

FR. Conceicao Rodrigues College Of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Humanities & Sciences

F.E. (IT) (Semester II) (2018-2019)

Lesson Plan

Subject: Applied Chemistry-II (FEC203)

Credits-3.5

Syllabus:

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned				
		Theory	Pract.	Tut.	Theory	TW / Pract	Tut.	Total	
FEC203	Applied Chemistry–II	03	01	--	03	0.5	--	3.5	
Course Code	Course Name	Examination Scheme							
		Theory				Term Work	Pract	Or al	Total
		Internal Assessment			End Sem Exam				
		Test1	Test2	Av of Test1 &2					
FEC203	Applied Chemistry–II	15	15	15	60	25	--	--	100

Objectives

1. To provide necessary background in applied chemistry relevant to chemical industries.
2. To provide exposure in conducting experiments and interpret and report the results in professional format.

Module	Detailed Contents	Hrs.
01	<p>Corrosion: Introduction: Types of Corrosion - (I) Dry or Chemical Corrosion-i) Due to oxygen ii) Due to other gases (II) Wet or Electrochemical corrosion – Mechanism i) Evolution of hydrogen type ii) Absorption of oxygen. Types of Electrochemical Corrosion – Galvanic cell corrosion, Concentration cell corrosion (differential aeration), Pitting corrosion, Intergranular corrosion, Stress corrosion. Factors affecting the rate of corrosion – Nature of metal, position of metal in galvanic series, potential difference, overvoltage, relative area of anodic and cathodic parts, purity of metal, nature of the corrosion product, temperature, moisture, influence of pH, concentration of the electrolytes. Methods to decrease the rate of corrosion – Material selection, Proper designing, Use of inhibitors, Cathodic protection - i) Sacrificial anodic protection ii) Impressed current method, Anodic protection method, Metallic coatings – hot dipping – galvanizing and tinning, metal cladding, metal spraying, Electroplating, Cementation. Organic coatings – Paints (only constituents and their functions).</p>	11

02	<p>Alloys Introduction, purpose of making alloys, Ferrous alloys, plain carbon steel, heat resisting steels, stainless steels (corrosion resistant steels), effect of the alloy ingelement - Ni, Cr, Co, Mn, Mo, W and V; Non-Ferrous alloys - Composition, properties and uses of – Alloys of Aluminium - i) Duralumin ii) Magnalium. Alloys of Cu - (I) Brasses -i) Commercial brass ii) German silver, (II) Bronzes - i) Gun metal ii) High phosphorous bronze. Alloys of Pb - i) Wood's metal ii) Tinmann's solder. Powder Metallurgy - Introduction, (1) Methods of powder metal formation - i) Mechanical pulverization ii) Atomization iii) Chemical reduction iv) Electrolytic process v) Decomposition (2) Mixing and blending. (3) Sintering (4) Compacting - i) Cold pressing ii) Powder injection moulding (iii) Hot compaction. Applications of powder metallurgy. Shape Memory Alloys - Definition, properties and Uses.</p>	07
03	<p>Fuels Definition, classification of fuels - solid, liquid and gaseous. Calorific value - Definition, Gross or Higher calorific value & Net or lower calorific value, units of heat (no conversions), Dulong's formula & numerical for calculations of Gross and Net calorific values. Characteristics of a good fuel. Solid fuels – Analysis of coal – Proximate and Ultimate Analysis with Significance and numericals. Liquid fuels – Crude petroleum oil, its composition and classification and mining (in brief). Refining of crude oil - i) Separation of water ii) Separation of 'S' & iii) Fractional Distillation with diagram and composition and uses table. Cracking - Definition, Types of cracking - I) Thermal cracking – (i) Liquid phase thermal cracking (ii) Vapour phase thermal cracking. II) Catalytic cracking - (i) Fixed- bed catalytic cracking (ii) Moving – bed catalytic cracking. Advantages of Catalytic cracking. Petrol-Refining of petrol, unleaded petrol (use of MTBE), Catalytic converter, Power alcohol, Knocking, Octane number, Cetane number, Antiknocking agents. Combustion - Calculations for requirement of only oxygen and air (by weight and by volume only) for given solid & gaseous fuels. Biodiesel – Method to obtain Biodiesel from vegetable oils (Trans - esterification), advantage and disadvantages of biodiesel. Fuel cell - Definition, types and applications.</p>	12
04	<p>Composite Materials Introduction, Constitution - i) Matrix phase ii) Dispersed phase. Characteristic properties of composite materials. Classification - (A) Particle – reinforced composites - i) Large – particle reinforced composites ii) Dispersion – strengthened composites. (B) Fiber – reinforced composites - i) Continuous – aligned ii) Discontinuous – aligned (short) - (a) aligned (b) randomly oriented (C) Structural Composites - i) Laminates (ii) Sandwich Panels.</p>	04
05	<p>Green Chemistry Introduction, Twelve Principles of Green chemistry, numerical on atom economy, Conventional and green synthesis of Adipic acid, Indigo, Ibuprofen and Carbaryl. Green solvents</p>	06

