**SCME 264 Nanomaterials and Applications**

First Semester Academic Year 2021-2022

Faculty of Science, Mahidol University

**Student Groups Materials Science and Nano Engineering**

**Class Schedule** *Tuesday at 14:00-17:00 (lecture) Room: SC1-155 and online*

**Instructor (lecture)** *Assoc. Prof. Dr. Rakchart Traiphol (*[*rakchart.tra@mahidol.ac.th*](mailto: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**

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| **Date** | **Topics** | **Instructor** |
| Aug 10, 2021 | **What is Materials Chemistry?**: Historical perspectives, Consideration in the design of new materials, Design of new materials through critical thinking | Rakchart |
| Aug 17, 2021 | **Introduction to Nanomaterials:** Top-down process, Bottom up process, Development of solar cell technologies, Development of display technologies, Quantum dots | Rakchart |
| Aug 24, 2021 | **Introduction to Nanocomposites:** Nanocomposite of metal oxide, Nanocomposite fiber, Coated nanocomposite, Examples of PDA/ZnO and coated magnetic nanoparticle | Rakchart |
| Aug 31, 2021 | **Semiconductors:** Properties and types of semiconductors, Si-based applications, Si wafer production, Integrated circuits, Patterning via photolithography | Rakchart |
| Sept 7, 2021 | **Semiconductors:** Thin film deposition technologies, Physical vapor deposition, Chemical vapor deposition, Light emitting diode, Organic light emitting diode | Rakchart |
| Sept 14, 2021 | **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, 2021 | **Synthesis of Nanoparticles**: Flame Aerosol Process, Synthesis of conjugated polymer nanoparticles | Rakchart |
| Sept 28, 2021 | **Revision class** | Rakchart |
| Oct 4-8, 2021 | ***--- Midterm Exam ---*** |  |
| Oct 12, 2021 | **Nanotubes, Nanorods, and Nanoplates:** Introduction, Conditions for the formation of rods and plates, Layered structures, One-dimensional crystals | Nisanart |
| Oct 19, 2021 | **Optical Properties of Nanoparticles:** Optical properties related to quantum confinement, Quantum dots and other lumophores, Electroluminescence | Nisanart |
| Oct 26, 2021 | **Optical Properties of Nanoparticles:** Photochromic and Electrochromic Materials, Magneto-optic applications | Nisanart |
| Nov 2, 2021 | **Electrical Properties of Nanoparticles:** Fundamentals of electrical conductivity in nanotubes and nanorods, Electrical conductivity of nanocomposites | Nisanart |
| Nov 9, 2021 | **Magnetic Properties of Nanoparticles**: Magnetic Materials, Superparamagnetic Materials,Applications of superparamagnetic materials | Nisanart |
| Nov16, 2021 | **Mechanical Properties of Nanoparticles**: Bulk materials, influence of porosity and grain size, Composites and nanocomposites | Nisanart |
| Nov 23, 2021 | **Revision class** | Nisanart |
| Nov 29-Dec 10, 2021 | ***--- Final Exam ---*** |  |