



DEPARTMENT OF CHEMISTRY

COURSE PLAN - PART I			
Name of the programme and specialization	I B.Tech.(ICE)		
Course Title	Chemistry-II		
Course Code	CHIR13	No. of Credits	4 (3 credit theory & 1 credit practical)
Course Code of Pre-requisite subject(s)	Nil		
Session	January 2019	Section (if, applicable)	Nil
Name of Faculty	Dr. Sarthak Mandal	Department	Chemistry
Official Email	smardal@nitt.edu	Telephone No.	+918158805377 (M)
Name of Course Coordinator(s) (if, applicable)	Dr. Sarthak Mandal		
Official E-mail	smandal@nitt.edu	Telephone No.	+918158805377 (M)
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		

Syllabus (approved in BoS)**Theory (Units):****Unit 1: Chemical Thermodynamics**

Second Law of Thermodynamics - Entropy change accompanying various processes (isothermal expansion, phase transition, heating, entropy of mixing of perfect gases); Absolute entropy and the Third Law of Thermodynamics; Spontaneity of a chemical reaction and Gibbs energy; Standard Gibbs energies of formation and reactions; Equilibrium constant through chemical potential (gas equilibria), relation between K_p & K_c .

Unit 2: Kinetics and Catalysis

Chemical Kinetics: The rate law: First order, second order, third order and pseudo order - The Arrhenius equation - Steady state approximation - Chain reactions (hydrogen-bromine reaction) - Enzyme catalysis (Michaelis-Menten Mechanism). Adsorption - types - adsorption of gases on solids - adsorption of solutes from solutions - role of adsorbents - activated carbon in pollution abatement of air and waste water.

Unit 3: Electrochemistry and Corrosion

Cell EMF, its measurement and applications - concentration cell - electrode (hydrogen gas



electrode) and electrolyte concentration cell - concentration cell with and without transference - fuel cells - hydrox fuel cell.

Dry corrosion and wet corrosion, mechanisms, types of corrosion, Differential metal corrosion, differential aeration corrosion, inter granular, Passivity, Pitting, Polarization, over potential and its significance, Pourbiax diagrams, Potentiodynamic Polarization.

Unit 4: Solid State Chemistry

Brief introduction to solid state chemistry, Preparative methods: Solid state reaction, chemical precursor method, co-Precipitation, sol-gel, metathesis, self-propagating high temperature synthesis, ion exchange reactions, intercalation / deintercalation reactions; hydrothermal and template synthesis; High pressure synthesis.

Unit 5: Fuels and Lubricants

Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.

Practicals (Laboratory Experiments):

1. Corrosion rate by polarization technique
2. Conductometric titration
3. Potentiometric titration
4. pH metric titration
5. Determination of molecular weight of polymer by viscometry
6. Demonstration of sophisticated instruments and assignments on them

Reference Books

1. P. W. Atkins and J. de Paula, Physical chemistry by Oxford University Press
2. P. C. Jain & M. Jain, 'Engineering Chemistry', Dhanpat Rai Publishing Company, New Delhi, 2005.

COURSE OBJECTIVES

To introduce the students to the fundamentals of chemical thermodynamics, chemical kinetics, electrochemistry, corrosion and solid state chemistry. To provide them a brief idea on the requirements of fuels and lubricants.

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)
Students will learn about the:	



1. Principles and applications of chemical thermodynamics	
2. Importance of reaction mechanisms using chemical kinetics	
3. Applications of electrochemistry & corrosion day-to-day life.	
4. Basic concepts of Solid state chemistry	
5. Theory and applications of fuels and lubricants.	

COURSE PLAN – PART II

COURSE OVERVIEW

This is a three credit course offered to I year B.Tech. This course is a combination of theory (3 credit) and practicals (1 credit). Three theory classes (3 h per week) will be conducted per week and one lab session (3 h) will be held during alternate 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	Unit 1: Second Law of Thermodynamics - Entropy change accompanying various processes (isothermal expansion, phase transition, heating, and entropy of mixing of perfect gases).	C&T, PPT
2	III week of January	Absolute entropy and the Third Law of Thermodynamics; Spontaneity of a chemical reaction, Gibbs energy; Standard Gibbs energies of formation and reactions	C&T, PPT
3	IV week of January	Equilibrium constant through chemical potential (gas equilibria), relation between K_p & K_c .	C&T, PPT
4	I week of February	Unit 2: Chemical Kinetics: The rate law: First order, second order, third order and pseudo order	C&T, PPT
5	II week of February	The Arrhenius equation - Steady state approximation - Chain reactions (hydrogen-bromine reaction).	C&T, PPT



6	III week of February	Enzyme catalysis (Michaelis-Menten Mechanism). Adsorption – types – Adsorption of gases on solids – adsorption of solutes from solutions – role of adsorbents – activated carbon in pollution abatement of air and waste water	C&T, PPT
7	IV week of February	Unit 3: Cell EMF, its measurement and applications - concentration cell - electrode (hydrogen gas electrode) and Electrolyte concentration cell - concentration cell with and without transference	C&T, PPT
8	I week of March	Fuel cells - hydrox fuel cell. Dry corrosion and wet corrosion, mechanisms, types of corrosion. Differential metal corrosion, differential aeration corrosion, inter granular, Passivity, Pitting, Polarization, over potential and its significance, Pourbiac diagrams, Potentiodynamic Polarization.	C&T, PPT
9	II week of March	Unit 4: Brief introduction to solid state chemistry, Preparative methods: Solid state reaction, chemical precursor method.	C&T, PPT
10	III week of March	co-Precipitation, sol-gel, metathesis, self-propagating high temperature synthesis, ion exchange reactions	C&T, PPT
11	IV week of March	Intercalation/deintercalation reactions; hydrothermal and template synthesis; High pressure synthesis	C&T, PPT
12	I week of April	Unit 5: Fuels - Classification, examples, relative merits, types of coal, determination of calorific value	C&T, PPT



		of solid fuels, bomb calorimeter,	
13	II week of April	Theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems .	C&T, PPT
14	III week of April	Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.	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 February	60 minutes	15
2	assignment	IV week of March	One week	5
3	Test-2	III week of April	60 minutes	15
CPA	Compensation Assessment*	III week of April	60 minutes	15
4	Final Assessment *	IV week of April	3 hours	40
Practicals				
5	Regular class experiments	All practical classes	3 hours per experiment	25

Theory (75) + Practical (25) = Total (100)

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: vmbiju@nitt.edu/ Phone: +91-9443843076

COMPENSATION ASSESSMENT POLICY

For those students who missed Test I and Test II due to genuine reasons, Compensation assessment will be conducted during 15-19, April 2019.

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

Sarath Kumar
Course Faculty _____

CC- Chairperson S. Anand
4/2/19

HOD S. Varadachari
4/2/19