

DEPARTMENT OF MATHEMATICS

| COURSE PLAN – PART I  |  |                          |             |
|---|--|--------------------------|-------------|
| Name of the programme and specialization  | M.Sc., Mathematics   |                          |             |
| Course Title  | Algebra  |                          |             |
| Course Code   | MA702  | No. of Credits           | 03          |
| Course Code of Pre-requisite subject(s)   | NIL  |                          |             |
| Session   | January 2020   | Section (if, applicable) | -           |
| Name of Faculty   | Dr. N. Prakash   | Department               | Mathematics |
| Email   | <a href="mailto:prakashn@nitt.edu">prakashn@nitt.edu</a>                                 | Telephone No.            | 7845688072  |
| Name of Course Coordinator(s) (if, applicable)  | -  |                          |             |
| E-mail  | -  | Telephone No.            | -           |
| Course Type   | <input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course |                          |             |
| <b>Syllabus (approved in BoS)</b>   |  |                          |             |
| Review of basic Group Theory – Group actions – Conjugacy classes – The class equation – Sylow’s Theorem - Direct Product –Fundamental Theorem of Finite Abelian Groups.   |  |                          |             |
| Review of basic Ring Theory – Ideals and Factor rings – Prime and Maximal ideals – Euclidean domains – principal ideal domains and unique factorization domains – Polynomial rings – Factorization of Polynomials.  |  |                          |             |
| Extension fields – Splitting fields – Algebraic and Transcendental extensions – Simple extensions – Separable extensions - Finite fields.   |  |                          |             |
| Galois Theory – Fundamental Theorem of Galois Theory – Solvability of Polynomials by Radicals – Solvable groups – Insolubility of a quantic.  |  |                          |             |
| <b>ESSENTIAL READINGS : (Textbooks, reference books etc.)</b>   |  |                          |             |
| 1. D. S. Dummit and R. M. Foote: <i>Abstract Algebra</i> , 3rdEdition, John-Wiley, 2011.<br>2. M. Artin: <i>Algebra</i> , 2nd edition, Pearson, 2011.<br>3. I.N. Herstein: <i>Topics in Algebra</i> , 2nd edition, John-Wiley, 2008.<br>4. J.A. Gallian: <i>Contemporary Abstract Algebra</i> , 4thedition, Narosa, 1999.<br>5. N. Jacobson: <i>Basic Algebra I and II</i> , 2nd Edition, Dover Publication Inc., 2009. |  |                          |             |



| <b>COURSE OBJECTIVES</b>  |  |  |  |
|---|--|--|--|
| The course objective is to  |  |  |  |
| <ol style="list-style-type: none"> <li>1. discuss group actions, Sylow's theorems, Fundamental theorem of finite Abelian groups and their applications in finite group theory.</li> <li>2. study the concepts of ideals and rings and various domains.</li> <li>3. introduce finite fields and their extensions.</li> <li>4. learn the concepts of Galois theory and solvability of polynomials by radicals.</li> </ol> |  |  |  |
| <b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs)</b>   |  |  |  |
| <b>Course Outcomes</b>  |  |  | <b>Aligned Programme Outcomes (PO)</b> |
| On completion of this course students will be able to   |  |  |  |
| 1. classify the finite groups using Sylow's theorems and fundamental theorem of finite Abelian groups.  |  |  | <b>a,e</b>                             |
| 2. present examples of various domains, prime ideals and maximal ideals.  |  |  |  |
| 3. construct finite fields of prime power order and explain the field extensions.   |  |  |  |
| 4. discuss the solvability of polynomials by radicals using Galois theory.  |  |  |  |
| <b>COURSE PLAN – PART II</b>  |  |  |  |
| <b>COURSE OVERVIEW</b>  |  |  |  |
| This course will introduce  |  |  |  |
| <ol style="list-style-type: none"> <li>1. group actions, Sylow's theorems, Fundamental theorem of finite Abelian groups and their applications.</li> <li>2. polynomial rings, prime ideals, maximal ideals and various domains.</li> <li>3. finite fields and their extensions.</li> <li>4. Galois theory and solvability of polynomials.</li> </ol>  |  |  |  |
| <b>COURSE TEACHING AND LEARNING ACTIVITIES</b>  |  |  |  |
| <b>S.No.</b>  | <b>Week/Contact Hours</b>                                | <b>Topic</b>   | <b>Mode of Delivery</b>                |
| 1.  | 1 <sup>st</sup> , 2 <sup>nd</sup> & 3 <sup>rd</sup> week | Review of basic Group Theory – Group actions – Conjugacy classes – The class equation – Sylow's Theorem - Direct Product – Fundamental Theorem of Finite Abelian Groups. | Chalk and Talk                         |