Suggested Experiments: (Any five)

1. Estimation of Zn – Complexometric titration.
2. Estimation of Ni – Complexometric titration.
3. Estimation of Al – Complexometric titration.
4. Flue gas analysis using Orsat's apparatus.
5. Estimation of Fe from plain carbon steel
6. Estimation of Ni by gravimetric method.
7. Estimation of Sn iodometrically.
8. Preparation of Biodiesel from edible oil.
9. Estimation of Cu - Iodometrically.
10. Estimation of percentage moisture in coal.
11. Estimation of percentage ash in coal.
12. To estimate the emf of Cu – Zn system by potentiometry.
13. Demonstration of Electroplating.

Term work

Term Work shall consist of minimum five experiments. The distribution of marks for term work shall be as follows:

- | | |
|--|------------|
| 1. Attendance (Practical and Theory) | : 05marks |
| 2. Laboratory Work (Experiments and journal) | : 10 marks |
| 3. Assignments and Viva on practicals | : 10marks |

Assessment:**Internal Assessment Test:**

Assessment consists of two class tests of 15 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 35% syllabus is completed. Duration of each test shall be one hour.

End Semester Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 15 marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus where in sub – questions of 3 marks will be asked.
4. Remaining questions will be mixed in nature. (e.g. Suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in the syllabus.

References:

1. Engineering Chemistry – Jain & Jain (Dhanpat Rai)
2. Engineering Chemistry – Dara & Dara (S Chand)
3. Engineering Chemistry – Wiley India (ISBN – 9788126519880)
4. A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai)
5. A Text Book of Green Chemistry – V.K. Ahluwalia (Springer)

Course Outcomes:

Upon completion of this course students will be able to:

CO203.1: To recognize the various types of fuels.

CO203.2: To relate the different types of corrosion.

CO203.3: To extract metals from their alloys.

CO203.4: To understand the processes that minimizes the use of hazardous substances.

CO203.5: To interpret the phase diagram

Mapping of CO and PO/PSO

Relationship of course outcomes with program outcomes: Indicate 1 (low importance), 2 (Moderate Importance) or 3 (High Importance) in respective mapping cell.

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P01 0	P01 1	P01 2
FEC203.1	2											
FEC203.2	2											
FEC203.3	2											
FEC203.4	2											
FEC203.5	2											
TOTAL												
CO-PO MATRIX												

Justification

P01: COs are mapped to this PO1 because the students gain basic knowledge on applied chemistry related concepts required for higher semesters (chemical technology and their applications)

CO Assessment Tools:

FEC203.1: Direct Methods(80%):

Test-II	Lab-1	Lab-2	UE
40%	10%	10%	40%

InDirect Methods(20%): Course exit survey

CO1dm

$FEC203.1 = 0.8 * CO1dm + 0.2 * CO1dm$

FEC203.2: Direct Methods(80%):

