# Course Specifications

## General Information

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| **Course name** | Magnetic Resonance Imaging Techniques |
| **Course number** | AMSR4298 |
| **Faculty** | |
| **Department** | |
| **Course type** | Major Needs |
| **Course level** | 4 |
| **Credit hours (theoretical)** | 2 |
| **Credit hours (practical)** | 0 |
| **Course Prerequisites** | |

## Course Objectives

1 - To provide hands-on experience in acquiring and processing MRI data using different imaging protocols.

2 - To introduce students to the fundamental principles of magnetic resonance imaging (MRI) and its applications.

3 - To understand the clinical applications of MRI and its role in medical diagnostics.

4 - To explore advanced MRI techniques, including functional MRI (fMRI) and diffusion MRI.

5 - To develop practical skills in acquiring, analyzing, and interpreting magnetic resonance data.

## Intended Learning Outcomes

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| **Knowledge and Understanding** | * Explain different MRI imaging protocols and their respective applications<br>* Discuss the factors influencing image quality in MRI. |
| **Intellectual Skills** | * Critically evaluate and select appropriate imaging protocols for specific clinical or research scenarios.<br>* Analyze and interpret MRI images to identify anatomical structures and pathological conditions. |
| **Professional Skills** | * Apply standard safety protocols and guidelines in MRI practice.<br>* Collaborate with interdisciplinary teams in the planning and execution of MRI studies. |
| **General Skill** | * Utilize appropriate software tools for image processing and analysis in MRI.<br>* Acquire and handle MRI data using proper protocols and techniques. |

## Course Contents

1 - Pulse sequence design and selection.
2 - Tissue weighting and parameter selection.
3 - Artifacts and their mitigation.
4 - Image reconstruction techniques.
5 - Image enhancement and filtering.
6 - Spine MR imaging.
7 - Brain MR imaging.
8 - Musculoskeletal MR imaging
9 - Abdominal MR imaging.
10 - Pelvis MR imaging.
11 - Cardiovascular MR imaging.
12 - Neck and Chest MR imaging
13 - Angiographic imaging.
14 - Oncological MR imaging.

## Teaching and Learning Methods

1 - Lectures: In-depth presentations by the instructor on advanced medical imaging principles and applications.
2 - Case Studies: Analysis and interpretation of advanced medical images in clinical scenarios.
3 - Group Discussions: Interactive discussions on research papers and emerging trends in advanced medical imaging.
4 - Independent Study: Assigned readings and research to deepen understanding of advanced medical imaging.

## Teaching and Learning Methods for the Disabled Students

1 - Providing accessible course materials in alternative formats (e.g., electronic).
2 - Ensuring physical accessibility to classrooms and practical sessions.
3 - Offering assistive technologies or tools for students with disabilities.

## Students Assessment

| Assessment Method | TIME | MARKS |
|---|---|---|
| First Quiz and Assignment | Week 3 | 10 |
| Second Quiz and Assignment | Week 6 | 10 |
| Midterm Exam | Week 8 | 30 |
| Third Quiz and Assignment | Week 10 | 10 |
| Final Exam | Week 15 | 40 |

## Books and References

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| Essential books | Dale, B. M., Brown, M. A., & Semelka, R. C. (2015). MRI: Basic principles and applications. John Wiley & Sons.<br>Westbrook, C., & Talbot, J. (2018). MRI in practice. John Wiley & Sons.<br>Saba, L. (2015). Magnetic resonance imaging handbook. CRC Press. |
| Recommended books | Yamada, K. (2021). Advances in diffusion-weighted imaging, an issue of magnetic resonance imaging clinics of North America. Elsevier Health Sciences. |
| Other References (Periodical, web sites, .... etc.) | Rich, W. Z., & Grey, M. (2023). LANGE review: MRI clinical concepts and imaging applications manual with registry review. McGraw Hill Professional. |