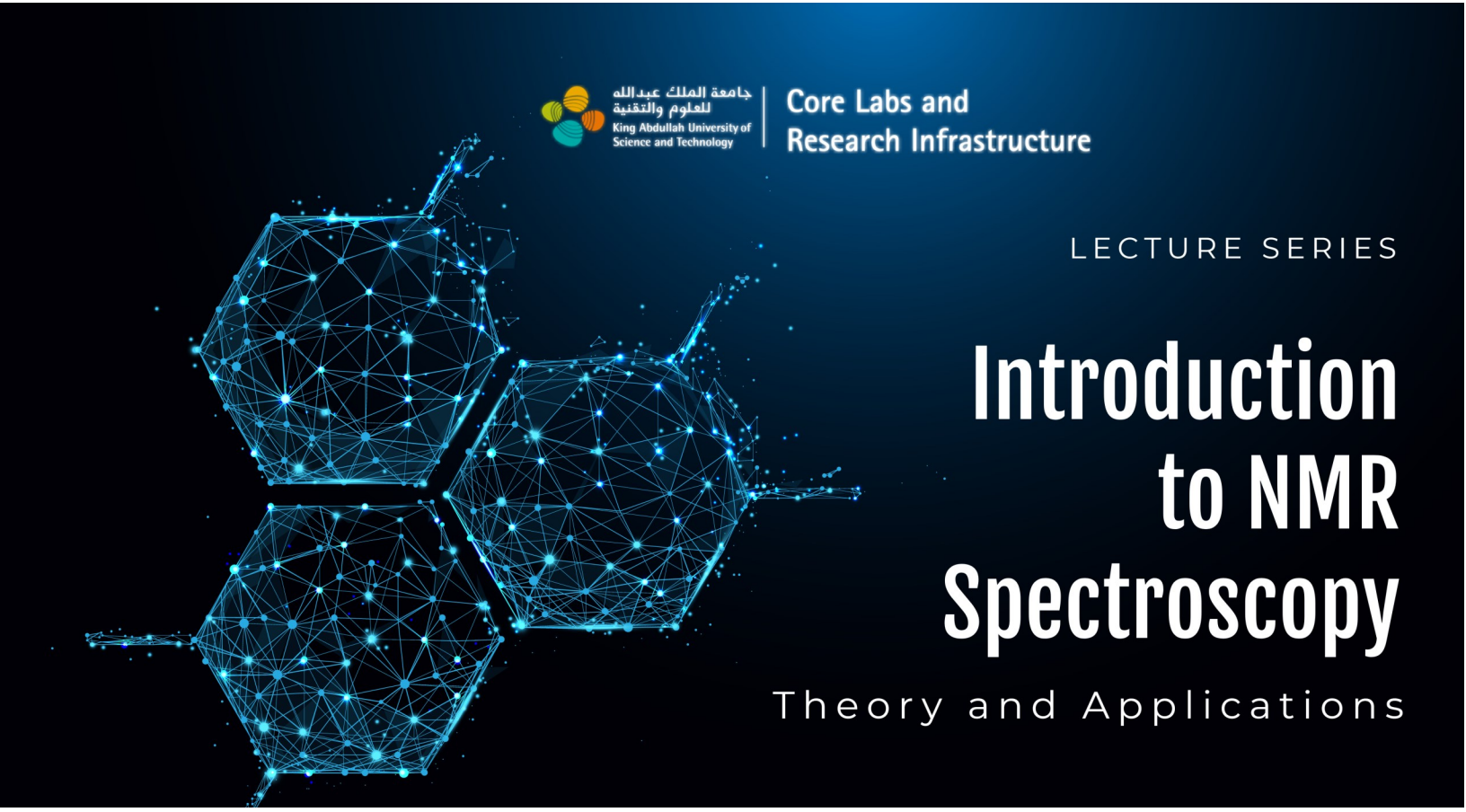


KAUST Imaging and Characterization Core Lab (IAC) presents:

