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| **logoDepartment of Life Sciences, School of Science****University of Management and Technology** |
| Course Code: BT-662Course Title: Advanced Research Methodology |
| **Lecture Schedule** | Tuesday – **Section A1** (06:30 – 09:30 PM) | **Semester** | Spring 2024 |
| **Pre-requisite** | -- | **Credit Hours** | **03** (*03 contact hours*) **Theory** |
| **Instructor** | Dr. Muhammad Akram | **Contact** | Muhammad\_akram@umt.edu.pk |
| **Office** | New FACULTY HALL North block (Ext. 3615) | **Office Hours** | Displayed on LMS and office door |
| **Align with the SDGs** | SDG number 3 & 4(See page 9) |
| **Attendance Policy** | Participant Handbook Clause 2.10: Class Attendance – A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination/assessment. Participant with less than 80% of attendance in a course shall be awarded grade ‘SA’ (Short attendance) and shall not be allowed to take end term exams. |
| **Plagiarism Policy** | UMT follows the HEC Plagiarism policy, which is available at: <https://www.hec.gov.pk/english/services/faculty/Plagiarism/Pages/default.aspx> |
| **Course Learning Outcomes (CLOs)** | Upon successful completion, students will have knowledge and skills to:**CLO 1.** Understand and apply complex research designs, such as experimental, quasi-experimental, and non-experimental designs, to address specific research problem. **CLO 2.** Gain proficiency to use advanced data collection methods, such as surveys, interviews, observations, and archival research.**CLO 3.** Explore various sampling techniques, including probability and non-probability sampling.**CLO 4.** Develop advanced skills in data analysis, use of statistical software, hypothesis testing, regression analysis, and other advanced statistical techniques.**CLO 5.** Proficiency in writing research proposals, problem statement formulation, research hypotheses development, research proposal, articles, thesis and research funding. |
| **Course description** | Following topics will be included in this course (*detailed week-wise breakup is given at the end of the document*): Introduction to research methodology, different types of hypotheses in scientific research, literature review and technical reading skills, research design, formulating research methods, ethics in research, technical writing research proposal, synopsis, research articles, thesis and research projects, contributions, arguments, and dealing with criticisms, lessons learned from nature’s reports, bibliometrics and research quality, improving presentation skills, intellectual property rights, research management, planning and collaboration, patent writing and filling. Students will prepare a comprehensive review on an assigned topic. |
| **Learning Resources** | Text Book | * Goh, K. M. 2023. Research Methodology in Bioscience and Biotechnology: Springer Nature.
* Deb, D., Dey, R., & Balas, V. E. 2019. Engineering research methodology. A Practical Insight for Researchers.
* Kumar R. 2019. Research Methodology: a step-by-step guide for beginners. 5th Edition. Los Angeles: Sage.
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| Reference Book | * Jain, R., & Surbhi, M. 2019. Research methodology in Arts. Science and Humanities. Society Publishing.
* Bairagi, V., & Munot, M. V. (Eds.). 2019. Research methodology: A practical and scientific approach. CRC Press.
* Chandra V & Hareendran A. 2018. Research Methodology. Research Methodology.
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| **Teaching Kits** | All didactic material will be shared on:* PowerPoint slides and books shared on LMS
* Recording (if any)
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| **Grading Policy** | * Assignments 10%
* Quizzes 10%
* Midterm 25%
* Presentation 10%
* Final 45%
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**COURSE CALENDER**

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| **Lecture #** | **TOPICS** | **Readings** |
| 1 | **Introduction to research methodology*** Objectives of Research
* Motivation behind Research
* Positivism and Relativism in Research
* Common Types of Research
 | **Chapter 1**(Dipankar et al 2019)(Surbhi Jain 2019)(Bairagi, 2019) |
| 2 | **Different types of Hypotheses in Scientific Research*** Important Features of Research Hypothesis
* Types of Research Hypotheses
* Formulating Research Hypothesis
* Testing Research Hypothesis
* Challenges of Formulating Research Hypothesis.
 | **Chapter 5**(Surbhi Jain 2019) |
| 3 | **Literature Review and Technical Reading*** Conducting Background Research
* Resources for Literature Survey
* Bibliographic Databases.
* Critical and Creative Reading
 | **Chapter 2**(Dipankar et al 2019)(Bairagi, 2019) |
| 4 | **Research Design*** Epidemiological Studies
* Basic Studies
* Descriptive & Analytical Studies
* Approaches of Research Design
 | **Chapter 6**(Surbhi Jain 2019)**Chapter 3**(Bairagi, 2019) |
| 5 | **Research Methods*** Samples and Population
* Probability and Nonprobability Sampling
* Methods of sampling
* Managing and Keeping Biological Samples
 | **Chapter 6 and 7**(Surbhi Jain 2019)**Chapter 3**(Bairagi, 2019) |
| 6 | **Ethics in Research*** Research Ethics
* Plagiarism and its Consequences
* Types of Research Misconduct
* Importance of Ethics in Scientific Research
 | **Chapter 5**(Dipankar et al 2019)**Chapter 10**(Surbhi Jain 2019) |
| 7 | **Technical Writing-I*** Writing of Synopsis
* Research Thesis writing
* Writing of Manuscript and Research Report
 | **Chapter 2**(Kian Mau Goh, 2023)**Chapter 6**(Dipankar et al 2019) |
| 8 | **Technical Writing-II**Research proposal / project write up for competitive research grants and evaluation | **Chapter 6**(Dipankar et al 2019)**Chapter 6** (Bairagi, 2019) |
| **9** | **Mid Term Exam** |  |
| 10 | **Contributions, Arguments, and Dealing****with Criticisms*** Research Contributions
* Dealing with Criticisms from Reviewers
* Revising Peer-reviewed Papers
 | **Chapter 7**(Dipankar et al 2019) |
| 11 | **Lessons Learned from Nature’s Reports** * Good Lab Culture
* Mentors and Collaborators
* Stress and Mental Health
 | **Chapter 7**(Kian Mau Goh, 2023) |
| 12 | **Bibliometrics and Research Quality*** Impact Factors: Definition and Usage
* Quality of Research Outcome
 | **Chapter 10** (Dipankar et al 2019) |
| 13 | **Improving Presentation Skills*** Effective Presentation
* Students will present two latest research articles on cutting-edge technologies in bi-weekly Seminars/Journal club
 | **Chapter 6**(Kian Mau Goh, 2023)**Chapter 9**(Dipankar et al 2019) |
| 14 | **Intellectual Property Rights*** Significance of Intellectual Property Rights
* Importance of IPR in Global Economy
* Role of Intellectual Property in Technology Transfer
* The Philosophy of Intellectual Property Rights
 | **Chapter 8**(Bairagi, 2019) |
| 15 | **Research Management, Planning and Collaboration*** Effort Management in Research
* Research Collaboration
 | **Chapter 8**(Dipankar et al 2019) |
| 16 | **Patent Writing and Publishing*** Conducting patent searches using databases
* Analyzing existing patents and identifying patentable inventions
* Understanding the legal framework for patents
* National vs. international patent applications
 | **Chapter 4 & 6**(Dipankar et al 2019) |
| 17 | * Different software’s used in research data analysis
* Recent advances in research methods
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| **18** | **Final Term Exam** |  |