SCME 264 Nanomaterials and Applications
First Semester Academic Year 2023
Faculty of Science, Mahidol University

Student Groups	**Materials Science and Nano Engineering**
Class Schedule	*Thursday at 13:00-16:00 Room: SC1-153*
Instructor (lecture)	*Assoc. Prof. Dr. Rakchart Traiphol (rakchart.tra@mahidol.ac.th)*
	Prof. Dr. Nisanart Traiphol (Nisanart.t@Chula.ac.th)

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 prothestics 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

Date	Topics	Instructor
Aug 10, 2023	**What is Materials Chemistry?**: Historical perspectives, Consideration in the design of new materials, Design of new materials through critical thinking	Rakchart
Aug 17, 2023	**Introduction to Nanomaterials:** Top-down process, Bottom up process, Development of solar cell technologies, Development of display technologies, Quantum dots	Rakchart
Aug 24, 2023	**Introduction to Nanocomposites:** Nanocomposite of metal oxide, Nanocomposite fiber, Coated nanocomposite, Examples of PDA/ZnO and coated magnetic nanoparticle	Rakchart
Aug 31, 2023	**Semiconductors:** Properties and types of semiconductors, Si-based applications, Si wafer production, Integrated circuits, Patterning via photolithography	Rakchart
Sept 7, 2023	**Semiconductors:** Thin film deposition technologies, Physical vapor deposition, Chemical vapor deposition, Light emitting diode, Organic light emitting diode	Rakchart
Sept 14, 2023	**Synthesis of Nanoparticles**: Inert gas condensation process, Physical and chemical vapor synthesis process, Laser Ablation Process, Flame Aerosol Process, Synthesis of Coated Particles	Rakchart
Sept 21, 2023	**Synthesis of Nanoparticles**: Flame Aerosol Process, Synthesis of conjugated polymer nanoparticles	Rakchart
Sept 28, 2023	**Revision class**	Rakchart
Oct 2-6, 2023	**--- *Midterm Exam* ---**	
Oct 12, 2023	**Nanorods, and Nanoplates:** Introduction, Conditions for the formation of rods and plates, Layered structures, One-dimensional crystals	Nisanart
Oct 19, 2023	**Nanotubes:** Carbon nanotubes: Introduction, Structure, Properties, Applications	Nisanart
Oct 26, 2023	**Optical Properties of Nanoparticles:** Optical properties related to quantum confinement, Quantum dots and other lumophores, Electroluminescence	Nisanart
Nov 2, 2023	**Optical Properties of Nanoparticles:** Photochromic and Electrochromic Materials, Magneto-optic applications	Nisanart
Nov 9, 2023	**Electrical Properties of Nanoparticles:** Fundamentals of electrical conductivity in nanotubes and nanorods, Electrical conductivity of nanocomposites	Nisanart
Nov 16, 2023	**Magnetic Properties of Nanoparticles**: Magnetic Materials, Superparamagnetic Materials, Applications of superparamagnetic materials	Nisanart
Dec 23, 2023	**Mechanical Properties of Nanoparticles**: Bulk materials, influence of porosity and grain size, Composites and nanocomposites	Nisanart
Dec 4-15, 2023	**--- *Final Exam* ---**	