

Academic Course Description

BHARATH UNIVERSITY

Faculty of SCIENCE AND HUMANITIES

Department of Civil Engineering

BCH201 - ENGINEERING CHEMISTRY II

FIRST Semester, 2015-16 (ODD Semester)

Course (catalog) description

The purpose of this course is to develop a strong foundation in the principles and methods to understand the properties in of the surface phenomenon, phase rule and alloys, advanced Engineering materials, fuels and analytical techniques.

Compulsory/Elective course: Elective course : Compulsory for All first year students

Credit & Contact hours : 3 credits & 45 hour

Course Coordinator : Dr.A. Manikandan, Associate Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@bharathuniv.ac.in)	Consultation
Dr. A. Manikandan	First Year B.Tech, Students	First year Block		Chemistryhod2017@gmail.com	9.00 - 9.50 AM
Faculties of chemistry Department	First Year B.Tech, Students	First year Block		Chemistryhod2017@gmail.com	9.00 - 9.50 AM

Relationship to other courses:

Pre –requisites : +2 level chemistry

Assumed knowledge : The students will have a chemistry, physics and mathematics background obtained at a higher secondary (or equivalent) level.

Following courses : BCH101, BCH102 and Practical I

Syllabus Contents

UNIT I - SURFACE CHEMISTRY 9

INTRODUCTION : Adsorption , absorption , desorption , adsorbent , adsorbate and sorption – (definition only) - Differences between adsorption and absorption - Adsorption of gases on solids – factors affecting adsorption of gases on solids – Adsorption isotherms – Freundlich adsorption isotherm and Langmuir adsorption isotherm - Role of adsorbents in catalysis (in heterogeneous catalysis, Ion-exchange adsorption and pollution abatement.

UNIT II - PHASE RULE AND ALLOYS 9

INTRODUCTION : Statement of Phase Rule and explanation of terms involved – one component system – water system – Construction of phase diagram by thermal analysis - Condensed phase rule [Definition only] Two Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic composition – Pattinsons Process of desilverisation of Lead - Alloys : Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing –hardening – tempering - normalizing – carburizing - nitriding - Non- ferrous alloys: Brass and Bronze

UNIT III - ANALYTICAL TECHNIQUES 9

INTRODUCTION: Types of spectroscopy - Atomic spectroscopy – molecular spectroscopy – Explanation – differences between Atomic spectra – molecular spectra, Absorption spectrum and Emission spectrum, Photo physical laws - Lambert's law - Beer-Lambert's law –applications (determination of unknown concentration) - IR spectroscopy: Principle – instrumentation (block diagram only) – working - finger print region: UV-visible spectroscopy - Principle – instrumentation (block diagram only) – working – estimation of iron by colorimetry Beer-Lambert's law - Flame photometry– principles – instrumentation (block diagram only) – working - estimation of sodium ion by Flame photometry

UNIT IV - FUELS 9

INTRODUCTION : Calorific value – types of Calorific value - gross calorific value – net calorific value; Analysis of Coal – Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto-Hoffmann method - Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number (definition only) - Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG (definition and composition only) - Flue gas analysis – importance - Orsat apparatus

INTRODUCTION : Refractories ; Definition - characteristics - classification – acidic, basic and neutral Refractories – properties - refractoriness- measurement of refractoriness (Segar Cone Test) ,refractoriness under load measurement of refractoriness under load , dimensional stability- reversible and irreversible dimension stability - porosity, thermal spalling – definition – reason for spalling – points to decrease the spalling) - Manufacture of Refractories : alumina bricks and Magnesite bricks, Lubricants: haracteristics - Classification - Liquid lubricants - Properties – viscosity index (definition , determination), flash and fire points, cloud and pour points, oilyness) - Solid lubricants – graphite and molybdenum sulphide

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “Engineering Chemistry” Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara “A text book of Engineering Chemistry” S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, “Engineering Chemistry, Volume 1”, Crystal Publications, Chennai, (2007).

Computer usage: Yes

Professional component

General	-	0%
Basic Sciences	-	100%
Engineering sciences & Technical arts	-	0%
Professional subject	-	0%

Broad area: Surface Chemistry, Phase Rule And Alloys, Analytical Techniques, Fuels, Engineering Materials

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2 nd week	Session 1 to 14	2 Periods

2	Cycle Test-2	March 2 nd week	Session 15 to 28	2 Periods
3	Model Test	April 2 nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To enhance the fundamental knowledge in Chemistry and its applications relevant to various streams of Engineering and Technology. This course emphasizes:	Correlates to program outcome		
	H	M	L
Understand about the gaseous properties in solid of the surface phenomenon.	a,e	g,i	k
Understand the principle and properties of the phase rule and alloys.	c	e,j	b,h
Acquire Knowledge on instruments involved in the analytical techniques	d	b	i
Acquire Knowledge on fuels	a	c,m	d,f
To Understand the impact of Advanced Engineering materials in technical uses		g	b,c

