

Invited scholar

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Exploring Raman Spectroscopy and AFM Microscopy: A Comprehensive Lecture Series

I am pleased to inform you that I will be delivering a series of lectures on spectroscopy, with a particular focus on Raman spectroscopy and AFM microscopy. These lectures will cover the fundamental principles, practical applications, and recent advancements in both fields.

Week 1: Introduction to Raman Spectroscopy

Day 1:

Introduction to Spectroscopy and Raman Scattering

Overview of various spectroscopic techniques.

Fundamentals of light-matter interaction.

Principles of Raman scattering and its historical background.

Day 2:

Theory of Raman Spectroscopy

Vibrational modes of molecules and selection rules.

Differences between Raman and Infrared spectroscopy.

Day 3:

Instrumentation in Raman Spectroscopy

Laser sources and detectors.

Spectrometers used in Raman.

Sample preparation techniques and challenges.

Day 4:

Applications of Raman Spectroscopy

Raman spectroscopy in material science.

Raman mapping and imaging techniques.

Case studies and recent advancements.

Week 2: Introduction to AFM Microscopy

Day 1:

Fundamentals of Atomic Force Microscopy (AFM)

Principles of atomic force and tip-sample interactions.

Modes of AFM operation (contact, tapping, and non-contact modes).

Day 2:

AFM Instrumentation and Techniques

AFM system components and setup.

Scanning techniques and image acquisition.

Calibration, resolution, and tip wear.

Day 3:

Advanced AFM Techniques and Applications

Force spectroscopy, nanomechanical properties, and AFM lithography.
Applications in material science, and nanotechnology.

Day 4:

Case Studies and Future Directions

Case studies of AFM applications in research.

Future trends in AFM technology.

Challenges and emerging techniques in nanoscale imaging.

- **Lab Sessions or Demos are included, some practical demos or case studies related to Raman and AFM at the end of each week.**
- **A written exam is expected at the end of the lectures.**