**SCME 222 Physical Chemistry and Thermodynamics**

Second Semester Academic Year 2020-2021

Faculty of Science, Mahidol University

**Student Group Materials Science and Nano Engineering**

**Class Schedule** *Monday at 9:30-12:20 (lecture)*

*On-line (Microsoft Teams and Google Meet, Line group) and On-site (if possible)*

**Instructors**  *Dr. Sirirat Kumarn (sirirat.kum@mahidol.ac.th)*

*Assoc. Prof. Dr. Rakchart Traiphol (rakchart.tra@mahidol.ac.th)*

**Course Description**

Thermodynamics and kinetics with applications to gases, solutions, phase equilibria and electrolytes, theories and reaction mechanisms used for explaining rates of reaction in chemical and biological systems, macromolecules, and aggregates

**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.

Score consists of

Attendance/Participation 10%

Assignments 20%

Midterm Exam 35%

Final Exam 35%

**Textbooks**

 **Recommended**

1. Atkins, P.; de Paula, J., *Physical Chemistry*. 8th Edition. Oxford University Press: New York, 2006. Or any later editions.
2. Keeler, ; Wothers, , *Chemical Structure and Reactivity: An Integrated Approach*. 2nd Edition, Oxford University Press: Oxford, 2014.
3. Chang, R.; Goldsby, K. A., *Chemistry*. 12th Edition. McGraw-Hill: New York, 2016.

**Course Timetable for Lecture**

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| **Date**  | **Topics**  | **Instructor** |
| Jan 18, 2021 | **Introduction to thermodynamics**: natural processes, the Second Law, definitions, the First Law | Sirirat |
| Jan 25, 2021 | **Gas expansion**: work, heat, reversible and irreversible processes, the Second Law, entropy | Sirirat |
| Feb 1, 2021 | **First Law of thermodynamics**: internal energy, enthalpy, heat capacity, measuring entropy, Gibbs energy | Sirirat |
| Feb 8, 2021 | **Chemical changes**: standard states, enthalpies of formation, entropy and Gibbs energy changes, the Master Equations | Sirirat |
| Feb 15, 2021 | **Chemical potential**: mixing of ideal gases, reacting mixtures, chemical potentials, equilibrium constants | Sirirat |
| Feb 22, 2021 | **Chemical equilibrium**: chemical equilibria, conditions, applications | Sirirat |
| Mar 1, 2021 | **Microscopic basis of entropy and phase equilibria**: distributions, phase equilibria, phase diagrams, phase boundaries | Sirirat |
| Mar 8, 2021 | **Revision** | Sirirat |
| Mar 15-19, 2021 | ***--- Midterm Exam ---*** |  |
| Mar 22, 2021 | **Macromolecules and aggregates:** determination of size and shape, structure, and dynamics, and self-assembly | Rakchart |
| Mar 29, 2021 | **Macromolecules and aggregates:** determination of size and shape, structure, and dynamics, and self-assembly | Rakchart  |
| Apr 5, 2021 | **Molecules in motions**: molecular motion in gases, molecular motion in liquid, diffusion.  | Rakchart  |
| Apr 12, 2021 | **Molecules in motions**: molecular motion in gases, molecular motion in liquid, diffusion. | Rakchart |
| Apr 19, 2021 | **The rate of chemical reaction:** The rate of reaction, integrated rate laws, temperature dependent of reaction rate, elementary reaction, unimolecular reaction. | Rakchart  |
| Apr 26, 2021 | **The kinetics of complex reaction**: chain reactions, polymerization kinetics, photochemistry | Rakchart  |
| May 3, 2021 | **Student Presentation and Revision class** | Rakchart |
| May 10-21, 2021 | ***--- Final Exam ---***  |  |