Introduction to NMR Spectroscopy lecture series

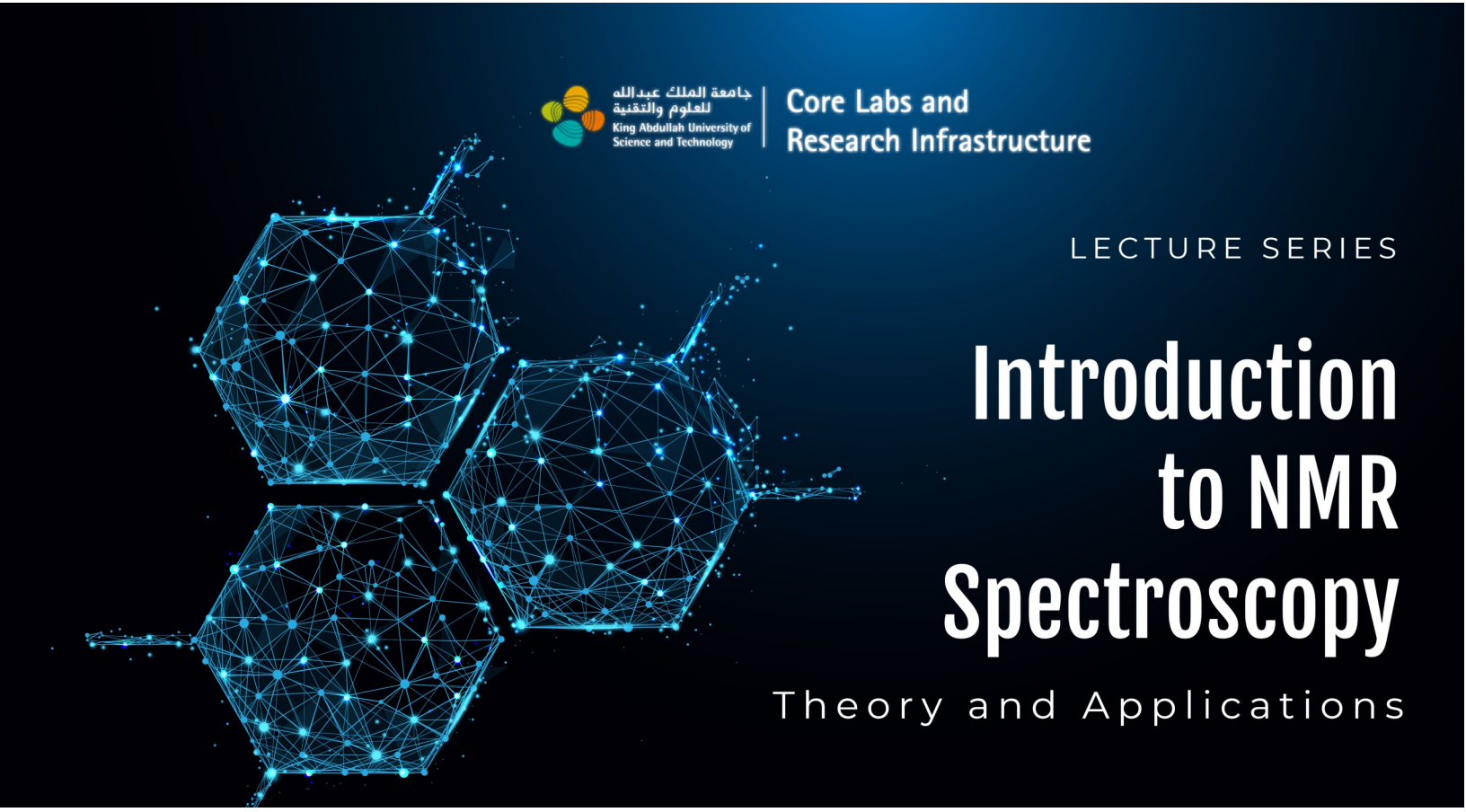
Theory and Applications

NMR: A useful tool

NMR spectroscopy is a versatile analytical tool used extensively in chemistry for molecular identification and quantification and to study physical properties in a wide range of applications in biology and medicine. Samples in different states—such as in solid, liquid and gas states and *in situ* (e.g., functional tissue)—can be studied using a number of different NMR experiments. By utilizing NMR, researchers investigate molecules at the atomic level.

Because of its many attributes, NMR spectroscopy is commonly used for the structural elucidation of different types of samples, including solid state samples in the catalysis, membrane and polymers fields; in the pharmaceutical industry; in tissue samples, including human, animal, plant and marine organism tissues; and in liquid samples, such as bio-fluids, solvents and petroleum samples.

NMR is also a novel tool employed in investigating molecular dynamics, through which researchers can determine and study in real time molecular confirmations and the changes associated with chemical reactions. These studies provide useful information on how molecules move, flex, react and bond with other molecules over several time scales. Both kinetic and thermodynamic parameters can be calculated from NMR spectra.



COURSE OUTLINE

How the NMR spectrometer work – From Spins to Pulses

Day 1 Sunday, February 21
3:00 – 5:00 p.m.

The Important NMR Parameters for Structure Determination: Chemical shift; spin-spin coupling and Data processing

Day 2 Monday, February 22
3:00 – 5:00 p.m.

