

## SCME 264 Nanomaterials and Applications

First Semester Academic Year 2022  
Faculty of Science, Mahidol University

<b>Student Groups</b>	<b>Materials Science and Nano Engineering</b>	
<b>Class Schedule</b>	<i>Thursday at 13:00-16:00 Room: SC1-156</i>	
<b>Instructor (lecture)</b>	<i>Assoc. Prof. Dr. Rakchart Traiphol</i>	<a href="mailto:rakchart.tra@mahidol.ac.th"><i>(rakchart.tra@mahidol.ac.th)</i></a>
	<i>Assoc. Prof. Dr. Nisanart Traiphol</i>	<i>(Nisanart.t@Chula.ac.th)</i>

### Course Description

Methods for producing nanostructures, nanostructured materials and nanoscale devices, using deposition, growth and self-assembling processes; using real-world examples to demonstrate how the unique properties of these materials can be tailored for a wide range of applications from novel building materials and medical prosthetics to the next generation of electronic devices

### Grading Policy

Student evaluation is in accordance with the rules and regulations of the Faculty of Science, Mahidol University. Letter grades of A, B+, B, C+, C, D+, D, and F will be given according to the student's score.

Lecture (100%):

Attendance/Participation	10%
Assignments	20%
Midterm Exam	35%
Final Exam	35%

### Textbooks

#### Recommended

1. Vollath, D., Nanomaterials; An Introduction to Synthesis, Properties and Applications. Weinheim: Wiley-VCH Verlag GmbH & Co, 2008.
2. Fahlman, B.D., Materials Chemistry: Springer, 2011.

### Course Timetable for Lecture

<b>Date</b>	<b>Topics</b>	<b>Instructor</b>
Aug 11, 2022	<b>What is Materials Chemistry?:</b> Historical perspectives, Consideration in the design of new materials, Design of new materials through critical thinking	Rakchart
Aug 18, 2022	<b>Introduction to Nanomaterials:</b> Top-down process, Bottom up process, Development of solar cell technologies, Development of display technologies, Quantum dots	Rakchart
Aug 25, 2022	<b>Introduction to Nanocomposites:</b> Nanocomposite of metal oxide, Nanocomposite fiber, Coated nanocomposite, Examples of PDA/ZnO and coated magnetic nanoparticle	Rakchart
Sept 1, 2022	<b>Semiconductors:</b> Properties and types of semiconductors, Si-based applications, Si wafer production, Integrated circuits, Patterning via photolithography	Rakchart
Sept 8, 2022	<b>Semiconductors:</b> Thin film deposition technologies, Physical vapor deposition, Chemical vapor deposition, Light emitting diode, Organic light emitting diode	Rakchart
Sept 15, 2022	<b>Synthesis of Nanoparticles:</b> Inert gas condensation process, Physical and chemical vapor synthesis process, Laser Ablation Process, Flame Aerosol Process, Synthesis of Coated Particles	Rakchart
Sept 22, 2022	<b>Synthesis of Nanoparticles:</b> Flame Aerosol Process, Synthesis of conjugated polymer nanoparticles	Rakchart
Sept 29, 2022	<b>Revision class</b>	Rakchart
Oct 3-7, 2022	<i>--- Midterm Exam ---</i>	
Oct 20, 2022	<b>Nanorods, and Nanoplates:</b> Introduction, Conditions for the formation of rods and plates, Layered structures, One-dimensional crystals	Nisanart
Oct 27, 2022	<b>Nanotubes:</b> Carbon nanotubes: Introduction, Structure, Properties, Applications	Nisanart
Nov 3, 2022	<b>Optical Properties of Nanoparticles:</b> Optical properties related to quantum confinement, Quantum dots and other lumophores, Electroluminescence	Nisanart
Nov 10, 2022	<b>Optical Properties of Nanoparticles:</b> Photochromic and Electrochromic Materials, Magneto-optic applications	Nisanart
Nov 17, 2022	<b>Electrical Properties of Nanoparticles:</b> Fundamentals of electrical conductivity in nanotubes and nanorods, Electrical conductivity of nanocomposites	Nisanart
Nov 24, 2022	<b>Magnetic Properties of Nanoparticles:</b> Magnetic Materials, Superparamagnetic Materials, Applications of superparamagnetic materials	Nisanart
Dec 1, 2022	<b>Mechanical Properties of Nanoparticles:</b> Bulk materials, influence of porosity and grain size, Composites and nanocomposites	Nisanart
Dec 6-16, 2022	<i>--- Final Exam ---</i>	