Test-I	UE
60%	40%

InDirect Methods(20%): Course exit survey

C02idm

$$\text{FEC203.2} = 0.8 * \text{C02dm} + 0.2 * \text{C02idm}$$

FEC203.3: **Direct Methods (80%):**

Test-II	A-I	Lab-3	Lab-4	Lab-5	UE
20%	20%	5%	5%	10%	40%

InDirect Methods (20%): Course exit survey

C03idm

$$\text{FEC203.3} = 0.8 * \text{C03dm} + 0.2 * \text{C03idm}$$

FEC203.4: **Direct Methods (80%):**

Test-II	A-II	UE
30%	30%	40%

InDirect Methods (20%): Course exit survey

C04idm

$$\text{FEC203.4} = 0.8 * \text{C04dm} + 0.2 * \text{C04idm}$$

FEC203.5: **Direct Methods(80%):**

Test-II	UE
60%	40%

InDirect Methods (20%): Course exit survey

C05idm

$$\text{FEC203.5} = 0.8 * \text{C05dm} + 0.2 * \text{C05idm}$$

Course Outcomes Target:

Upon completion of this course students will be able to:

FEC203.1 To recognize the various types of fuels.

TARGET RANGE: 2.0

FEC203.2: To relate the different types of corrosion

TARGET RANGE: 2.0

FEC203.3 To extract metals from their alloys.

TARGET RANGE: 2.0

FEC203.4 To understand the processes that minimizes the use of hazardous substances.

TARGET RANGE: 2.0

FEC203.5 To interpret the phase diagram

TARGET RANGE: 2.0

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CO203.1: To recognize the various types of fuels CO203.2: To relate the different types of corrosion CO203.3: To extract metals from their alloys CO203.4: To understand the processes that minimizes the use of hazardous substances CO203.5: To interpret the phase diagram				
Subject: Applied Chemistry				
Branch: IT			Semester: II	
<i>Sr. No.</i>	<i>Name of the Topic</i>	<i>Executed Date</i>	<i>Executed Date</i>	<i>Remark</i>
Module-I (Corrosion)(Course Outcome No.: 02)				
1	Introduction	01-01-2019	01-02-2019	
2	Types of corrosion	01-02-2019	01-03-2019	01/01/2019 : Mass Bunk
3	Galvanic or Bimetallic corrosion	01-03-2019	01-04-2019	
4	Concentration cell corrosion	01-04-2019	03-06-2019	15/3/2019 : Crescendo (Friday)
5	Pitting corrosion	03-06-2019	03-07-2019	
6	Intergranular corrosion	03-07-2019	03-11-2019	
7	Waterline corrosion	03-11-2019	03-13-2019	
8	Stress corrosion	03-13-2019	03-14-2019	

9	Passivity	03-14-2019	03-18-2019	
10	Galvanic series	03-18-2019	03-20-2019	
11	Factors influencing corrosion, Corrosion control	03-20-2019	03-25-2019	
Module-III (Fuels)(Course Outcome No.: 01)				
12	Introduction	01-08-2019	01-08-2019	31/1/2019 : Annual Sports Day (Thursday)
13	Classification of fuels	01-09-2019	01-09-2019	
14	Calorific value	01-10-2019	01-10-2019	
15	Numericals for Gross Calorific value and Net Calorific value	01-11-2019	01-11-2019	
16	Characteristics of a good fuel	01-14-2019	01-14-2019	
17	Comparison of solid, liquid and gaseous fuels	01-16-2019	01-16-2019	
18	Analysis of coal	01-17-2019	01-17-2019	
19	Numericals on proximate analysis	01-21-2019	01-21-2019	
20	Numericals on ultimate analysis	01-23-2019	01-23-2019	
21	Liquid fuels, Refining of crude oil	01-24-2019	01-24-2019	
22	Cracking, Petrol	01-28-2019	01-28-2019	
23	Combustion, Numericals on combustion	01-30-2019	01-30-2019	4/2/2019 & 6/2/2019 : UT-I
24	Bio-diesel, Fuel Cells	07-02-2019	07-02-2019	
Module-V (Green Chemistry)(Course Outcome No.: 04)				
25	Introduction, Goals of Green Chemistry			
26	Twelve principles of Green Chemistry	18-02-2018	18-02-2018	
27	Atom economy	20-02-2019	20-02-2019	11/2/2019, 13/2/2019 & 14/2/2019 : Euphoria
28	Synthesis of Adipic acid, Synthesis of Indigo	21-02-2019	21-02-2019	
29	Industrial applications of Green Chemistry	25/2/2019	25/2/2019	
Module-II (Alloys)(Course Outcome No.: 03)				
30	Introduction	26-02-2019	26-02-2019	
31	Purpose of making alloys	28-02-2019	28-02-2019	
32	Types of alloys	25-03-2019	27-03-2019	
33	Ferrous alloys	27-03-2019	28-03-2019	
34	Non-ferrous alloys	28-03-2019		

