**Planning and Quality Assurance Affairs**

Form (A)

# Course Specifications

## General Information

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|---|---|
| **Course name** | Advanced Techniques in Medical Imaging |
| **Course number** | AMSR4299 |
| **Faculty** | |
| **Department** | |
| **Course type** | Major Needs |
| **Course level** | 4 |
| **Credit hours (theoretical)** | 2 |
| **Credit hours (practical)** | 0 |
| **Course Prerequisites** | |

## Course Objectives

1 - To provide a comprehensive understanding of advanced imaging modalities used in medical diagnostics and research.

2 - To develop skills in image interpretation, analysis, and diagnosis using advanced medical imaging modalities.

3 - To familiarize students with emerging trends and advancements in medical imaging technology.

4 - To promote critical thinking and research methodology in the interpretation and application of advanced medical imaging.

5 - To explore the clinical applications and limitations of advanced medical imaging techniques.

## Intended Learning Outcomes

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|---|---|
| **Knowledge and Understanding** | * Discuss the relevance and appropriateness of different imaging techniques in specific clinical scenarios. |
| | * Understand the role of advanced imaging in the diagnosis, staging, and follow-up of various medical conditions. |
| **Intellectual Skills** | * Analyze and interpret complex medical imaging studies accurately. |
| | * Evaluate the quality and validity of advanced imaging examinations. |
| **Professional Skills** | * Demonstrate proficiency in performing advanced imaging procedures using appropriate equipment and techniques. |
| | * Communicate effectively with patients, healthcare professionals, and colleagues in a multidisciplinary setting. |
| **General Skill** | * Stay updated with the latest research and advancements in the field of medical imaging. |
| | * Adapt to technological advancements and changes in the medical imaging landscape. |

## Course Contents

1. - Overview of advanced medical imaging modalities and their applications.
2. - Comparison of different imaging modalities for specific applications
3. - Quantitative analysis techniques in medical imaging
4. - Image segmentation, registration, and fusion methods
5. - Image-guided interventions and surgical planning
6. - Advanced CT imaging techniques
7. - Dual-energy CT and spectral imaging.
8. - Advanced techniques and sequences in MRI.
9. - Functional MRI (fMRI) for studying brain function.
10. - Diffusion-weighted imaging (DWI) and diffusion tensor imaging (DTI).
11. - Clinical applications of PET imaging in oncology, cardiology, and neurology.
12. - Clinical applications of SPECT imaging in cardiology, neurology, and nuclear medicine.
13. - Emerging Trends in Advanced Medical Imaging:
14. - Hybrid imaging techniques (PET-CT, SPECT-CT, PET-MRI).
15. - Molecular imaging and targeted imaging agents.
16. - Artificial intelligence and machine learning in advanced medical 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 | Grant, L. A., & Griffin, N. (2018). Grainger & Allisons diagnostic radiology essentials E-book. Elsevier Health Sciences. |
| | Sacerdoti, F. M., Giordano, A., & Cavaliere, C. (2016). Advanced imaging techniques in clinical pathology. Humana Press. |
| | Sandhu, M. S., Garg, A., & Gupta, A. K. (2019). Comprehensive textbook of diagnostic radiology: Three volume set. Jaypee Brothers Medical Publishers. |
| | Subasi, A. (2022). Applications of artificial intelligence in medical imaging. Elsevier. |
| Recommended books | Li, Q., & Nishikawa, R. M. (2015). Computer-aided detection and diagnosis in medical imaging. Taylor & Francis. |
| | Khandelwal, N., Gupta, A. K., & Garg, A. (2018). Diagnostic radiology: Neuroradiology including head and neck imaging. Jaypee Brothers Medical Publishers. |