Course Documentation
School of Biosciences

Program: Chemical Engineering Technologist

Academic Year: 2011-12   Fall [ ]   Winter [x]   Spring [ ]

Program Year: 3   **Program Semester:**   6

Course Name: Physical Chemistry

Course Code: CHEM 3004   **Course Hours:**   42   **Credit Value:**   3

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Class	Lab	Field	Other	Total
3				3

Prerequisites/Corequisites/Equivalent Courses

PR/CO/EQ	Course Code	Course Name	Conditions
PR	CHEM 2003 CHEM 2005	Chemical Engineering Analytical Chemistry 2	
CO	N/A		
EQ	N/A		

This Course is A Prerequisite For:

Course Code	Course Name
N/A	

1. Calendar Description

This is an introduction to Chemical Kinetics (first, second and third order reactions), to Phase Diagrams (Raoult's Law, azeotropes and eutectics, two and three component systems), Electrochemistry (ion migration and conductance), and to the First and Second Laws of Thermodynamics (enthalpy and entropy) as well as related thermochemistry and predicting reaction spontaneity (Gibbs' Free Energy).
Prerequisite: CHEM 2005

2. Course Learning Outcomes: Upon successful completion of the course, the student will be

Dean/Chair Approval: Date: 2/9/2012

Understand and do calculations (where applicable) for the following cases:

1. specific heats, universal gas law and graphing review
2. first, second and third order rate equations and graphing of
3. relate gas and liquid mixtures - ideal and non ideal mixture phase diagrams and azeotropes
4. relate solid and liquid mixtures - phase diagrams and eutectics
5. relate chemical and electrical equivalences - Faraday's Laws
6. relate molecular (compound) and ionic conductances
7. relate parameters which make up energy of systems
8. relate first law & second law of thermodynamics to chemical reactions and spontaniety

3. Essential Employability Skills Outcomes: This course will contribute to the achievement of the following essential employability skills

[x]   1. communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.

[x]   2. respond to written, spoken, or visual messages in a manner that ensures effective communication.

[x]   3. execute mathematical operations accurately.

[x]   4. apply a systematic approach to solve problems.

[x]   5. use a variety of thinking skills to anticipate and solve problems.

[x]   6. locate, select, organize, and document information using appropriate technology and information systems.

[x]   7. analyze, evaluate, and apply relevant information from a variety of sources.

[x]   8. show respect for the diverse opinions, values, belief systems, and contribution of others.

[x]   9. interact with others in groups or team in ways that contribute to effective working relationships and the achievement of goals.

[x]   10. manage the use of time and other resources to complete projects.

[x]   11. take responsibility for one's own actions, decisions, and consequences.

4. General Education:

Indicate if this course is identified as a General Education course in the program of study.

[ ] Yes   [x] No

If yes, indicate which General Education theme this course addresses.

[ ]   1. Arts in Society

[ ]   2. Civic Life

[ ]   3. Social and Cultural Understanding

[ ]   4. Personal Understanding

[ ]   5. Science and Technology

5. Prior Learning Assessment and Recognition:

Students may apply to receive credit by demonstrating achievement of the course learning outcomes through previous life and work experiences.
This course is eligible for challenge through the following method(s) indicated

Challenge Exam	Portfolio	Interview	Dual Credit	Other	Not Eligible
[x]	[ ]	[ ]	[ ]	[ ]	[ ]

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6. Required Texts, Materials, Resources or Technical Materials Required

A formal textbook and/or a set of course notes (produced by the instructor to be purchased), will probably be used to facilitate the learning of the concepts. In addition, some results of the lab experiments will be used as examples in the presentation of the practical and theoretical concepts for this course. Some texts on physical chemistry are available in the Resource centre and from the instructor.

7. Evaluation: Students will demonstrate learning in the following ways

Assessment Description	Course Learning Outcome(s)	Assignment Weighting
Assignments	Out come No. & How	35% of total course mark
Specific Heat + graph, Review R & Molar Volume,	1. Two Hand-in Assign	
First Order rate Equations, Second & Third Order rate Equations Activation Energy - if time	2. Three hand-in Assign	
Phase Diagrams - Azeotropes & Calculations		
Eutectic Phase Diagrams - Calculations		
Faraday's Laws	3. Two hand-in Assign	
Ion Migration		
Enthalpy, Entropy & Gibb's F.E.	4. One hand-in Assign	
	5. One hand-in Assign	
	6. In class Assign	

	7. & 8. Hand-in Assigns	
Quizzes and Tests First, Second & Third Order Rate equations concepts & calculations, heat calculations, molecularity, predicting rates. azeotrope and eutectic phase diagrams and related mathematical equations, determining compositions, phases, ratios	Outcomes & How 1. & 2. Test #1 3 & 4. Test #2	30% of total course mark
Final Exam (3 hours) Review of all topics, main emphasis is on those topics not tested on.	Outcomes & How 1,2,3 & 4 and 5, 6, 7, & 8. Final Exam	35% of total course mark

8. Other:
Loyalist College has a Violence Prevention policy:

All College members have a responsibility to foster a climate of respect and safety, free from violent behavior and harassment.
- Violence (e.g. physical violence, threatening actions or harassment) is not, in any way, acceptable behavior.
- Weapons or replicas of weapons are not permitted on Loyalist College property.
- Unacceptable behavior will result in disciplinary action or appropriate sanctions.
- More information can be found in the "Student Manual"   .

Passing grade is 60%

9. Curriculum, Delivery, Learning Plan and Learning Outcomes:

Course Components/Course Learning Outcomes	Related Elements of Performance	Learning Activities/Assessment/Resources
1. Introduction Review properties of gases, liquids and solids at the molecular and macroscopic level	relates to the following topics	identify molecular and macroscopic properties
2. Chemical Kinetics parameters, reaction orders (1st, 2nd and 3rd) - concns, times, half lives), activation energies	rate effects, designations and reaction rates	determine the rate and order of a reaction and concentrations of reactants
3. Phase diagrams Raoul's law (Liquid-gas ideal cases), deviations from ideal cases (azeotropes), two solid-liquid phases (single and multiple type eutectics), three component systems	relate gas and liquid mixtures relate solid and liquid mixture concentrations	draw appropriate phase diagrams to determine concentrations
4. Electrochemistry electrolysis systems, electrical and chemical equivalences (molarities) via	relates chemical and electrical equivalences relates molecular (compound) and ionic	determine conductances for different solutions, e.g titrations, Ka, Kb and Ksp info

faraday's laws migration of ions, transport numbers (Moving Boundary and Hittort methods), conductance (ionic, specific and equivalent), Kohlrausch equation	conductances	
5. First law of Thermodynamics Heat, work, energy of a system, reversible systems, maximum work, properties intensive and extensive), enthalpy, qp and qv	relate parameters which make up energy of systems	understand the properties of the fist law
6. Thermochemistry Heat of reaction, enthalpy changes, Hess's and Kirchoff's laws, applications	relate frist law to chemical reactions	determine energies involved
7. Second law of thermodynamics entropy changes for ideal cases	relate first law and chemical reactions	calculate entropy changes of a system
8. predicting spontaneous reactions enthalpy, entropy and gibbs' free energy	relate spontaniety to chemical reactions	detremine values of enthalpy, entropy and free energy of chemical systems