35	Powder Metallurgy			
<i>Signature and Date:</i> <div> <i>Faculty</i> <i>HOD</i> <i>Principal</i> </div>				

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CO203.1: To recognize the various types of fuels
CO203.2: To relate the different types of corrosion
CO203.3: To extract metals from their alloys
CO203.4: To understand the processes that minimizes the use of hazardous substances
CO203.5: To interpret the phase diagram

Subject: Applied Chemistry

Academic Year: 2018-19

Branch: Production

Semester: II

<i>Sr. No</i>	<i>Name of the Topic</i>	<i>Planned Date</i>	<i>Executed Date</i>	<i>Remark</i>
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Module-I (Corrosion)(Course Outcome No.: 02)

1	Introduction	01-01-2019	01-02-2019	
2	Types of corrosion	01-02-2019	01-04-2019	01/01/2019 : Mass Bunk
3	Galvanic or Bimetallic corrosion	03-05-2019	03-05-2019	
4	Concentration cell corrosion	03-07-2019	03-07-2019	15/3/2019 : Crescendo (Friday)
5	Pitting corrosion	03-08-2019	03-08-2019	
6	Intergranular corrosion	03-12-2019	03-12-2019	
7	Waterline corrosion	14/3/2019	14/3/2019	
8	Stress corrosion	15/3/2019	19/3/2019	
9	Passivity	19/3/2019	22/3/2019	
10	Galvanic series	22/3/2019		
11	Factors influencing corrosion			
12	Corrosion control			

Module-III (Fuels)(Course Outcome No.: 01)

13	Introduction	01-07-2019	01-07-2019	31/1/2019 : Annual Sports Day (Thursday)
14	Classification of fuels	01-08-2019	01-08-2019	
15	Calorific value	01-09-2019	01-08-2019	
16	Numericals for Gross Calorific value and Net Calorific value	01-10-2019	01-09-2019	
17	Characteristics of a good fuel	15/1/2019	01-10-2019	5/2/2019 : Unit Test-I
18	Comparison of solid, liquid and gaseous fuels	17/1/2019	15/1/2019	
19	Analysis of coal	18/1/2019	17/1/2019	
20	Numericals on proximate analysis	22/1/2019	18/1/2019	
21	Numericals on ultimate analysis	24/1/2019	22/1/2019	
22	Liquid fuels, Refining of crude oil	25/1/2019	24/1/2019	
23	Cracking, Petrol	29/1/2019	25/1/2019	

24	Combustion, Numericals on combustion	31/1/2019	29/1/2019	
25	Bio-diesel, Fuel Cells	02-01-2019	02-01-2019	
		02-05-2019	02-08-2019	

Module-V (Green Chemistry)(Course Outcome No.: 04)				
26	Introduction, Goals of Green Chemistry	02-08-2019	21/2/2019	12/2/2019, 14/2/2019 & 15/2/2019 : Euphoria
27	Twelve principles of Green Chemistry	02-12-2019	22/2/2019	
28	Atom economy	14/2/2019	25/2/2019	
29	Synthesis of Adipic acid, Synthesis of Indigo	15/2/2019	28/2/2019	
30	Industrial applications of Green Chemistry	21/2/2019	03-01-2019	
Module-II (Alloys)(Course Outcome No.: 03)				
31	Introduction	22/2/2019	26/3/2019	
32	Purpose of making alloys	25/2/2019	28/3/2019	
33	Types of alloys	28/2/2019	29/3/2019	
34	Ferrous alloys, Non- ferrous alloys	03-01-2019		
35	Powder Metallurgy			
Signature and Date:				
Faculty		HOD		Principal

