

DEPARTMENT OF CHEMISTRY
NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, Surathkal

COURSE PLAN AND EVALUATION PLAN

- 1) **Course Code:** CY 110 2) **Course Title:** Chemistry 3) **L-T-P:** 3-0-0. (3) 4) **Credit:** 03
 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, Nanomaterials and green chemistry.
- e) To grasp the knowledge of basics 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) Understanding of theoretical background of corrosion and methods of its control in industries.
- c) Understanding the basic concepts of fuel, their sources and related uses.
- d) Acquisition of comprehensive knowledge of semiconductor chemistry, chemistry of nanomaterials and green chemistry.
- e) Exposure to different types of polymerization reaction, knowledge of advance polymers and selection of materials for various applications.
- f) 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 |
| 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 Micro-biological corrossions, 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 |
| 3. | Nano-materials | Introduction to nanomaterials, general properties: comparison with bulk materials, size effects. General methods of preparation: CVD, pulsed laser deposition, sol-gel, hydrothermal. Nanocarbon: types, preparation, properties and application. ZnO and TiO ₂ nanostructures: preparation, properties and applications. | 4 |
| 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. Desalination of brackish water by Reverse osmosis and Electrodialysis. | 4 |
| 5. | Chemistry of Fuels | Classification of fuels, Calorific value, Determination of CV using Bomb calorimeter and Boy's calorimeter; Theoretical calculation of CV, Coal and its analysis - Ultimate and Proximate analysis; Liquid fuels, Fluidized bed catalytic cracking, Synthetic petrol by Fischer-Tropsch process; Power alcohol; Biodiesel, Hydrogen as a source of energy. | 5 |
| 6. | Polymer Science | Basic definitions, Classification, 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; Natural rubber, Compounding of rubber, Vulcanization of rubber, Synthetic rubber, Preparation, Properties and Uses of SBR and Silicone rubbers; Conducting polymers. Biodegradable polymers. | 10 |
| 7. | Semiconductor Chemistry | Production of electronic grade silicon, CZ and FZ methods, Doping, Epitaxy and Etching. | 2 |
| 8. | Green Chemistry | Principles of green chemistry (statements with brief explanation), Atom economy & E-factor, Conventional and Green synthesis of Ibuprofen. | 3 |

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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, 31st Edn. 1990.
2. P. C. Jain and Monika Jain, *Engineering Chemistry*, Dhanpat Rai & Sons, Delhi, Revised 6th Edn. 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

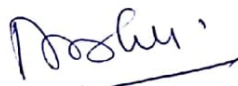
Mid Term Test : 20 Marks

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) Two assignments will be given, 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, making them to a total of **40** marks
4. The quiz test will be scheduled as follows:

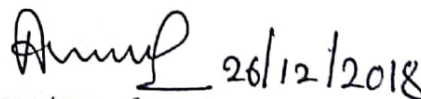
Quiz Test-1 : 5th week; January 22, 2019 (TUESDAY)
Quiz Test-2 : 13th week; March 19, 2019 (TUESDAY)

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: 26 12 – 2018



Signature of HOD (Chairman - DUGC)

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