INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**BACHELOR OF SCIENCE (CHEMISTRY)**
SEMESTER	**2**
COURSE TITLE	**ELEMENTARY CHEMISTRY-II**
COURSE CODE	**02CY0154**
COURSE CREDITS	**4**

Objective:

1 To study physical aspects of photochemical reactions.
2 To make students capable for understanding the basics of electrochemistry.
3 To study the fundamental chemistry of aldehyde and ketones.
4 To study the properties of the first transition series elements i.e., 3d block elements.

Course Outcomes: After completion of this course, student will be able to:

1 Understand the concepts of photochemical processes.
2 Be aware of the basics of reaction mechanism, structure and stability of aldehyde and ketones.
3 Obtain the information regarding first transition series and their applications.
4 Understand the basic of electrochemical reactions and their construction.
5 Gain the detail knowledge of ‘d’ block elements and their variable oxidation states, which is of great interest for the formation of catalyst.

Pre-requisite of course: Students must have primary knowledge of organic chemistry and periodic table studied in 12th standard level along with basic knowledge of photochemistry and electrochemistry for the better understanding of the subject.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Photochemistry** Introduction, law of photochemistry: Grothus-Draper law, Lambert-Beers law, Stark-Einstein’s law, quantum efficiency and factors affecting quantum efficiency, quantum yield, reasons for low and high quantum yield, photo sensitization, photosensitized reactions, kinetics of HI decomposition, H2-Br2 reaction, dimerization of anthracene, decay of excited states by radiative and non-radiative paths, fluorescence and phosphorescence, Jablonsky diagram, chemiluminescence.	15

DR. VICKY DEVENDRA JAIN
Digitally signed by (Name of HOD)

DR. KANTHA DEVI ARUNACHALAM
Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
2	**Electromotive Force** Introduction, types of electrochemical cells and examples, half-cell, reversible and irreversible cell, convention sign, types of electrodes, cell reactions, representation of cell, emf of cell, emf series, thermodynamic derivation of Nernst equation. Standard cells, half-cells/electrodes, different types of electrodes (with examples), standard electrode potential (IUPAC convention) and principles of its determination, types of cells: electrolytic, galvanic and concentration cells, liquid junction potential and its minimization.	15
3	**Aldehyde and Ketone** Introduction, structure, nomenclature, nature of carbonyl group, methods of synthesis, preparation of ketones by use of organocopper compounds, physical properties, relative reactivities and distinction of aldehydes and ketones, nucleophilic addition, oxidation, reduction, addition of cyanide, addition of derivatives of ammonia, addition of alcohols, acetal formation, iodoform test, acidity of a–hydrogens, reactions involving carbanions, base-promoted halogenation of ketones, acid-catalysed halogenation of ketones: enolization, aldol condensation, dehydration of aldol products, use of aldol condensation in synthesis, crossed aldol condensation, Claisen condensation, Cannizzaro reaction, Perkin reaction, benzoin condensation reactions.	15
4	**Elements of the First Transition Series** Introduction and definition, electronic configuration, general comparison of 3d, 4d and 5d elements in term of electronic configuration, reversal of energies of 3d and 4s orbitals, physical properties: elemental forms, metallic nature, crystal structure, conductivity, density, catalytic properties and tendency of formation of alloys, effective nuclear charges, screening effects, slater's rules, atomic properties: atomic and ionic radii, atomization energy, oxidation states, redox properties and their stability, magnetic properties: spectral character, coordination chemistry, magnetic behavior and interstitial compounds.	15
Total Hours		**60**

Textbook :

1 A Textbook of Physical Chemistry, K. L. Kapoor, Macmillan, 2004

2 Organic Chemistry, S.M. Mukherji, S.P. Singh, R.P. Kapoor, R. Dass, New Age International Publishers, 2018

References:

1 An Introduction to Chemical Thermodynamics, An Introduction to Chemical Thermodynamics, R.P. Rastogi, R.R. Misra, Vikas Pub. Pvt. Ltd, 2009

2 Physical Chemistry, 3rd Edition, Physical Chemistry, 3rd Edition, G.W. Castellan, Narosa Publishing House, 2004

DR. VICKY DEVENDRA JAIN
Digitally signed by (Name of HOD)

DR. KANTHA DEVI ARUNACHALAM
Digitally signed by (Name of Dean/ Principal)

References:

3 Essentials of Physical Chemistry, Essentials of Physical Chemistry, A. Bahl, J. D. Tuli, S. Chand Publishing, 2019

4 Organic Reactions and their Mechanisms, Organic Reactions and their Mechanisms, P.S. Kalsi, New Age International Publishers, 2005

5 Organic Chemistry, Organic Chemistry, R.T. Morrison, R.N. Boyd, Pearson, 2011

6 Concise Inorganic Chemistry, 5thEdition, Concise Inorganic Chemistry, 5thEdition, J.D. Lee, Blackwell Science, London, 2009

7 Basic Inorganic Chemistry, 3rd Edition, Basic Inorganic Chemistry, 3rd Edition, F.A. Cotton, G. Wilkinson, Jhon Wiley & Sons, Inc. , 1995

8 Principles of Inorganic Chemistry, Principles of Inorganic Chemistry, B.R. Puri, L.R. Sharma, K.C. Kalia, Milestone Publishers, 2014

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
20.00	30.00	25.00	15.00	10.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the class-room.

3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses.

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

5 Measure progress in different ways, through projects, portfolios and participation.

6 Use visual cues, instructional videos, promote handwritten notes and allow time to students for questions.

Supplementary Resources:

1 http://nptel.ac.in/course.php?disciplineId=104

2 http://ocw.mit.edu/courses/chemistry/

3 http://vlab.amrita.edu/index.php?sub=2

4 http://www.vlab.co.in/ba_labs_all.php?id=9

5 https://www.khanacademy.org/science/chemistry

6 https://www.bozemanscience.com/ap-chemistry

7 https://chem.libretexts.org/

DR. VICKY DEVENDRA JAIN
Digitally signed by (Name of HOD)

DR. KANTHA DEVI ARUNACHALAM
Digitally signed by (Name of Dean/ Principal)