

TEMPLATE FOR COURSE SPECIFICATION(physical chemistry)

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course is to study chemical kinetics , electrochemistry ,electrochemical cells , catalysis and chemical thermodynamics with applications to gases ,solution ,to provide a firm foundation for understanding the physical principles that govern chemical systems.

1. Teaching Institution	University of Technology
2. University Department/Centre	Chemical Engineering Department
3. Course title/code	Physical chemistry/CE.231
4. Programme(s) to which it contributes	CE.231
5. Modes of Attendance offered	Fall
6. Semester/Year	2 semester/year
7. Number of hours tuition (total)	3
8. Date of production/revision of this Specification	2015
9. Aims of the Course	To understand the chemical kinetics catalysis ,electrochemical cells ,the first law of thermodynamics and equilibrium.

10• Learning Outcomes, Teaching ,Learning and Assessment Method	
A- Knowledge and Understanding	
A1.understand and use basic physical chemistry language.	
A2.identify and discuss factors influencing molecular properties.	
A3.apply physical chemistry principles and laws.	
A4.problems of chemical nature.	
A5.critically interpret and reason physical chemistry data.	
B. Subject-specific skills	
B1. Apply physical chemistry principle and laws.	
B2.problems of chemical nature.	
B3. Understand and use basic physical laws and calculate the order of reaction.	
Teaching and Learning Methods	
Lectures, Tutorials , Example Classes , Weekly homework problems	
Assessment methods	
Midterm exams , Final exam , Quizzes, Weekly homework.	
C. Thinking Skills	
Nothing	
Teaching and Learning Methods	
Lectures, Tutorials , Example Classes , , Weekly homework problems .	
Assessment methods	
Midterm exams , Final exam , Quizzes, Weekly homework.	

D. General and Transferable Skills (other skills relevant to employability and personal development).

11. Course Structure

Week	Hours	Unit/Module or Topic Title	ILOs	Teaching Method	Assessment method
1st semester					
1	3	Introduction of chemical kinetics and study the rate of chemical reaction of 1 st and 2 nd order	Calculate the order of reaction of 1 st and 2 nd order reaction and find the value of rate constant and half life .	Lectures, Tutorials , Example Classes ,	Quiz and homework
2	3	Derive the rate constant at zero and 3 rd order reactions	Calculate the rate constant of zero and 3 rd order reaction and find the value of rate constant and half-life of the chemical reaction.	Lectures, Tutorials , Example Classes	Quiz and homework
3	3	The effect of temperature on the reaction rate constant .	Calculate the Activation energy.	Lectures, Tutorials , Example Classes	Quiz and homework
4	3	Activation energy	To know if the chemical reaction is endothermic or exothermic.	Lectures, Tutorials , Example Classes	Quiz and homework
5	3	Complex reactions	Calculate the rate constant of reversible ,side and consecutive reactions.	Lectures, Tutorials , Example Classes	Quiz and homework
6	3	electrochemistry	Electrolysis ,first and second law of faraday.	Lectures, Tutorials , Example Classes	Quiz and homework