|    |   |   |                |
|----|---|---|----------------|
| 2. | 4 <sup>th</sup> & 5 <sup>th</sup> week                    | Review of basic Ring Theory – Ideals and Factor rings – Prime and Maximal ideals– Euclidean domains   | Chalk and Talk |
| 3. | 6 <sup>th</sup> Week                                      | <b>Assessment - 1</b>   |                |
| 4. | 6 <sup>th</sup> , 7 <sup>th</sup> week                    | Principal ideal domains and unique factorization domains – Polynomial rings – Factorization of Polynomials.                                   | Chalk and Talk |
| 5. | 8 <sup>th</sup> , 9 <sup>th</sup> & 10 <sup>th</sup> week | Extension fields – Splitting fields – Algebraic and Transcendental extensions – Simple extensions – Separable extensions - Finite fields.     | Chalk and Talk |
| 6. | 11 <sup>th</sup> Week                                     | <b>Assessment - 2</b>   |                |
| 7. | 11 <sup>th</sup> & 12 <sup>th</sup> Week                  | Galois Theory – Fundamental Theorem of Galois Theory – Solvability of Polynomials by Radicals – Solvable groups – Insolvability of a quintic. | Chalk and Talk |
| 8. | 13 <sup>th</sup> or 14 <sup>th</sup> Week                 | <b>Final Assessment</b>   |                |

**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

| S.No. | Mode of Assessment                   | Week / Date                               | Duration  | % Weightage |
|-------|--------------------------------------|---|---|-------------|
| 1.    | Assessment - 1 (Written Test)        | 6 <sup>th</sup> Week                      | 1 hour  | 20%         |
| 2.    | Assessment – 2 (Written Test)        | 11 <sup>th</sup> Week                     | 1 hour  | 20%         |
| 3.    | Assessment - 3 (Assignments/Quiz)    |   | Will be announced while distributing the list of problems | 10%         |
| CPA   | Compensation Assessment              | 12 <sup>th</sup> Week                     | 1 hour  | 20%         |
| 4.    | Final Assessment (End Semester Exam) | 13 <sup>th</sup> or 14 <sup>th</sup> Week | 3 hours   | 50%         |

**COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)**

1. Feedback from the students during class committee meetings and in the class after Assessment 1 and 2.
2. Online feedback through questionnaire before the final assessment.
3. Student knowledge about the topic covered in this course will be judged through marks obtained in examination.

**COURSE POLICY (preferred mode of correspondence with students, compensation**



**assessment policy to be specified)**

**MODE OF CORRESPONDENCE (email / phone etc)**

Students can meet the course faculty by fixing appointment through E-mail ([prakashn@nitt.edu](mailto:prakashn@nitt.edu)) or phone call (+91-7845688072) between 9:30 am to 5:30 pm in the working days.

**COMPENSATION ASSESSMENT POLICY**

1. Students who have missed either Assessment-1 or Assessment-2 or both can register for Compensation Assessment which shall be conducted soon after the completion of the Assessment-2 and before the Final Assessment.
2. The Compensation Assessment shall be conducted for the weightage of 20% comprising the syllabus of both Assessment-1 and Assessment-2.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)


- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

**FOR APPROVAL**

  
Dr. N. Prakash  
(Course Faculty)

  
CC-Chairperson

  
HOD