Materials Science and Nano Engineering in Industrial process SCME 373(3 credit)

Academic Year 2023 Term 2

Class Schedule: Mon (13:30-16:30 pm)

Room: SC1-154

Coordinator: Dr. Kittitat Subannajui (email: kittitat.sub@mahidol.ac.th)

Office SC1-201, Salaya Phone: 0890888204

Instructors:

Dr Kittitat Subannajui (email: kittitat.sub@mahidol.ac.th)

Office: B400, Phayathai campus (by appointment), Phone: 0890888204

Course Description: Fundamental knowledge of material science and nano engineering in industrial processing, materials for machine and industries, mold and industrial part design, industrial machine components and assembly, visiting related industries.

Grading Policy: Course assessment will be based on the following:

Attendance and class concentration: 10%

Students must attend all classes for full marks, and 80% of classes overall to pass. Late (> 10 min) will be recorded as absence.

Examination 90%

The final grade given will be based on letter scale (A, B^+, B, C^+, C, D^+, D, F).

Reference Material

Textbooks

- Materials Science and Engineering: An Introduction, 9th Edition, William D. Callister, David G. Rethwisch, Wiley; 9 edition (November 20, 2013)
- Physical Metallurgy, 3rd Edition, Peter Haasen, Cambridge University Press; 3 edition (April 26, 1996)
- Materials processing : a unified approach to processing of metals, ceramics and polymers / Lorraine F. Francis (University of Minnesota) Francis, Lorraine with contributions from Bethanie J.H. Stadler (University of Minnesota, Christine C. Roberts (Sandia National Labs).

Class Schedule

Week	Topic/Description	No. of Hrs.	Teaching Activity	Instructor
15 Jan	Introduction to Material processing • Mortor • Gear and inverter • Hydraulic • Heating system • Cooling system	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
22 Jan	Metallurgical processing • Basic smelting and purification • Casting Injection molding	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
29 Jan	Metallurgical processing • Hot/Cold rolling • Forging • Deep drawing	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
5 Feb	Metallurgical processing • Bending/Cutting Extrusion • Heat treatment • Sintering/ Selective sintering	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
12 Feb	Metallurgical processing • Welding • Electrochemical process/Zinc or chrome coating	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui

Week	Topic/Description	No. of Hrs.	Teaching Activity	Instructor
19 Feb	Polymer processing • (Basic polymer synthesis • Casting • Rotation molding Extrusion • Injection molding • Blow molding)	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
26 Feb	Polymer processing • Thermoforming and compression forming • Foaming • Fiber blowing/spinning	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
	Midterm Exam Week			

Week	Topic/Description	No. of Hrs.	Teaching Activity	Instructor
11 Mar	Polymer processing • Rubber processing • Rapid prototyping	3	Lecture with PowerPoint/Quiz	Kittitat Subannajui
18 Mar	Ceramics Processing • Powder processing (raw materials) • Forming (Compression/Extrusion/injection molding/slip casting/ so on) • Sintering • Finishing	3	Lecture with PowerPoint/Quiz	Tanakorn Osotchan

25 Mar	Ceramics Processing • Glass processing: Float glass production, Tempered glass, Laminated glass, Ion implanted glass • Jewelry processes • Cement	3	Lecture with PowerPoint/Quiz	Tanakorn Osotchan
1 Apr	Semiconductor Processing • Silicon wafer production/semiconductor wafer P. • Clean room dressing • Wet chemical cleaning steps • Wafer dryer • Photoresist and spin coating • Mask aligner	3	Lecture with PowerPoint/Quiz	Tanakorn Osotchan
8 Apr	Semiconductor Processing • Developer • RIE, ICP etcher • Sputtering and thin film process • CVD process • ALD process • Photoresist removing process • SOI wafer (silicon on insulator))	3	Lecture with PowerPoint/Quiz	Tanakorn Osotchan
15 Apr	Nanotechnology	3	Lecture with	Tanakorn Osotchan

	• Chemical synthesis • CVD ALD • Pyrolysis • Milling • Microsystem technics		PowerPoint/Quiz	
22 Apr	Industrial atmosphere, mindset, ethic, safty and environment.	3	Lecture with PowerPoint/Quiz	Tanakorn Osotchan
29 Apr	Conclusion on the Materials Processing and the Discussion on the future of material processing	3	Lecture with PowerPoint/Quiz	Tanakorn Osotchan
	Final Exam week			