MINOR ELECTIVE COURSE-UG
CHEMISTRY

(Semester Course for Undergraduate Students as per NEP-2020)

Syllabus for Sri Dev Suman Uttarakhand University
Campus and all Affiliated Colleges

Department of Chemistry

Sri Dev Suman Uttarakhand University,
Badsahithaul, Tehri (Garhwal), Uttarakhand

BOARD OF STUDIES IN CHEMISTRY

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Prof. Kuldeep Singh Negi Principal Govt. P.G. College, Khanpur, Haridwar			11.07.2023
Research Institution Director			
Director, USERC, Dehradun			11.07.23

Minor Chemistry course- U.G.

Semester-1 OR 2
Paper-1 (Theory)

Programme/Class: Certificate in Introductory Chemistry	Year: First	Semester: First/Second
		Paper-1 Theory Subject: Chemistry
Course Code:		Course Title: Basics of Chemistry-I

Course outcomes: Upon completion of this course, the students will able to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed at an entry-level position in chemical industry or a chemistry graduate program. Students will have theoretical aspect of periodic trends of the periodic table, provide chemists with an invaluable tool to quickly predict an element's properties. Upon successful completion of this course, the students will be able to understand aliphatic, aromatic compounds functional groups in covalent compounds.

Credits:4	Minor
Max. Marks: 25+75	Min. Passing Marks:.....

Total Number of Lectures = 60

Unit	Contents	Number of Lectures
1	**Analytical approaches:** Types of errors, precision & accuracy, absolute and relative uncertainty. Significant figures; significant figures in Arithmatics-addition, subtraction, multiplication and division. Mean and standard deviation.	10
2	**Laboratory Apparatus:** Laboratory burner; Bunsen burner, air flow regulation, obtaining warm gentle flame with the burner, hottest flame of the burner.	5
3	**Steps in Chemical Analysis:** Sampling, sample preparation, analysis, interpretation and preparation of report.	5
4	**Use of Measuring Equipments:** Pipette, burette, chemical balance, least count.	5
5	**Thermochemistry**: Energy changes in chemical reactions, Enthalpy, specific heat, heat capacity- constant volume and constant pressure, Standard enthalpy of formation and reactions	5
6	**Atom and Molecules:** Bohr's Atomic theory (only postulates), structure of an atom; nuclear particles, atomic number, mass number and Isotopes, Atomic orbitals, filling of electrons in various orbitals-Aufbau energy diagram, Pauli's Exclusion Principle, Hund's rule of maximum multiplicity .	7

7	**Ions, Molecules, bonding, molar mass and chemical reactions** Ions, ionic bond and ionic compounds, Chemical equations, Reactions in aqueous medium- Arrhenius theory of acids and bases, Acid-Base reaction, definition of acid and base, neutralization, Oxidation Reduction reactions-oxidation number, Molecules and chemical formulae, molar mass, molar mass and Avogadro's number, Covalent compounds-bonding, VSEPR concept and geometry, Valence Bond theory, Hybridization, geometry of covalent molecules, Hydrogen bonding	8
8	**Periodic Properties:** Periodic table and periodic law, periodic classification of the elements, Periodic relationship among the elements, periodic properties-atomic size, ionization energy, electron affinity, electronegativity	5
9	**Hydrocarbons, functional groups**: Alkanes, alkenes, alkynes, aromatic hydrocarbons. Homologous series, Preparation and properties of ethene and ethyne. Functional groups in organic compounds-alcohols, ethers, aldehydes, ketones and carboxylic acids	5
10	**Environmental chemistry:** Atmospheric pollution, Ozone layer depletion, Acid rain, Greenhouse effect, smog, water pollution, soil pollution, green chemistry	5

Recommended Texts:

1. Nivaldo, J. and Tro, Ho Yu Au-Yeung, Introductory Chemistry, Pearson India Education, 2017, 5th edition.
2. Timberlake, K. C., and Timberlake, W., Basic Chemistry, Pearson India Education, 2017, 4th edition.
3. Pavia, D.L., Lampman, G. M., Kriz, G. S, and Engel, R.G., Microscale and Macroscale Techniques in the Organic Laboratory, Harcourt College Publishers, 2001, 1st edition.
4. Harris, D. C., Exploring Chemical Analysis, W. H. Freeman and Company, New York, 1993, 4th edition.
5. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman and Company, New York, 2010, 8th edition.
6. Lee, J.D., "Concise, Inorganic Chemistry", Oxford University Press, 2008, India, 5 th edition.
7. Puri, B.R., Sharma, L.R., and Kalia, K.C., "Principles of Inorganic Chemistry", Vishal Publishing Co., India, 2020, 33rd edition.
8. Madan, R.L., "Chemistry for Degree Students, B. Sc. First Year", S. Chand Publishing, New Delhi, India, 2011, 3rd edition.
9. Madan, R.D., Malik, U.M. and Tuli, G.D., "Selected topics in Inorganic Chemistry", S. Chand Publishing, New Delhi, India, 2010

10. Boyd, Morrison and Bhattacharjee, "Organic Chemistry", Pearson Education India, 2010, 7th edition.
11. Mukherji, S.M., "Reaction mechanism in Organic Chemistry", Laxmi Publications, 2007, 3rd edition.
12. Environmental Chemistry., Anil. K. De and Arnab De; New Age International pvt. publication. 2019
13. An introduction to green chemistry, V.Kumar , Vishal Publishing Company, Jalandhar, 2015.
14. Fundamentals of Chemistry I, Jagdamba Singh, Baniwal, Seema, Joshi R.K, Joshi, G, Bisht Anuradha; Pragati Prakashan. 2022.

