Advanced Biomedical Imaging with NMR Techniques

Duration: 5 Days

Language: en

Course Code: IND5 - 141

Objective

Upon completion of this course, participants will be able to:

- Understand the fundamental principles of NMR spectroscopy.
- Gain hands-on experience in operating NMR equipment.
- Learn to analyse and interpret NMR data accurately.
- Explore various applications of NMR in biomedical research and diagnostics.
- Develop strategies for integrating NMR techniques into their research or clinical practice.

Audience

This course is intended for

- Biomedical researchers
- Medical professionals
- Laboratory technicians
- Graduate students in the life sciences

- Pharmaceutical industry professionals

Training Methodology

The course employs a blend of instructional methods, including:

- Interactive lectures
- Hands-on laboratory sessions
- Group discussions and case studies
- Expert-led Q&A sessions
- Comprehensive course materials and resources

Summary

This comprehensive course provides an in-depth understanding and hands-on experience with Nuclear Magnetic Resonance (NMR) techniques, focusing on their application in biomedical imaging and research. Participants will gain theoretical knowledge and practical skills necessary to utilise NMR spectroscopy in their professional work, enhancing their ability to conduct cutting-edge biomedical research and diagnostics.

Course Content & Outline

Section 1: Introduction to NMR Spectroscopy

- Overview of NMR principles
  - Basic concepts: spin, magnetic fields, and resonance
  - NMR instrumentation and components
  - Safety protocols and best practices
- Theoretical foundations
  - Quantum mechanics of NMR
  - Relaxation processes: T1 and T2 relaxation times
  - Chemical shifts and coupling constants

Section 2: NMR Signal Acquisition and Processing

- Practical session on NMR spectrometer setup
  - Sample preparation and handling
  - Calibration and tuning of NMR instruments
- Data acquisition techniques
  - Pulse sequences and their applications
  - Spectral acquisition parameters

- Signal processing and spectral analysis
    - Fourier transformation
    - Phase correction, baseline correction, and peak picking

Section 3: Applications of NMR in Biomedical Research

- Metabolomics and metabolic profiling
    - NMR in studying metabolic pathways
    - Identifying biomarkers for diseases
- Protein and nucleic acid structure determination
    - High-resolution NMR techniques for macromolecules
    - Analysing protein-ligand interactions
- Imaging and diagnostics
    - Magnetic Resonance Imaging (MRI) principles
    - Functional MRI and its biomedical applications

Section 4: Advanced Techniques and Emerging Trends

- Multi-dimensional NMR spectroscopy
    - 2D, 3D, and 4D NMR experiments
    - NOESY, COSY, HSQC, and TOCSY techniques
- Solid-state NMR and its applications
    - Principles and methods
    - Case studies in biomedical research
- Hyperpolarisation techniques
    - Enhancing sensitivity in NMR
    - Recent advancements and future directions

Section 5: Hands-on Sessions and Case Studies

- Practical lab sessions
    - Sample preparation for various NMR experiments
    - Conducting and troubleshooting NMR experiments
    - Data acquisition and analysis
- Case studies and group discussions
    - Real-world applications of NMR in biomedical research
    - Collaborative projects and problem-solving sessions
    - Q&A session with experts

Certificate Description

Upon successful completion of this training course, delegates will be awarded a Holistique Training Certificate of Completion. For those who attend and complete the online training course, a Holistique Training e-Certificate will be provided.

Holistique Training Certificates are accredited by the British Assessment Council (BAC) and The CPD Certification Service (CPD), and are certified under ISO 9001, ISO 21001, and ISO 29993 standards.

CPD credits for this course are granted by our Certificates and will be reflected on the Holistique Training Certificate of Completion. In accordance with the standards of The CPD Certification Service, one CPD credit is awarded per hour of course attendance. A maximum of 50 CPD credits can be claimed for any single course we currently offer.

Categories

Health, Safety & Environment HSE, Healthcare & Pharmaceutical, Technology

Tags

Biomedical Imaging , NMR Spectroscopy