**Faculty Profile**

**Dr. Arshad Majid Mirza (S.I.)** was born in Rawalpindi, Pakistan. He received the Ph.D. degree in theoretical plasma physics from the Quaid-i-Azam University (QAU), Islamabad, Pakistan in (1991). He joined the Department of Physics, QAU in (1993) as an Assistant Professor and became Associate Professor in January (2000) and became BPS Professor in (2005) and then Tenured Professor in (2007). Dr. Mirza also worked as an **Alexander-von-Humboldt**(AvH) Research Fellow at Ruhr University Bochum (RUB), Germany.

In his capacity as a Chairman, Department of Physics as well as Dean of Faculty of Natural Sciences at QAU, Islamabad, he was responsible for executing various research and development programs at the university level. He has more than 27 years of university teaching and research experience and has published around 200 research papers in HEC recognized International Journals with high Citation Index and Impact Factor. He has supervised 90 M.Phil. and supervised/co-supervised 15 Ph.D. research students.  He is also supervising three Ph.D. and four M.Phil. research students. Presently, he is working as a Professor of Physics and worked till 27th March 2023 as a Dean SSC at UMT, Lahore.  Prof. Mirza is actively engaged to develop and strength teaching/research activity at SSC, UMT.

**Course Outline**

**University of Management and Technology**

**School of Science and Technology**

***Department of Physics***

**Course Code:** **PH 416**

 **Course Title: Electromagnetic Theory-1**

 **Program: BS (Phy)**

**Course Outline**

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| **Schedule**  | Wednesday, Thursday12:30-1:45; 8:00-9:15 | **Pre-requisite** | PH 416-Electricity & Magnetism |
| **Course Coordinator** | Arshad Majid Mirza | **Contact** | arshad.mirza@umt.edu.pk |
| **Course description** | Mechanics tells us how a system will behave when subjected to a given force. There are just four basic forces known (presently) to physics: I list them in the order of decreasing strength: 1. Strong 2. Electromagnetic 3. Weak 4. Gravitational. The brevity of this list may surprise you. Where is friction? Where is the "normal" force that keeps you from falling through the floor? Where are the chemical forces that bind molecules together? Where is the force of impact between two colliding billiard balls? The answer is that all these forces are electromagnetic. Indeed, it is scarcely an exaggeration to say that we live in an electromagnetic world virtually every force we experience in everyday life, with the exception of gravity, is electromagnetic in origin. This is an undergraduate level introduction to electrodynamics. The course is consist of three parts. A quick review of the vector analysis is included in the first part. In the second part, we discuss the electrostatic, potentials and electric field in matters. Part three concludes the magnetostatics and magnetic field in matters. |
| **Learning outcomes** | After completion of the course student will be able to * Understand the basic concepts in field theory
* Able to solve the simple problems where charges are static
* Apply knowledge to the problems involving steady currents.
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| **Textbook** | Introduction to Electrodynamics, Griffiths 3rd Ed. |
| **Reference Book:** | Modern Electrodynamics by Zangwill (2012, First Edition) |
| **Assignments**  | Problems will be assigned at regular intervals as an assignment. | **Quizzes**  | All quizzes will be announced well before time. No make-ups will be offered for missed quizzes. |
| **Mid Term****Examination** | A 60-minutes on campus exam will cover all the material covered during the first 14-16 lectures. | **Final** **Examination** | A 120-minutes on campus exam will cover all the material covered during the semester.  |
| **Attendance** **Policy** | Students missing more than 25% of the lectures will receive an “SA” grade in the course and will not be allowed to take Final exam.  |
| **Grading** **Policy** | Assignment+ Quizzes: 20% Mid Term Examination: 30%Final Examination: 50%The assessment policy can be changed. |

**Department of Physics**

**Electromagnetic Theory-1 (PH 416)**

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| **Week** | **TOPICS** | **Readings** |
| 1 | Vector Analysis: Vector algebra and differential calculus  | Chapter 1 |
| 2 | Vector Analysis: Integral calculus, curvilinear coordinates and Dirac delta functions | Chapter 1 |
| 3 | Electrostatics: Electric field and divergence and curl of electrostatic field | Chapter 2 |
| 4 | Electrostatics: The electric potential | Chapter 2 |
| 5 | Electrostatics: Work and energy in electrostatics   | Chapter 2 |
| 6 | Electrostatics: Conductors | Chapter 2 |
| 7 | Potentials: Laplace’s equation | Chapter 3 |
| 8 | Potentials: The method of images and separation of variables | Chapter 3 |
| 9 | Potentials: Multipole expansion | Chapter 3 |
| 10 | Electric field in matter: Polarization and electric field of a polarized object | Chapter 4 |
| 11 | Electric field in matter: Electric displacement | Chapter 4 |
| 12 | Electric field in matter: Electric displacementMagnetostatics: The Lorentz force law | Chapter 4 and 5 |
| 13 | Magnetostatics: The Biot-Savart law, divergence and curl of B or Ampere’s Law | Chapter 5 |
| 14 | Magnetosstatics: Magnetic vector potentialMagnetic field in matter: Magnetization | Chapter 5 and 6 |
| 15 | Magnetic field in matter: Magnetic field of magnetized object and auxiliary field H. | Chapter 6 |