Suggestive digital platforms web links

https://www.labster.com/chemistry-virtual-labs/
https://www.vlab.co.in/broad-area-chemical-sciences
http://chemcollective.org/vlabs

Suggested Continuous Evaluation Methods: Students can be evaluated on the basis of score obtained in a mid-term exam, together with the performance of other activities which can include short exams, in-class or on-line tests, home assignments, group discussions or oral presentations.

Evaluation method	Marks
Mid-term exam/ in-class or on-line tests/ home assignments/ group discussions/ oral presentations	15 marks
Overall performance throughout the semester, Discipline, participation in different activities)	05 marks
Attendance	05 marks

Suggested equivalent online courses:

Further Suggestions: .....

Minor Chemistry courses

Semester-3 OR 4

Paper-2 (Theory)

Programme/Class: Certificate in Introductory Chemistry	Year: SECOND	Semester: THIRD/FOURTH
		Paper-2 Theory Subject: Chemistry
Course Code:	**Course Title:** Basics of Chemistry-II	

Course outcomes: Upon completion of this course, the students will able to understand the analytical principles behind melting, boiling, distillation and extraction.
The course will also strengthen the knowledge of students regarding complete picture of states of matter that includes gaseous, liquid, solid and colloidal states. This course will give students a broad picture of chemistry around us.

Credits:4	Minor
Max. Marks: 25+75	Min. Passing Marks: .....

Total Number of Lectures = 60

S. No.	Contents	Contact Hours/ Lectures
1	**Physical Constants:** Melting points, melting point theory, mixture melting point, packing of melting point tube, Determination of melting point; decomposition, discoloration, softening, shrinking and sublimation. Boiling point, determination of boiling point, use of boiling chips, calibration of thermometer.	10
2	**Distillation:** Simple distillation, distillation theory, fractional distillation, difference between simple and fractional distillation	5
3	**Electronegativity and polarization of covalent bond;** inductive, mesomeric, electromeric effect, hydrogen bonding and its significance Polymers-definition, properties, polyethylene-preparation	8
4	**Electromagnetic Radiation:** Properties, absorption of light, transmittance, absorbance and Beer's and lambert's Law.	5
5	**Gaseous State:** Pressure of a gas, pressure volume relationship-Boyle's law, the temperature volume relationship-Charles's law, Ideal gas equation	8
6	**Solution:** Solution, colloidal solution, Tyndall effect, Brownian movement, Emulsion	5
7	**Solubility and Extraction:** Solubility-Definition, predicting solubility behaviour, water as a solvent, organic solvents. Extraction-Theory, distribution coefficient, separation	5
8	**Chemical Concentration:** Normality, molarity, preparation of solution of defines normality/molarity of a given compound and	8

	from a given solution of different strength, percent composition, part per million (ppm), part per billion (ppb), calculations.	
9	**Applied Chemistry**: Chemistry around us as drugs, dyes, polymers, medicines, hormones, Food, beverages, colour, fragrances, Chemicals, fertilizers, paint, cosmetics, alloys.	5

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2. Timberlake, K. C., and Timberlake, W., Basic Chemistry, Pearson India Education, 2017, 4th edition.
3. Pavia, D.L., Lampman, G. M., Kriz, G. S, and Engel, R.G., Microscale and Macroscale Techniques in the Organic Laboratory, Harcourt College Publishers, 2001, 1st edition.
4. Harris, D. C., Exploring Chemical Analysis, W. H. Freeman and Company, New York, 1993, 4th edition.
5. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman and Company, New York, 2010, 8th edition. Company, New York.
6. Puri, B.R., Pathania, M.S. and Sharma, L.R., "Principles of Physical Chemistry", Vishal Publishing, India, 2020, 47th edition
7. Bahl, A., Bahl, B.S. and Tuli, G.D., "Essential of Physical Chemistry", S. Chand Publishing, India, 2010.
8. Fundamental Concepts Of Applied Chemistry, Ghosh Jayshree; S Chand and company; 2010
9. Synthetic Organic Chemistry; Chatwal Gurdeep. R.; Himalaya Publishing House; 2007

Suggestive digital platforms web links

https://www.labster.com/chemistry-virtual-labs/
https://www.vlab.co.in/broad-area-chemical-sciences
http://chemcollective.org/vlabs
https://onlinecourses.swayam2.ac.in/ugc19_bt16/preview

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Attendance	05 marks

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Further Suggestions: .....