7	3	Electrolytic conductance	Calculation of equivalent conductance and molecular conductance of solutions.	Lectures, Tutorials, Example Classes	Quiz and homework
8	3	Transference numbers	Methods for the determination of transport numbers.	Lectures, Tutorials, Example Classes	Quiz and homework
9	3	Conductance of sparingly soluble salt	Determination of the solubility of sparingly soluble salt.	Lectures, Tutorials, Example Classes	Quiz and homework
10	3	The relation between concentration and equivalent conductance	Calculation of equivalent conductance of infinite dilution.	Lectures, Tutorials, Example Classes	Quiz and homework
11	3	Electrochemical cells	E.M.F and electrode potential, types of electrochemical cells.	Lectures, Tutorials, Example Classes	Quiz and homework
12	3	Nernst equation, standard electrode potential	The determination of standard electrode potential	Lectures, Tutorials, Example Classes	Quiz and homework
13	3	Thermodynamic data from cell e.m.f.s	Measurement of ΔG° , ΔG the temperature dependence of the e.m.f.	Lectures, Tutorials, Example Classes	Quiz and homework
14	3	Catalysis types of Catalysis and factors influencing catalysis.	Study homogeneous, heterogeneous, auto catalysis, promoters and catalytic poisoning.	Lectures, Tutorials, Example Classes	Quiz and homework
15	3	Enzyme catalysis, the mechanization of enzyme reactions.	Calculation of dissociation constant of enzyme – substrate complex.	Lectures, Tutorials, Example Classes	Quiz and homework
2nd semester					
1	3	Introduction to chemical engineering thermodynamic	Define work heat, temperature, pressure and volume.	Lectures, Tutorials, Example Classes	Quiz and homework
2	3	First law of thermodynamic and other basic concepts	Joule's experiments, internal energy, kinetic energy, potential energy, formulation of the first law of thermodynamics.	Lectures, Tutorials, Example Classes	Quiz and homework
3	3	State functions	State functions that depend on path and state functions which do not depend on path.	Lectures, Tutorials, Example Classes	Quiz and homework

4	3	Enthalpy and steady state inflow process.	The enthalpy of chemical and physical change How much heat must be removed during steady state inflow process	Lectures, Tutorials , Example Classes	Quiz and homework
5	3	Equilibrium and phase rule	-Define phase component and degree of freedom -how to interpret (liquid – vapour)composition diagram (liquid- liquid) (liquid – solid)	Lectures, Tutorials , Example Classes	Quiz and homework
6	3	Reversible processes	-The relation between calorimetric measurements of $\Delta H, \Delta u$ -how the internal energy varies with temperature -how the enthalpy varies with temperature	Lectures, Tutorials , Example Classes	Quiz and homework
7	3	Heat capacities	The relation between C_p and C_u .	Lectures, Tutorials , Example Classes	Quiz and homework
8	3	Application of the equation of the ideal gases	The PVT behavior of pure substance.	Lectures, Tutorials , Example Classes	Quiz and homework
9	3	The virial equation .	It suggests the representation of PV along an isotherm by a power series expansion in pressure	Lectures, Tutorials , Example Classes	Quiz and homework
10	3	The constant-volume process The constant-pressure process	Calculate change in enthalpy, change in internal energy, the relation between C_p and C_v	Lectures, Tutorials , Example Classes	Quiz and homework
11	3	The constant temperature process.	Calculate the relation between volume and pressure with work and constant temperature.	Lectures, Tutorials , Example Classes	Quiz and homework
12	3	The adiabatic process.	-The relation between temperature and volume for reversible adiabatic process. - the relation between temperature and pressure for reversible adiabatic process.	Lectures, Tutorials , Example Classes	Quiz and homework
13	3	The polytropic process.	The general equation applying to : 1- an ideal gas 2- in nonflow process	Lectures, Tutorials , Example Classes	Quiz and homework
14	3	Heat effect.	Heat capacities of gases, liquids and solids as a function of temperature	Lectures, Tutorials , Example	Quiz and homework

				Classes	
15	3	Heat change accompanying phase change	Heat of industrial reactions	Lectures, Tutorials , Example Classes	Quiz and homework

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	1-p.w atkins and j.de paula/ physical chemistry 8 th ed.(2006) 2-introduction to chemical engineering thermodynamics 4 th ed. j.m.smith, h.c.van ness.
Special requirements (include for example workshops, periodicals, IT software, websites)	–
Community-based facilities (include for example, guest Lectures , internship , field	–

13. Admissions	
Pre-requisites	Before undertaking this module the student should have undertaken the following: Basic Principles of chemical engineering chemistry, mathematics 1.
Minimum number of students	Central Admission
Maximum number of students	Central Admission