**University of Management and Technology**

**School of Science**

***Department of Mathematics***

**Course Code:** MTH 705

 **Course Title: Advance Rings and Modules**

**Program: PhD MA**

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| **Schedule**  |  | **Pre-requisite** |  |
| **Course Coordinator** |  Dr. Sohail Zafar | **Contact** | Ext 3474Cell: 03214242349 |
| **Course****Description** | This course introduces advanced concepts of rings and modules. The main objective of this course is to prepare students for research in different areas of Algebra. **Rings:** Basic Concepts of Groups, Definition of Ring, Subring, Ideals, Maximal and Prime Ideals. Operations with ideals. The ideal generated by a set. Quotient rings. Ring homomorphism. The isomorphism theorems & applications. Finitely generated ideals. Rings of fractions. Euclidean domains. The Euclidean algorithm. Principal ideal domains. Unique factorization domains, Polynomial Rings, Irreducibility criteria for polynomials. Polynomials in Several Variables, Monomial Ideals, Grobner Basis.**Modules:** Definition of Modules, modules, Quotient Modules, Module Homomorphism, Module Isomorphism theorems (applications), Generation of Modules, Direct Product of Modules, Free Modules, Exact Sequences of Modules, Projective and Injective Modules. Tensor Product of Modules, Homological Modules. Noetherian rings and Modules.  |
| **Expected****Outcomes** | After successfully completing the course, students should be* comfortable with several concepts of rings and modules
* Able to understand and apply the concepts of algebra in different areas of mathematics
* Able to read, understand and explore research article.
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| **Text** **Book(s)** | D. S. Dummit and R. M. Foote, Abstract Algebra, 3rd Edition, Addison-Wesley Publishing Company, 2004. |
| **Reference books/ research Papers:** | 1. [Joseph Gallia](http://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&text=Joseph+Gallian&search-alias=books&field-author=Joseph+Gallian&sort=relevancerank)n, Contemporary Abstract Algebra 8th Edition,  2013.2. I.N. Herstein, Topics in Algebra, Xerox Publishing Company, 1964.3. P. M. Cohn, Algebra, John Wiley and Sons, London, 1974.4. M.F. Atiyah, I.G. Macdonald, Introduction to Commutative Algebra, Addison-Wesley. |
| **Assignments** | 2 Assignments | **Project** | 1 project from advanced topics and/or research papers |
| **Mid Term****Examination** | 1 Midterm Exam  | **Final** **Examination** | 1 Final Examination |
| **Attendance** **Policy** | SA would be reported if 5 two and half classes are missed without any accidental or medical or any extreme family matters. |
|  | **Grading Policy** |
| **Assignments**  |  20% | **Quizes** | 10% |
| **Mid Term****Examination** | 30% | **Final** **Examination** | 40% |