



Estd. 1962  
NAAC 'A' Grade

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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग— २६०९०९४)

फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Science/ No 0 0 3 9 8

Date: 18 OCT 2021

To,

1) The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur	2) The Head, All Concerned Department Shivaji University, Kolhapur.
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**Subject:** Regarding Syllabi of **M.Phil/Ph.D. Course work Mathematics Paper-III**  
under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the University authorities have accepted and granted approval to the revised syllabi of **M.Phil/Ph.D. Course work Mathematics Paper-III** under the Faculty of Science and Technology.

Sr.No	Title Of Paper	Paper No.
1	Numerical Analysis	III
2	Commutative Algebra	III
3	Theory of Near Rings	III

This syllabi shall be implemented from the academic year 2021-2022 (i.e. from June 2021) onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in)

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar

Copy to:

1	The Dean, Faculty of Science & Technology	7	Appointment Section
2	The Chairman BOS	8	Computer Centre
3	B.Sc/M.Sc Section	9	Affiliation Section (U.G.)
4	O.E. II, Section	10	Affiliation Section (P.G.)
5	Eligibility Section	11	P.G.Admission Section
6	P.G.Seminar Section		

**M. Phil./ Ph. D. Course Work**

**Mathematics**

**Syllabus to be implemented from**

**June, 2021 onwards**

**List of papers**

**Optional papers: Paper III**

**10. Numerical Analysis**

**11. Commutative Algebra**

**12. Theory of Near Rings**

## **NEW/REVISED SYLLABUS FOR**

**M. Phil. / Ph.D. Course Work**

(Introduced from June 2021 onwards)

- (i) Paper : III(10)**  
**(ii) Title of Paper : Numerical Analysis**  
**(iii) Specific Objectives :-**

### **(iv) UNITS:**

**UNIT I:** Boundary value problems, Finite difference method, Cubic Spline method, Galerkin's method, linear shooting method, shooting methods for nonlinear problem, Finite difference method for non-linear problems.

(No of Lectures 15)

**UNIT II:** Finite difference approximations to partial derivatives, Jacobi's method, Gauss-Seidal method, Successive Over Relaxation (SOR) method, Alternative Direction Implicit method, stability analysis and convergence analysis.

(No of Lectures 15)

**UNIT III:** Parabolic partial differential equations, solution of one dimensional parabolic equation, Bender- Schmidt method, Crank-Nicolson method, Iterative methods of solution for an implicit scheme, parabolic equations in two and three dimensions.

(No of Lectures 15)

**UNIT IV:** Hyperbolic partial differential equations, solution techniques, equations in two and three dimensions, finite element methods in hyperbolic partial differential equations.

(No of Lectures 15)

### **(v) Recommended Reading:**

#### **a) Basic Reading:**

C. F. Gerald and P.O. Wheatley: Applied Numerical Analysis, Sixth Edition, Pearson Education 2002

#### **b) Additional Readings: -**

#### **c) References:**

##### **i) Books:**

- 1) M. K. Jain: Numerical Solutions of Differential Equations, Second Edition, Wiley Eastern Ltd. 1991
- 2) G. D. Smith: Numerical Solution of Partial Differential Equations Finite Difference Methods, Third Edition, Oxford University Press.
- 3) S.S. Sastry: Introductory Methods of Numerical Analysis, Fifth Edition, PHI Learning Pvt. Ltd. 2012

##### **ii) Periodicals / Journals: -**

## NEW/REVISED SYLLABUS FOR

### M. Phil. / Ph.D. Course Work

(Introduced from June 2021 onwards)

#### Paper - III (11)

##### Title of paper -Commutative Algebra

Specific Objectives: In this course student will be acquainted with concepts of Commutative Algebra.

Unit – I : Minimal Prime and Primary Ideals : Examples and properties of Minimal, Prime and Primary Ideals. The nil radical of an ideal and its properties, semiprime ideals. The associated prime ideal of a primary ideal, Problems. (No of Lectures 15)

Unit – II: Minimal prime ideals of a ring.Certain Radicals of a Ring : Jacobson Radical, The definition of the idempotents of  $R/I$  can be raised or lifted into  $R$  and its properties, Primary rings, Problems. (No of Lectures 15)

Unit – III: Quasiregular element and its properties, Prime radicals, Modular ideals, Radical of a ring. Boolean rings, Regular rings, Stone representation theorem. Direct sum of Rings, Problems. (No of Lectures 15)

Unit – IV: Birkhoff theorem , Rings with Chain conditions: Equivalence of three conditions of a ring with a.c.c., Hilbert Basis Theorem, Levitsky Theorem, Wedderburn Theorem, Problems. (No of Lectures 15)

Recommended Reading:

Basic Reading:

1. Barton David M. : A first course in Rings and Ideals Addison Wesley Publishing Company 1970.
2. Oscar Zoriski and P. Samuel : Commutative Algebra, Vol.I, Affiliated East Press Pvt. Ltd., New Delhi.

Additional Readings: -

References: i) Books: 1. M. Atiyah and I.C. McDonald : Commutative Algebra.

2. Motsumura : Commutative Algebra.

ii) Periodicals / Journals: -

## **NEW/REVISED SYLLABUS FOR**

### **M. Phil. / Ph.D. Course Work**

**(Introduced from June 2021 onwards)**

#### **Paper : III (12)**

##### **Title of paper : Theory of Near Rings**

Specific Objectives: In this course student will be acquainted with concepts of Near Rings.

Unit – I : Definition and properties of N – groups and substructures Homomorphism and Ideals. Annihilators. Near Rings of quotients. Products and direct products. Embedding in  $M(\Gamma)$ . (No of Lectures 15)

Unit – II: Chain conditions. Prime ideals, semi-prime ideals, Nil and Nilpotent ideals. Idempotent elements. (No of Lectures 15)

Unit – III: Distributively generated Near Rings. Construction of distributively generated Near Rings. Distributively generated Near Rings with finiteness conditions. Polynomial Near Rings. (No of Lectures 15)

Unit – IV: Near fields. Conditions to be a Near field. The additive group of a Near field. The center and Kernel of a Near field. Dikson Near fields. (No of Lectures 15)

##### **Recommended Reading:**

a) Basic Reading 1. Guntur Pilz: Near Rings, North Holland Publishing Company, Revised Edition 1983.

b) Additional Readings: -

c) References : i) Books: - 1. Gunter Pilz: Near-rings: The Theory and its Applications, Volume 23, 1st Edition

2. Satyanarayana, Bhavanari: Near Rings, Fuzzy Ideals, and Graph Theory

ii) Periodicals / Journals: -