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT -I : SURFACE CHEMISTRY			
1.	Adsorption- Types of adsorption	No	
2.	Adsorption of gases on solids	No	
3.	Adsorption isotherms	YES	

4.	Freundlich and Langmuir Isotherms	Yes	[T1, R2]
5.	Adsorption of solute from solution	Yes	
6.	Applications of Adsorptions	No	
7.	Role of adsorbents in catalysis	Yes	
8.	Ion exchange adsorption	Yes	
9.	Pollution abatement	Yes	
UNIT II: PHASE RULE AND ALLOYS - 9 HRS			
10.	Statement and explanation of terms involved in one component system	No	[T2, R2]
11.	Water system, condensed phase rule	Yes	
12.	Construction of phase diagram by thermal analysis	Yes	
13.	Simple eutectic system – Pb – Ag System	No	
14.	Alloys- importance of alloys	Yes	
15.	Ferrous alloys, Nichrome and Stainless steel	YES	
16.	Heat treatment of steel	YES	
17.	Non- ferrous alloys	No	
18.	Brass and Bronze	No	
UNIT III: ANALYTICAL TECHNIQUES - 9 HRS			
19.	Analytical techniques , introduction and Beer- Lambert's law	No	
20.	UV- Visible Spectroscopy - Principles , Instrumentation and Applications	No	
21.	IR Spectroscopy - Principles ,	No	

	instrumentation and Applications		[T3, R32]
22.	Explanation of Finger – Print Region	No	
23.	Estimation of Iron by Colorimetry (Block diagram only)	No	
24.	Flame Photometry- Principle, Instrumentation (Block diagram only)	Yes	
25.	Estimation of Sodium by Flame Photometry	No	
26.	Atomic Absorption Spectroscopy- Principle, instrumentation (Block diagram only)	No	
27.	Estimation of Nickel by Atomic Absorption Spectroscopy	No	
UNIT IV: FUELS - 9 HRS			
28.	FUELS - CLASSIFICATION	No	[T2, R3]
29.	ANALYSIS OF COAL - PROXIMATE	YES	
30.	ULTIMATE ANALYSIS OF COAL	YES	
31.	MANUFACTURE OF COKE	No	
32.	LIQUID FUELS	Yes	
33.	CATALYTIC CRACKING AND METHODS	Yes	
34.	SYNTHETIC PETROL	No	
35.	GASEOUS FUELS	No	
UNIT V: ENGINEERING MATERIALS - 9 HRS			

36.	Refractories- Classification – Properties	No	[T1, T2, R3]
37.	Manufacture of Refractories - Alumina and Magnesite	No	
38.	Abrasives- Natural and - Quartz , Garnet , Diamond, Emery , Corundum	No	
39.	Synthetic Abrasives - Silicon Carbide and Boron Carbide	No	
40.	Lubricants- Mechanism of Lubrication, Liquid Lubricants	No	
41.	Properties- Viscosity index, Flash and Fire points , Cloud and Pour points, Oiliness,	No	
42.	Solid Lubricants - Graphite and Molybdenum Sulphide	No	
43.	Nanomaterials- Introduction to nanochemistry	No	
45.	Carbon nanotubes and their applications	No	

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.

- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and brainstorming skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	5%
Cycle Test – II	5%
Model Test	5%
Assignment	5%
Attendance	10%
Final exam	70%

Prepared by: Dr. A. Manikandan, Associate Professor , Department of Chemistry

Dated : 10.5.2016

Addendum

ABET Outcomes expected of graduates of B.Tech., Civil/ program by the time that they graduate:

- a. An ability to apply knowledge of Mathematics, science, and engineering
- b. An ability to design and conduct experiments, as well as to analyze and interpret data
- c. An ability to design a hardware and software system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d. An ability to function on multidisciplinary teams
- e. An ability to identify, formulate, and solve engineering problems
- f. An understanding of professional and ethical responsibility
- g. An ability to communicate effectively
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. A recognition of the need for, and an ability to engage in life-long learning
- j. A knowledge of contemporary issues
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Educational Objectives

PEO1: PREPARATION

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

PEO2: CORE COMPETENCE

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

PEO3: PROFESSIONALISM

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

PEO4: SKILL

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

BCH201 - ENGINEERING CHEMISTRY II

Course Teacher	Signature
Dr. A. Manikandan	

Course Coordinator

HOD/CIVIL