# Subject Description Form

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| **Subject Code** | ABCT2712 |
| **Subject Title** | Physical Chemistry I |
| **Credit Value** | 3 |
| **Level** | 2 |
| **Pre-requisite** | General Chemistry II |
| **Objectives** | This module aims to familiarize students with fundamental concepts of thermodynamics and kinetics. |
| **Intended Learning Outcomes** | Upon completion of the subject, students will be able to:<br>a. discriminate different Thermodynamics functions and calculate their values in simple processes<br>b. use the Thermodynamics principles and functions to analysis simple chemical systems and determine the effect of external conditions on their equilibrium positions.<br>c. demonstrate a better understanding on the fundamental principles of reaction rate theories as well as their contemporary applications<br>d. identify and solve problems on learned topics in related areas of chemistry and other fields as well as real-life cases |
| **Subject Synopsis/ Indicative Syllabus** | <u>Chemical Thermodynamics</u><br>Fundamental concepts of thermodynamics: systems, states, state variables, state/path function, intensive/extensive properties. First law of thermodynamics: heat and work, internal energy, enthalpy. Second and third laws of thermodynamics: entropy, free energies, adiabatic, isothermal, isobaric and reversible processes. Effect of change in state variables on some state/path functions.<br>Application of chemical thermodynamics : spontaneity of reaction, Joule-Thomson effect, Carnot cycle and heat engine, Nernst equation, Gibbs energy function and equilibrium constants, phase rule, Clausius-Clapeyron equation.<br><br><u>Chemical Kinetics</u><br>Rate equations and rate constants, reaction mechanism and elementary reactions. Common reaction types: opposing reactions, consecutive reactions, parallel reactions, chain reactions.<br>Reaction rate theories: Collision and absolute rate theories, activation energy, temperature dependence of rate constants, steady-state approximation, transition state theory. |

<table>
<tr><td>Teaching/Learning Methodology</td><td>Lectures will provide students with basic outlines of key concepts and guidance on further reading. Examples in Physical Chemistry itself as well as other chemistry subjects and real-life examples are utilized to illustrate the principles taught. Students are encouraged to present their answers to questions posed in lectures and problem sets in tutorial sessions.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td><td></td><td></td></tr>
<tr><td>1. Quizzes</td><td>40 %</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>2. Examination</td><td>60 %</td><td>√</td><td>√</td><td>√</td><td>√</td><td></td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="6"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:
The course aims at provide basic training in chemical thermodynamics and chemical kinetics so that students are able to understand the basic functions and theories as well as to apply them to solve problems. Thus, written quizzes and examination are suitable for assessing their progress.
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<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>26 Hrs.</td></tr>
<tr><td>▪ Tutorial</td><td>13 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self Study</td><td>52 Hrs.</td></tr>
<tr><td>▪ Preparation of Tutorials</td><td>26 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>117 Hrs.</td></tr>
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<tr><td>Reading List and References</td><td>Textbook:<br>Peter W. Atkins and J. de Paula, Physical Chemistry (9th Ed.), Oxford University Press, 2010</td></tr>
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