



## DEPARTMENT OF CHEMISTRY

## COURSE PLAN – PART I

Name of the programme and specialization	B. Tech. (Civil Engineering)		
Course Title	Chemistry (Theory)		
Course Code	CHIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	Nil		
Session	July 2023	Section (if, applicable)	A
Name of Faculty	Dr. Ganesh Chandra Nandi	Department	Chemistry
Official Email	<a href="mailto:nandi@nitt.edu">nandi@nitt.edu</a>	Telephone No.	7034458790
Name of Course Coordinator(s) (if, applicable)	Dr. Ganesh Chandra Nandi		
Official E-mail	<a href="mailto:nandi@nitt.edu">nandi@nitt.edu</a>	Telephone No.	7034458790
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		

**Syllabus (approved in BoS)****Theory (Units):****Unit 1: Electrochemistry and Corrosion**

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.

**Unit 2: Phase rule**

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.

**Unit 3: Water**

Sources, Hard & soft water, Estimation of hardness by EDTA method, Scale & Sludge-Caustic embrittlement -softening of water, zeolite process & demineralization by ion exchangers, boiler feed water, internal treatment methods-specifications for drinking water, BIS & WHO standards, treatment of water for domestic use, desalination -Reverse osmosis & Electrodialysis.



**Unit 4: Spectroscopy**

Interaction of electromagnetic radiation with matter, Electronic spectroscopy -Theory of electronic transitions, instrumentation, Beers Lambert law, Woodward FIESERrule, 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.

**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)
Students will learn about the:	
1. Fundamentals of Electrochemistry and Corrosion	1, 2, 4, 5
2. Importance of Phase rule	1, 2, 5, 7
3. Applications of Water Chemistry	1, 3, 5, 6
4. Basic concepts of Spectroscopy	1, 2, 5, 6, 7



5. Theory and applications of Polymers and Composites.		1, 2, 3, 7	
COURSE PLAN – PART II			
COURSE OVERVIEW			
<p>This is a three credit course offered to I year B.Tech. Production Engineering Students. This course is a theory (3 credit) course. Three theory classes (3 h per week) will be conducted per week. This course provides a thorough understanding of the subject through lectures, tutorials and demonstrations.</p>			
COURSE TEACHING AND LEARNING ACTIVITIES		( Add more rows)	
S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	IV week of August	<b>Unit 1:</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,	C&T, PPT
2	I week of September	Polarization -Chemical conversion coatings and organic coatings-Paints, enamels. <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 –Two-component system	C&T, PPT
3	II week of September	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.	C&T, PPT
4	III week of September	<b>Unit 3:</b> Sources, Hard & soft water, Estimation of hardness by EDTA method, Scale & Sludge. Caustic embrittlement -softening of water, zeolite process & demineralization by ion exchangers - Boiler feed water, internal treatment methods-	C&T, PPT
5	IV week of September	Specifications for drinking water- BIS & WHO standards, treatment of water for domestic use, desalination -Reverse osmosis & Electrodialysis,	C&T, PPT
6	I week of October	<b>Unit 4:</b> Interaction of electromagnetic radiation with matter, Electronic spectroscopy -Theory of electronic transitions, instrumentation.	C&T, PPT
7	II week of October	Beers Lambert law, Woodward FIESER rule, applications.	C&T, PPT



8	III week of October	IR spectroscopy -Fundamentals, Instrumentation and applications, Raman spectroscopy – Fundamentals and applications	C&T, PPT
9	IV week of October	<b>Unit 5:</b> Concept of macromolecules-Tacticity - Classification of Polymers-Types of Polymerization-Mechanism--Ziegler Natta Polymerization	C&T, PPT
10	I week of November	Effect of Polymer structure on properties-	C&T, PPT
11	II week of November	Molecular mass determination of polymers	C&T, PPT
12	III week of November	Static and dynamic methods, Light scattering--	C&T, PPT
	IV week of November	Important addition and condensation polymers – synthesis and properties	C&T, PPT
	I week of December	Rubbers –Vulcanization –Synthetic rubbers – Conducting polymers-Composite materials	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-1	I week of October	1 h	20
2	Test-2	IV week of October	1 h	20
3	Assignment	II week of Novemver	One week	10
4	Compensation Assessment*	IV week of Novemver	1 h	20
5	Final Assessment *	IV week of February	3 hours	50

**Total (100 Marks)**

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



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- 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 nandi@nitt.edu / Phone +91-7034458790

**COMPENSATION ASSESSMENT POLICY**

For those students who missed Test I and Test II due to genuine reasons, Compensation assessment will be conducted in the III week of February.

**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 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]*

CC- Chairperson

*[Signature]*  
12/09/23

HOD

*[Signature]*



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