



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 2022	Section (if, applicable)	A
Name of Faculty	Dr. Ganesh Chandra Nandi	Department	Chemistry
Official Email	nandi@nitt.edu	Telephone No.	7034458790
Name of Course Coordinator(s) (if, applicable)	Dr. Ganesh Chandra Nandi		
Official E-mail	nandi@nitt.edu	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 ₂ O, CO ₂ , 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 ₂ SO ₄ -H ₂ 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*, 3rd Edison, 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

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.

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	III week of November	Unit 1: 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	IV week of November	Polarization -Chemical conversion coatings and organic coatings-Paints, enamels. Unit 2: Definition of terms –phase-components-degree of freedom-derivation of Gibbs phase rule –one component system –H ₂ O, CO ₂ , Sulfur –Two-component system	C&T, PPT
3	I week of December	Reduced phase rule -Pb-Ag system – Compound Formation with congruent melting –Zn-Mg Alloy system-Copper-nickel alloy system, Systems with incongruent melting –Na ₂ SO ₄ -H ₂ O system and simple three-component systems.	C&T, PPT
4	II week of December	Unit 3: Sources, Hard & soft water, Estimation of hardness by EDTA method, Scale & Sludge. Caustic embrittlement -softening of water, zeolite process & demineralization by	C&T, PPT



		ion exchangers -Boiler feed water, internal treatment methods-	
5	III week of December	Specifications for drinking water- BIS & WHO standards, treatment of water for domestic use, desalination -Reverse osmosis & Electrodialysis,	C&T, PPT
6	IV week of December	Unit 4: Interaction of electromagnetic radiation with matter, Electronic spectroscopy -Theory of electronic transitions, instrumentation.	C&T, PPT
7	I week of January	Beers Lambert law, Woodward FIESER rule, applications.	C&T, PPT
8	II week of January	IR spectroscopy -Fundamentals, Instrumentation and applications, Raman spectroscopy -Fundamentals and applications	C&T, PPT
9	III week of January	Unit 5: Concept of macromolecules-Tacticity -Classification of Polymers-Types of Polymerization-Mechanism--Ziegler Natta Polymerization	C&T, PPT
10	IV week of January	Effect of Polymer structure on properties- Molecular mass determination of polymers	C&T, PPT
11	I week of February	Static and dynamic methods, Light scattering--Important addition and condensation polymers -synthesis and properties	C&T, PPT
	II week of February	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
Theory				
1	Test-I	III week of December	1 h	20
2	Test-2	III week of January	1 h	20
3	Assignment	I week of February	One week	10



4	Compensation Assessment*	III week of February	1 h	20
5	Final Assessment *	IV week of February	2 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)				
<u>MODE OF CORRESPONDENCE (email/ phone etc)</u> E-mail: nandi@nitt.edu / Phone: +91-7034458790				
<u>COMPENSATION ASSESSMENT POLICY</u> 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.				
<u>ATTENDANCE POLICY</u> (A uniform attendance policy as specified below shall be followed) <ul style="list-style-type: none">➤ 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.				
<u>ACADEMIC DISHONESTY & PLAGIARISM</u> <ul style="list-style-type: none">➤ 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

Gandi

CC- Chairperson

Dr. R. Senthilkumar

P. D. Jeyaraj
2/14/22

HOD

S. T. Jeyaraj