Syllabus for Bachelor of Science

Chemistry

Subject Code: 02CY0153

Subject Name: General Chemistry-II

B.Sc. Sem - II

Objectives:

- To understand the scope and principle of adsorption and water analysis.
- To explain the important features of amines with its classification and synthesis.
- To understand the classification of elements and periodicity in properties.
- To acquire knowledge regarding the second law of thermodynamics with Carnot cycle and heat engines.

Credits Earned: 4 Credits

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

- Understand the basic idea of water analysis and adsorption.
- Be aware with the classification of elements and periodicity in property.
- Capable to explain division of *s, p, d* and *f* blocks and their electronic configuration.
- Obtain the basic idea of second law of Thermodynamics.
- Get the idea of various thermochemical processes and their applications.

Pre-requisite of Course: Students should have basic conceptual clarity of chemistry at 12^{th} standard level. Student must have known the knowledge of thermodynamics laws and some basics of adsorption and water analysis studies.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term work (TW)	
4	0	0	4	50	30	20	0	0	100

Contents:

Unit	Topics	Contact Hours
1	**Adsorption and water analysis:** Introduction of adsorption, definition of adsorbent, adsorbate, adsorption, absorption, sorption, desorption, types of adsorptions, physical and chemical adsorption, difference between them, factor affection adsorption, adsorption isotherm, Freundlich and Langmuir adsorption isotherm. Water analysis, total solid and volatile solid, non-filterable solids and non-filterable volatile solids, filterable solids, total dissolved solid (TDS), total suspended solids (TSS), acidity, basicity, turbidity, hardness of water, soap method.	**15**
2	**Amines:** Introduction, definition and classification of amines, nomenclature of amines, properties: physical and chemical, preparation of amines: from reduction of nitro compounds, halides, Hoffmann degradation and alcohols, chemical reaction of amines: reaction with alkyl halides, acid chlorides, preparation of diazonium salt and its uses, sulphonation of aromatic amines.	**15**
3	**Classification of elements and periodicity in properties:** Introduction, Mendeleev's periodic law, modern periodic law, cause of periodicity, Bohr's table, structure features of Bohr's table, nomenclature, division of *s, p, d* and *f* blocks and their electronic configuration, periodic properties: atomic radius, ionic radii, ionisation potential and electronegativity.	**15**
4	**Second law of thermodynamics:** Introduction, process, spontaneous processes, nonspontaneous processes, criteria of spontaneity, statement of the second law, cyclic process, the Carnot cycle, heat engines, efficiency of a heat engine, first operation-isothermal reversible expansion, second operation-adiabatic reversible expansion, third operation-isothermal reversible compression, fourth operation-adiabatic reversible compression, net heat absorbed in one cycle, calculation of thermodynamic efficiency, Carnot theorem, entropy change in an irreversible process, the Clapeyron equation, Clausius–Clapeyron equation, numerical.	**15**
Total Hours		**60**

References:

1. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Blackwell Science Ltd., London. 2002
2. V.P. Kudesia, Water pollution, Pragati Prakashan, Meerut. 2001
3. B.S. Bahl, A. Bahl, A Textbook of Organic Chemistry. S. Chand Publishing. 2017
4. B.R. Puri, L.R. Sharma, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi. 2013
5. D.F. Shriver, P.W. Atkins, Inorganic Chemistry, 3rd Edition, Oxford University Press. 2010
6. K.L. Kapoor, A Textbook of Physical Chemistry, 3rd Edition, Macmillan India Ltd. 2013
7. R. P. Rastogi, R.R. Misra, An Introduction to Chemical Thermodynamics, 6th Edition, Vikas Pub. Pvt. Ltd. 2003
8. A. Bahl, J.D Tuli, Essentials of Physical Chemistry, 28th Edition, S. Chand Publishing. 2022

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as per 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	Understand	Apply	Analyze	Evaluate	Create
20%	30%	25%	15%	10%	-

Instructional Methods:

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, Virtual Laboratory.
4. Measure progress in different ways, through projects, portfolios and participation.
5. Use visual cues, instructional videos, promote handwritten notes and allow time to students for questions.

Supplementary Resources:

1. http://www.nptel.ac.in/courses/104103069/#
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/