differential equations : Introduction, Solution by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge – Kutta methods. Solution of linear systems- Iterative methods: Jacobi's method, Gauss-siedal method,

Prescribed text Book: Scope as in Introductory Methods of Numerical Analysis by S.S. Sastry, Prentice Hall India (4th Edition.), Chapter -1 (1. 2, 1. 3, 1.4,1.5), Chapter - 2 (2.2 – 2.6); chapter 3 (3.1, 3.3 to 3.7,3.9,3.9.1, 3.10,3.10.1,), Chapter.- 5(5.1,5.2,5.4 to 5.4.3.), Chapter - 7 (7.1 to 7.5); chapter 8(8.3.1,8.3.2).

Reference Books:

1. Numerical Methods by B.S.Grewal
2. Finite Differences and Numerical Analysis by H.C. Saxena S. Chand and Company, New Del

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc III YEAR MATHEMATICS SYLLABUS 2017-18
SEMESTER-V PAPER-VI (B)

PAPER TITLE: LAPLACE AND INVERSE LAPLACE TRANSFORMS

Objectives: This Course deals with Laplace transforms, Inverse Laplace transforms and it's applications.

UNIT-I:

Definition of Laplace transform, linearity property piecewise continuous function, Existence of Laplace transform, Functions of exponential order and of class A, First and second shifting theorems of Laplace transform, change of scale property laplace transform of derivatives, final and initial value theorems, Laplace transform of integrals, multiplication by t, division by t, Laplace transform of periodic functions and error function, Beta function and Gamma functions.

UNIT-II:

Definition of inverse Laplace transform linearity property, first and second shifting theorems of inverse Laplace transforms, change of scale property, division by p, convolution theorem, Heavisides expansion formula (with proofs and applications)

APPLICATIONS OF LAPLACE TRANSFORMS

UNIT-III:

Solution of ordinary differential equations with constant coefficients, and variable coefficients, solution simultaneous ordinary differential equations.

UNIT-IV:

Solution of partial differential equations, boundary value problems, heat equation, wave equation, Laplace equation and Integral equations.

Reference Books:

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|--|---|--|
| 1. Integral transforms | : | Vasistha & Gupta.
(Krishna prakashan Mandir) |
| 2. Fourier series and
Boundary value problems | : | Churchill
(Tata Mc Graw- Hill publishing
Company Ltd.) |
| 3. Higher Engineering | : | Dr. B.S.Grewal. |

Mathematics

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc III YEAR MATHEMATICS SYLLABUS 2017-18
SEMESTER-VI PAPER-VII,
LINEAR ALGEBRA & VECTOR CALCULUS

Linear Algebra

UNIT-I:

The adjoint or transpose of a linear transformation, Sylvester's law of nullity, rank of a matrix-echelon form, normal form, system of equations, characteristic values and characteristic vectors, Cayley- Hamilton theorem, Diagonalizable operators.

UNIT-II:

Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, complete orthonormal set, Gram - Schmidt orthogonalisation process.

Prescribed text book:

Linear Algebra by J.N.Sharma and A.R.Vasista, Krishna Prakasham Mandir, Meerut-250002.

Reference Books:

1. Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education low priced edition), New Delhi
2. Linear Algebra by Stephen H. Friedberg et al Prentice Hall of India Pvt. Ltd. 4th edition 2007.

Vector Calculus

UNIT-III:

Vector differentiation. Ordinary derivatives of vectors, Space curves, Continuity, Differentiability, Gradient, Divergence, Curl operators, Formulae involving these operators.

UNIT-IV:

Vector integration, theorems of Greens, Gauss and Stokes theorem in plane and applications of these theorems.

Prescribed text Book:

Vector Analysis by Murray. R.Spiegel, Schaum Series Publishing Company.

Reference Books:

1. Text book of vector Analysis by Shanti Narayana and P. K. Mittal, S. Chand & Company Ltd, New Delhi.
2. Mathematical Analysis by S.C. Mallik and Savitha Arora, Wiley Eastern Ltd.

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc III YEAR MATHEMATICS SYLLABUS 2017-18
SEMESTER-VI PAPER – VIII (a)

INTERGRAL TRANSFORMS

FOURIER TRANSFORMS:

UNIT-I:

Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse Theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae.

UNIT-II:

Linearity property of Fourier transforms, change of scale property, shifting theorem, modulation theorem, and convolution theorem of Fourier transforms, Parseval's identity.

FINITE FOURIER TRANSFORMS AND FOURIER SERIES:

UNIT-III:

Finite Fourier sine transforms, Inversion formula for sine transforms, and finite Fourier cosine transforms, applications of Fourier transforms initial and boundary value problems.

UNIT-IV:

Fourier series in the interval $(-l, l)$, $(-\pi, \pi)$, $(0, 2\pi)$, half-range sine and cosine series in the interval $(0, l)$, and $(0, \pi)$.

Reference Books:

- | | | |
|--|---|--|
| 1. Integral transforms | : | Vasistha & Gupta.
(Krishna prakashan Mandir) |
| 2. Fourier series and
Boundary value problems | : | Churchill
(Tata Mc Graw- Hill publishing
Company Ltd.) |
| 3. Higher Engineering
Mathematics | : | Dr. B.S.Grewal. |

OSMANIA UNIVERSITY COLLEGE FOR WOMEN, KOTI, HYDERABAD
B.Sc III YEAR MATHEMATICS SYLLABUS 2017-18
SEMESTER-VI PAPER-VIII (b)
PAPER TITLE: NUMBER THEORY & CRYPTOGRAPHY

Objectives:

This course aims to give the elementary ideas of Number theory which have number of applications in Cryptography.

Unit I: (Number theory)

Introduction, GCD, LCM of integers, Division algorithm, Euler's function, Prime Numbers, The fundamental theorem of arithmetic, Fermat's theorem, Wilson's Theorem, Distribution of primes, Fermat & Mersenne Primes, Primality Test.

Unit II: (Modular Arithmetic)

Congruences, Linear congruences, Simultaneous linear congruences, Chinese remainder theorem, congruences mod prime power.
Finite Fields, Finite fields of $GF(P)$, Finite fields of $GF(2^n)$.

Unit III: (Introduction to cryptography)

Some simple crypto systems, enciphering matrices.

Unit IV:

The idea of public key cryptography , RSA Algorithm.

Prescribed Text books:

Unit I & II scope as in "An Introduction to Theory of Numbers" by Niven and Zukerman, Willey Eastern Publications.

Unit III & IV scope as in "A course in Number theory and cryptography" by Neal Koblitz, 2nd edition, Springer publications.

References: