



DEPARTMENT OF CHEMISTRY

COURSE PLAN – PART I			
Name of the programme and specialization	B. Tech. (Instrumentation and Control Engineering)-II Sem		
Course Title	Chemistry (Theory)		
Course Code	CHIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	Nil		
Session	January 2020	Section (if, applicable)	B
Name of Faculty	Dr. Deepa Oberoi	Department	Chemistry
Official Email	<a href="mailto:doberoi@nitt.edu">doberoi@nitt.edu</a>	Telephone No.	+91-9639336444 (M)
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
<b>Syllabus (approved in BoS)</b>			
<p><b>Theory (Units):</b></p> <p><b>Unit 1: Electrochemistry and Corrosion</b>            Cell EMF-its measurement and applications -concentration cell -electrode electrolyte concentration cell -concentration cell with and without transference -Dry corrosion and wet corrosion, mechanisms, types of corrosion, Differential Metal corrosion, Differential Aeration corrosion, intergranular, Passivity, Pitting, Polarization -Chemical conversion coatings and organic coatings-Paints, enamels.</p> <p><b>Unit 2: Phase rule</b>            Definition of terms –phase-components-degree of freedom-derivation of Gibbs phase rule –one component system –H<sub>2</sub>O, CO<sub>2</sub>, Sulfur –Two-component system –Eutectic systems –reduced phase rule -Pb-Ag system –Compound Formation with congruent melting –Zn-Mg Alloy system-Copper-nickel alloy system -systems with incongruent melting –Na<sub>2</sub>SO<sub>4</sub>-H<sub>2</sub>O system and simple three-component systems.</p> <p><b>Unit 3: Water</b>            Sources, Hard &amp; soft water, Estimation of hardness by EDTA method, Scale &amp; Sludge-Caustic embrittlement -softening of water, zeolite process &amp; demineralization by ion exchangers, boiler feed water, internal treatment methods-specifications for drinking water, BIS &amp; WHO standards, treatment of water for domestic use, desalination -Reverse osmosis &amp;</p>			



Electrodialysis.

**Unit 4: Spectroscopy**

Interaction of electromagnetic radiation with matter, Electronic spectroscopy -Theory of electronic transitions, instrumentation, Beers-Lambert law, Woodward FIESER rule, applications. IR spectroscopy -Fundamentals, Instrumentation and applications, Raman spectroscopy – Fundamentals and applications.

**Unit 5: Polymers and Composites**

Concept of macromolecules-Tacticity-Classification of Polymers-Types of Polymerization-Mechanism--Ziegler Natta Polymerization -Effect of Polymer structure on properties - Important addition and condensation polymers –synthesis and properties –Molecular mass determination of polymers-Static and dynamic methods, Light scattering-Rubbers–Vulcanization–Synthetic rubbers –Conducting polymers-Composite materials

**Reference and Text Books**

1. P. C. Jain & M. Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, New Delhi, 2005.
2. P. W. Atkins and J. de Paula, *Physical chemistry*, Oxford University Press, 2002.
3. B.R. Puri, L. R. Sharma, M.S. Pathania, *Principles of Physical Chemistry*, Vishal Publishing Company, 2008.
4. F.W. Billmayer, *Textbook of Polymer Science*, 3<sup>rd</sup> Edition, Wiley. N.Y. 1991.
5. S.S. Darer, S. S. Umare, *A Text Book of Engineering Chemistry*, S. Chand Publishing, 2011.
6. Donald L. Pavia Gary M. Lampman George S. Kriz James R. Vyvyan, *Introduction to spectroscopy*, 3<sup>rd</sup> Edition, Brooks/Cole Cengage learning, 2011.

**COURSE OBJECTIVES**

To introduce the student's basic principles of Electrochemistry and Corrosion. They will be familiar with phase rule & its applications. Students will know about the essential requirements of water and its importance in day-to-day life. To provide students with a brief outline of the types and applications of polymers. Finally, students will be equipped with the usage of spectroscopy in industrial applications.

**MAPPING OF COs with POs**

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
<p>Students will learn about the:</p> <ul style="list-style-type: none"> <li>• Students will learn about the Electrochemistry and phase rule</li> <li>• They will be familiarized with the importance of polymer and its application in industries and its interpretation to understand the matter at atomic scale.</li> </ul> <p>Additionally, a brief introduction in the area of water,</p>	<p>1,6</p>



spectroscopy will be very useful for the students in future endeavor.	
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**COURSE PLAN – PART II**

**COURSE OVERVIEW**

This is a 3 credit course offered to I year B.Tech students. Three theory classes will be conducted per week. This course provides a thorough understanding of the subject through lectures, tutorials and demonstrations.

**COURSE TEACHING AND LEARNING ACTIVITIES** ( Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	II week of January 2020	<b>Unit 4</b> Interaction of electromagnetic radiation with matter, Electronic spectroscopy, Theory of electronic transitions, instrumentation,	C&T, PPT
2	III week of January 2020	Beers Lambert law, Woodward Fieser rule, applications.	C&T, PPT
3	IV week of January 2020	IR spectroscopy -Fundamentals, Instrumentation and applications, Raman spectroscopy –Fundamentals and applications.	C&T, PPT
4	V week of January 2020	<b>Unit 1</b> Cell EMF- its measurement and applications - concentration cell, electrode electrolyte concentration cell - concentration cell with and without transference	C&T, PPT
5	I week of February 2020	Dry corrosion and wet corrosion, mechanisms, types of corrosion, Differential metal corrosion, differential aeration corrosion	C&T, PPT
6	II week of February 2020	Intergranular corrosion Passivity, Pitting, Polarization Chemical conversion coatings and organic coatings- Paints, enamels.	C&T, PPT
7	III week of February 2020	<b>Unit 5</b> Concept of macromolecules-Tacticity -Classification of Polymers-Types of Polymerization-Mechanism- Ziegler Natta Polymerization	C&T, PPT
8		Effect of Polymer structure on	C&T, PPT



	IV week of February 2020	properties - Important addition and condensation polymers –synthesis and properties	
9	I week of March 2020	Molecular mass determination of polymers- Static and dynamic methods, Light scattering- Rubbers – Vulcanization – Synthetic rubbers – Conducting polymers- Composite materials	C&T, PPT
10	II week of March 2020	<b>Unit 2</b> Definition of terms – phase-components- degree of freedom-derivation of Gibbs phase rule One component system – H <sub>2</sub> O, CO <sub>2</sub> , Sulfur	C&T, PPT
11	III week of March 2020	Two-component system – Eutectic systems-reduced phase rule - Pb-Ag system – Compound Formation with congruent melting Zn- Mg Alloy system	C&T, PPT
12	IV week of March 2020	Copper-nickel alloy system - systems with incongruent melting – Na <sub>2</sub> SO <sub>4</sub> -H <sub>2</sub> O system and simple three-component systems.	C&T, PPT
13	I week of April 2020	<b>Unit 3</b> Sources, Hard & soft water, Estimation of hardness by EDTA method, Scale & Sludge- Caustic embrittlement,	C&T, PPT
14	II week of April 2020	Softening of water, zeolite process & demineralization by ion exchangers, Boiler feed water, internal treatment methods	C&T, PPT
15	III week of April 2020	Specifications for drinking water, BIS & WHO standards, Treatment of water for domestic use, desalination - Reverse osmosis & Electrodialysis.	C&T, PPT

**COURSE ASSESSMENT METHODS** (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
<b>Theory</b>				
1	Test-I	I week of February	60 minutes	20
2	Quiz/seminar/G.D./ assignment	IV week of January	1 week	5
3	Test-2	I week of March	60 minutes	20
4	Quiz/seminar/G.D./	III week of February	One week	5



	assignment			
CPA	Compensation Assessment*	II week of April	60 minutes	20
5	Final Assessment *	I week of May 2020	3 hours	50

**Total (100 Marks)**

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed)

1. Feedback from students during class committee meetings
2. Anonymous feedback through questionnaire at the end of the semester.

**COURSE POLICY** (including compensation assessment to be specified)

**MODE OF CORRESPONDENCE (email/ phone etc)**

E-mail: [doberoi@nitt.edu](mailto:doberoi@nitt.edu) / Phone: +91-9639336444

**COMPENSATION ASSESSMENT POLICY**

For those students who missed Test I and Test II due to genuine reasons, Compensation assessment will be conducted during 23.04.2020 - 27.04.2020.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the



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programmes.

## ADDITIONAL INFORMATION, IF ANY

The respective faculty will be available for consultation at times as per the intimation by the faculty.

## FOR APPROVAL

Course Faculty *[Signature]* 23.01.2020 CC- Chairperson *[Signature]* 23.1.20 HOD *[Signature]* 4/2/2020

**Dr. G. UMA**  
HEAD  
Instrumentation and Control Engineering  
National Institute of Technology  
Tiruchirappalli - 620 015.



Guidelines

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2019	2018	2017	2016	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) lower	(Class Average/2) whichever is	40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.