

DEPARTMENT OF CHEMISTRY
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, Surathkal

COURSE PLAN AND EVALUATION PLAN

- 1) **Course Code:** CY 110 2) **Course Title:** Chemistry Theory 3) **L-T-P:** 3-0-0. (3) 4) **Credit:** Three
 5) **Pre-requisite:** Nil 6) **Course category:** BSc 7) **Teaching Department:** Chemistry
 8) **Course for:** I/II Semester B. Tech.

9) *Objectives of the course:*

- a) To get comprehensive knowledge on fundamentals of Electrochemistry, electroplating, electroless-plating.
- b) To learn fundamental of corrosion process and its control by different methods.
- c) To understand some basic concepts of fuel and different sources of energy.
- d) To know the fundamentals of semiconductor chemistry and Nanomaterials.
- e) To grasp the knowledge of basic of polymer chemistry and advanced polymers.
- f) To get knowledge about quality of water for industrial application, and water purification methods.

10) *Skill development of the student expected from the course:*

- a) Development of basic knowledge of electrochemistry, electroplating, electroless-plating
- b) Acquisition of comprehensive knowledge of semiconductor chemistry and chemistry of nanomaterials.
- c) Exposure to different types of polymerization reaction, knowledge of advance polymers and selection of materials for various applications.
- d) Understanding of theoretical background of corrosion and methods of its control in industries.
- e) Understanding of chemical principles relevant to purification of water for industrial applications..

11) *Course coverage:* Lecture Schedule- **42 hours**

Sl. No	Main Topics	Blow-up syllabus	Lecture hours
1.	Electrochemistry and its applications	Introduction to single electrode potential, Derivation of Nernst equation, electrochemical series, types of electrodes, Calomel electrode, glass electrode, Polarization, Decomposition potential, Overvoltage; Electroplating, Theory, Factors affecting the nature of deposit, Methods of cleaning base metal; Electroplating of copper; Electroless plating of copper- PCB preparation.	8 hrs
2.	Corrosion Science	Theory of electrochemical corrosion, Factors affecting corrosion rate, Brief account on different forms of corrosion – General, Galvanic corrosion, and Galvanic series, Differential aeration, Pitting, Stress and Microbial corrosions, Corrosion control by proper material selection and design, protective coatings (metallic, inorganic and organic), Inhibitors, Cathodic and Anodic protection, Measurement of corrosion rate by weight loss method.	6 hrs
3.	Nano-materials	Introduction to Nanomaterials, General preparation, Properties and Uses of Nanomaterials, Brief accounts of Nanocarbons, Nanosized ZnO and TiO ₂ .	2 hrs
4.	Water Technology	Hardness of water, Boiler troubles, Scale & Sludge formation, Priming & foaming, Boiler corrosion by dissolved gases, MgCl ₂ , Caustic embrittlement, Internal treatment – Phosphate, Calgon and EDTA conditioning, Softening of water by Hot lime soda process and Ion exchange method, Desalination of brackish water by Multistage flash distillation, Reverse osmosis and Electrodialysis.	5 hrs
5.	Chemistry of Fuels	Classification of fuels, Calorific value, Determination of CV using Bomb calorimeter and Buoy's calorimeter; Theoretical calculation of CV, Coal and its analysis - Ultimate and Proximate analysis; Liquid fuels, Fluidized bed catalytic cracking, Petrol and Diesel knocking, Octane and Cetane numbers, Reforming of gasoline, Synthetic petrol by Fischer-Tropsch process; Power alcohol; Biodiesel, Hydrogen as a source of energy.	6 hrs
6.	Polymer Science	Classification of polymers based on Origin, Mechanism of formation, Thermal response and applications, Tacticity; Types of monomers, Mechanism of addition polymerization (free radical, cationic and anionic), Condensation polymerization and Coordination polymerization (Zeigler Natta catalyst); copolymerization – Alternate, random, Block and Graft; Degree of polymerization, Molecular weights of polymers, Number average, Weight average, Methods of polymerization – Bulk, solution, Suspension, and Emulsion polymerization; Glass transition temperature, Factors affecting T _g ; Effect of polymer structure on properties; Preparation, properties and uses of Teflon, PMMA and UF plastics. Elastomers, Natural rubber, Crepe rubber, Smoked rubber, Compounding of rubber, Vulcanization of rubber, Synthetic rubber, Preparation, Properties and Uses of SBR and Silicone rubbers; Conducting polymers, Liquid crystal polymers, Biodegradable polymers.	13 hrs
7.	Chemistry of Semiconductors	Production of electronic grade silicon, Growth by Czochralski (CZ), Float zone (FZ) processes, Doping in the melt, Epitaxy, Diffusion.	2 hrs

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12) Reference Books:

1. B. R. Puri, L. R. Sharma and Madan S Pathania, *Principles of Physical Chemistry*, S.N. Chand & Co., Jalandhar, 31stEdn. 1990.
2. P. C. Jain and Monika Jain, *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi, Revised 6thEdn. 1996.
3. J.C. Kuriacose, J. Rajaram, *Chemistry in Engineering and Technology, Volume I/II*, Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 1988.
4. R.V.Gadag & A. Nityananda Shetty, *Engineering Chemistry*, United Publishers, Mangalore 1993. Edn. & 1998 Edn.
5. F. W. Billmeyer, *Text book of Polymer Chemistry*, 3rd edition, John Wiley, London, 1994.
6. Gowariker et al., *Polymer Science and Technology*, Prentice Hall of India Pvt. Ltd., New Delhi, 1999.
7. Douglas A Skoog, *Principles of Instrumental analysis*, Saunders College Publishing, Chicago, 1985.
8. G. Chatwal and S. Anand, *Instrumental Methods of Chemical Analysis*, S. D. Himalaya Publishing House, 2000.
9. Mars G. Fontana, *Corrosion*, McGraw – Hill Book Company, 1986.
10. C. N. R. Rao, *Chemistry of Nanomaterials, Volume I and II*, Wiley Publication, 1996.
11. S. K. Gandhi, *VLSI Fabrication Principles*, Wiley Publications, 1990.

13) Evaluation Plan:

Evaluation plan (weightage for each component as per the regulations) is as follows:

1. The course will be evaluated in three components: Continuous evaluation, Mid Sem, and End Sem Test.
2. The weightage for three components are as follows:

Continuous evaluation : 40 Marks

Mid Term Test : 20 Marks

End Term Test : 40 Marks

3. As part of the continuous evaluation
 - a) Two quiz Tests will be conducted, one in the first half and other in the second half of the semester.
 - b) Surprise tests will be conducted throughout the semester.
 - c) Assignments will be given during the semester, one in the first half and other in the second half of the semester.
 - d) The Quiz, surprise test and assignment components will have **25, 10, and 05** marks, respectively and making them to total **40** marks
4. The quiz test will be scheduled as follows:

Quiz Test-1 : 5th week; **August 29, 2017 (TUESDAY)**

Quiz Test-2 : 13th week; **October 24, 2017 (TUESDAY)**

The Mid-Sem Test and End-Sem Test will be as per the schedule, given in the academic calendar.
5. The End-Sem test will be a comprehensive test including the entire syllabus of the course.
6. The Question papers of the quiz tests, surprise tests, Mid-Sem and End-Sem tests **will not have any Choice**.

Secretary –DUGC

Date: 24-07-2017

Signature of HOD (Chairman - DUGC)

Department of Chemistry