The Physics Behind NMR Spectroscopy: Vector model; relaxation; spin echo

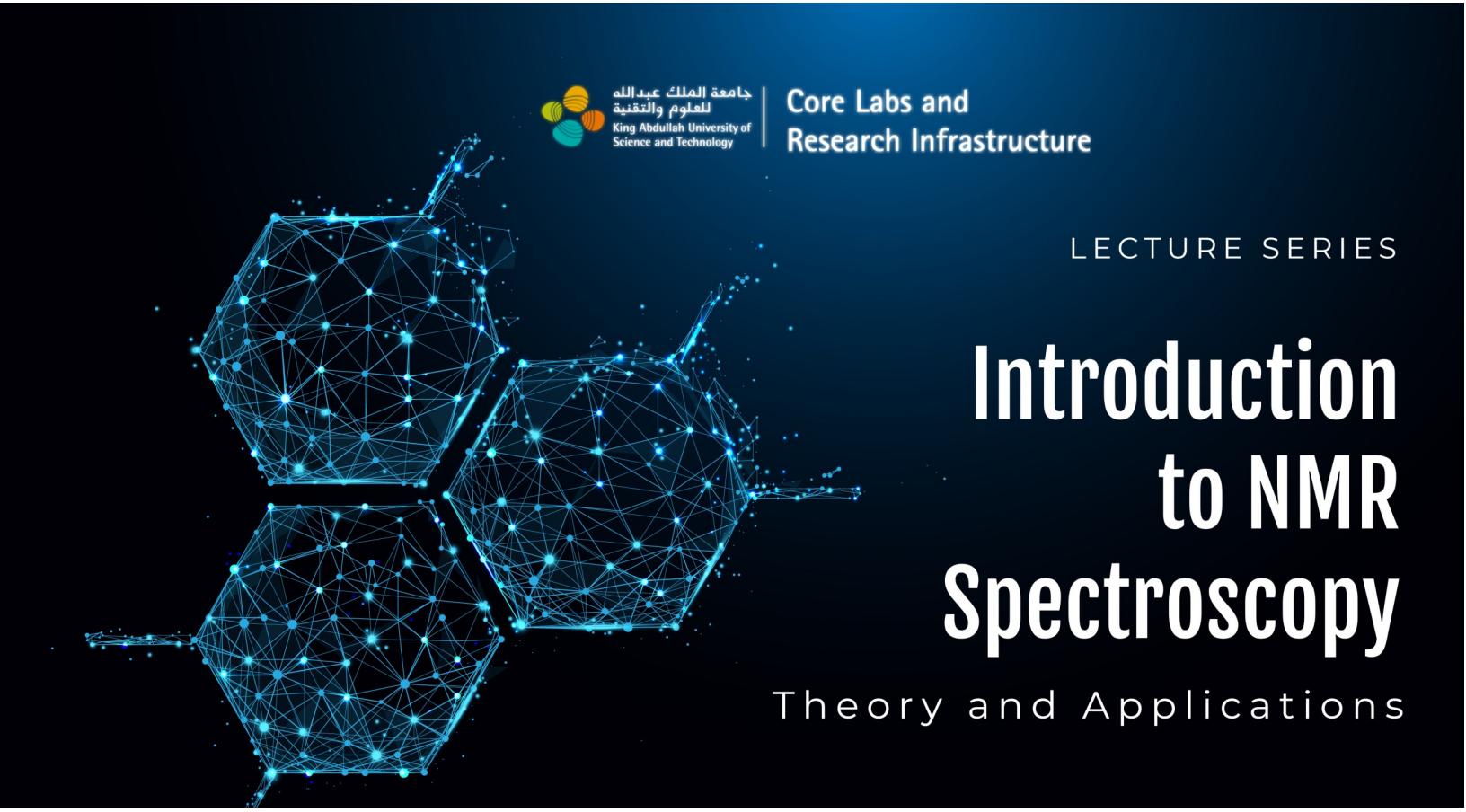
Day 3 Tuesday, February 23
3:00 – 5:00 p.m.

Two-Dimensional NMR spectroscopy for Structure Determination: COSY, TOCSY, HSQC, HMBC

Day 4 Wednesday, February 24
3:00 – 5:00 p.m.

Advanced Topic in Magnetic Resonance spectroscopy: How to Measure Inter-Atomic Distances using NMR Spectroscopy (NOESY and ROESY)

Day 5 Thursday, February 25
3:00 – 5:00 p.m.



All lectures to be presented by Dr. Abdul-Hamid Emwas, KAUST Imaging and Characterization Core Lab (IAC) staff scientist in NMR.

The KAUST NMR Lab is equipped with 14 magnetic resonance instruments, including ultra-high field NMR spectrometers and electron paramagnetic resonance (EPR) spectrometers. For a full and detailed list of equipment, please click here.

IAC lecture course topics have been selected mostly from the first few chapters (chapters 2 – 5 and chapter 8) of the textbook "Understanding NMR Spectroscopy," written by Dr. James Keeler from the University of Cambridge. A link to each of the chapters is available on Keeler's website here.

Please **register for the course** online using the link here. You will receive a confirmation email after registration.

For any questions, please contact nmr.staff@kaust.edu.sa.