Academic Course Description

BHARATH UNIVERSITY

Faculty of SCIENCE AND HUMANITIES

Department of Electronics and Communication Engineering

BCH201 - ENGINEERING CHEMISTRY II

Second Semester, 2016-17 (Even 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 & 45

Course Coordinator : Dr. Krishnaswamy

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Dr. Krishnaswamy	First Year B.Tech, Students	First year Block	-		1.00pm - 1.30 pm

Relationship to other courses:

Pre –requisites : BCH101 - Engineering Chemistry I

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

Following courses : BPC 2L1 Physics And Chemistry Laboratory

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 – Frendlich 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

UNIT V - ENGINEERING MATERIALS 9

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).

REFERENCES:

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

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 2nd week	Session 1 to 14	2 Periods

2	Cycle Test-2	March 2nd week	Session 15 to 28	2 Periods
3	Model Test	April last 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

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

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
	UNIT -I : SURFACE CHEMISTRY		
1.	Adsorption- Types of adsorption	No	[T1, R2]
2.	Adsorption of gases on solids	No	
3.	Adsorption isotherms	YES	
4.	Frendlich and Langmuir Isotherms	Yes	
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	[T3, R32]
20.	UV- Visible Spectroscopy - Principles , Instrumentation and Applications	No	
21.	IR Spectroscopy - Principles , instrumentation and Applications	No	
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	
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	[T1, T2, R3]
40.	Lubricants- Mechanism of Lubrication, Liquid Lubricants	No	
41.	Properties- Viscosity index, Flash and Fire points , Cloud and Pour points, Oilyness,	No	
42.	Solid Lubricants - Graphite and Molybdenum Sulphide	No	
43.	Nanomaterials- Introduction to nanochemistry	No	
45.	Carbon nanotubes and their applications	No	

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	-	10%
Assignments/Seminar/online test/quiz	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Dr.Rajenderan , Associate Professor , Department of Chemistry Dated :

Addendum

ABET Outcomes expected of graduates of B.Tech / ECE / 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

Electronics Engineering graduates are provided with a strong foundation to passionately apply the fundamental principles of mathematics, science, and engineering knowledge to solve technical problems and also to combine fundamental knowledge of engineering principles with modern techniques to solve realistic, unstructured problems that arise in the field of Engineering and non-engineering efficiently and cost effectively.

PEO2: CORE COMPETENCE

Electronics engineering graduates have proficiency to enhance the skills and experience to apply their engineering knowledge, critical thinking and problem solving abilities in professional engineering

practice for a wide variety of technical applications, including the design and usage of modern tools for improvement in the field of Electronics and Communication Engineering.

PEO3: PROFESSIONALISM

Electronics Engineering Graduates will be expected to pursue life-long learning by successfully participating in post graduate or any other professional program for continuous improvement which is a requisite for a successful engineer to become a leader in the work force or educational sector.

PEO4: SKILL

Electronics Engineering Graduates will become skilled in soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, interpersonal relationship, group discussion and leadership ability to become a better professional.

PEO5: ETHICS

Electronics Engineering Graduates are morally boosted to make decisions that are ethical, safe and environmentally-responsible and also to innovate continuously for societal improvement.

Course Teacher	Signature
Dr. Krishnaswamy	

Course Coordinator **HOD/ECE**