Academic Course Description

BHARATH UNIVERSITY

Faculty of SCIENCE AND HUMANITIES

Department of Electrical and Electronics Engineering

BCH101 - ENGINEERING CHEMISTRY I

FIRST Semester(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 : Compulsory for All first year students

Credit & Contact hours : 3 and 45 hours

Course Coordinator : Dr.Rajenderan

Instructors : Dr.Rajenderan

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Dr.Rajenderan	First Year B.Tech, Students	First year Block	**04422290125**	rajendran1317@gmail.com	9.00 - 9.50 AM
Faculties of chemistry Department	First Year B.Tech, Students	First year Block	**04422290125**	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.

Syllabus Contents

UNIT I WATER TECHNOLOGY 9

Introduction-Characteristics : Hardness of water – types - temporary and permanent hardness - estimation by EDTA method Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination –Domestic water treatment – disinfection methods (Chlorination, Ozonation , UV treatment) Boiler feed water – requirements – disadvantages of using hard water in boilers Internal conditioning (Calgon Conditioning method) – External conditioning – Demineralization process – Desalination and Reverse osmosis.

UNIT II POLYMERS 9

Introduction-Polymers- definition – polymerization – degree of polymerization - types of polymerization– Addition polymerization and Condensation polymerization – Mechanism of Polymerization - free radical polymerization mechanism only, Plastics: Classification – thermoplastics and thermosetting plastics – difference between thermoplastics and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET, Rubber :Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber Synthetic rubbers – butyl rubber and SBR

UNIT III ELECTRO CHEMISTRY 9

Introduction CELLS: types of Electrochemical cells , Electrolytic cells – Reversible and irreversible cells EMF – measurement of EMF– Single electrode potential – Nernst equation Reference electrodes : Standard Hydrogen electrode -Calomel electrode Ion selective electrode :Glass electrode and measurement of pH using Glass electrode Electrochemical series – significance Titrations :Potentiometer titrations (redox - Fe^{2+}vs dichromate titrations) Conduct metric titrations (acid-base – HCI vs, NaOH titrations)

UNIT IV CORROSION AND CORROSION CONTROL 9

Introduction: Chemical corrosion Definition - Chemical Corrosion - Electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – mechanism of Chemical and Electrochemical corrosion factors influencing corrosion control – sacrificial anode and impressed cathodic current methods – Protective coatings :Paints– constituents of the paint and their functions Metallic coatings – electroplating of Gold and electro less plating of Nickel.

UNIT V NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9 Introduction : Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain Reactions – nuclear energy critical mass - super critical mass - sub - critical mass - Light water nuclear reactor for power generation (block diagram only) – breeder reactor Solar energy conversion – solar cells – wind energy Fuel cells – hydrogen – oxygen fuel cell Batteries :Primary and secondary Batteries – differences between Primary and secondary Batteries Secondary batteries :Lead–acid storage battery –working –uses Nickel–cadmium battery - working –uses Solid – state battery : Lithium battery

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: Water Technology, Polymer, Electrochemistry, Corrosion and Corrosion control, Non-Conventional Energy Sources and Storage Devices

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 18	2 Periods
2	Cycle Test-2	September 2nd week	Session 19 to 35	2 Periods
3	Model Test	October4th 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 : WATER TECHNOLOGY			
1.	INTRODUCTION TO WATER TECHNOLOGY	No	[T1, R2]
2.	HARDNESS - TYPES , EXPRESSION UNITS	No	
3.	ESTIMATION OF HARDNESS	YES	
4.	ESTIMATION OF ALKALINITY	Yes	
5.	DOMESTIC WATER TREATMENT	Yes	
6.	BOILER TROUBLES	No	
7.	INTERNAL & EXTERNAL CONDITIONING	Yes	
8.	DESALINATION	Yes	
9.	REVERSE OSMOSIS	Yes	
UNIT II: POLYMERS - 9 HRS			

10.	INTRODUCTION & CLASSIFICATION	No	[T2, R2]
11.	TERMS & DEFINITION	Yes	
12.	TYPES OF POLYMERISATION	Yes	
13.	FREE RADICAL MECHANISM	No	
14.	PLASTICS - TYPES , PVC , TEFLON	Yes	
15.	INTRODUCTION & CLASSIFICATION	YES	
16.	TERMS & DEFINITION	YES	
17.	TYPES OF POLYMERISATION	No	
18.	FREE RADICAL MECHANISM	No	
UNIT III: ELECTROCHEMISTRY - 9 HRS			
19.	INTRODUCTION TO ELECTROCHEMISTRY	No	[T3, R32]
20.	ELECTROCHEMICAL CELL – DEFINITION	No	
21.	NERNST EQUATION - DERIVATION	No	
22.	EMF MEASUREMENTS – POGENDROFF	No	
23.	WORKING HYDROGEN , CALOMEL ELECTRODE	No	
24.	ELECTROCHEMICAL SERIES & APPLICATIONS	Yes	
25.	DETERMINATION OF Ph , ION SELECTIVE	No	
26.	POTENTIOMETRIC TITRATIONS	No	
27.	CONDUCTOMETRIC TITRATIONS	No	
UNIT IV: CORROSION AND CORROSION CONTROL - 9 HRS			
28.	INTRODUCTION - CORROSION	No	[T2, R3]
29.	TYPES OF CORROSION	YES	
30.	ELECTROCHEMICAL CORROSION	YES	

31.	FACTORS INFLUENCING CORROSION	No	
32.	MODES OF CORROSION CONTROL	Yes	
33.	TYPES OF INHIBITORS	Yes	
34.	PROTECTIVE COATING - PAINTS	No	
35.	ELECTRO PLATING OF GOLD OVER COPPER	No	
UNIT V: NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES - 9 HRS			
36.	INTRODUCTION - NUCLEAR REACTION	No	
37.	TYPES OF NUCLEAR REACTION	No	
38.	NUCLEAR ENERGY CRITICAL MASS - SUPER CRITICAL MASS - SUB – CRITICAL MASS	No	[T1, T2, R3]
39.	LIGHT WATER NUCLEAR REACTOR FOR POWER GENERATION	No	
40.	BREEDER REACTOR SOLAR ENERGY CONVERSION – SOLAR CELLS – WIND ENERGY FUEL CELLS	No	
41.	HYDROGEN – OXYGEN FUEL CELL BATTERIES PRIMARY AND SECONDARY BATTERIES	No	
42.	LEAD–ACID STORAGE BATTERY –WORKING –	No	
43.	USES NICKEL–CADMIUM BATTERY	No	
45.	STATE BATTERY : LITHI BATTERY	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

Evaluation Strategies

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

Prepared by: Dr.Rajenderan**,** Department of Chemistry **Dated :**

Addendum

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

a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.
b) An ability to identify, formulate, and solve engineering problems.
c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d) An ability to design and conduct experiments, as well as to analyze and interpret data.
e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
f) An ability to apply reasoning informed by the knowledge of contemporary issues.
g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
h) An ability to understand professional and ethical responsibility and apply them in engineering practices.
i) An ability to function on multidisciplinary teams.
j) An ability to communicate effectively with the engineering community and with society at large.
k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
l) An ability to recognize the need for, and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION

Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE

Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM

Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS

Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

BCH101 - ENGINEERING CHEMISTRY I

Course Teacher	Signature
Dr.Rajenderan	

Course Coordinator **HOD/EEE**

(Dr.Rajenderan) **( )**