

TDC (CBCS) Programme Outcomes (From Academic Year: 2018-2019)

1. B. Sc. Honours with Chemistry (*Honours Course*).
2. B. Sc. with Chemistry (*General Course*).

Programme Outcomes of B. Sc. with Chemistry Honours (Honours Course)

After completing the programme,

- The students shall gain the foundation and concepts in Chemistry in general. They will learn to think in a critical manner
- The students shall be able to relate the basic knowledge of Chemistry to the broad understanding of life and industrial processes.
- Students will develop the proficiency in acquisition of data using variety of laboratory instruments and in the analysis and interpretation of such data.
- Students should learn how to design and conduct an experiment (or series of experiment) demonstrating their understanding of scientific method and process.
- Students are also expected to understand the analytical methods required to interpret and analyze results and draw logical conclusions as supported by their data using the principles of chemical and basic sciences.

1st Semester (Honours)

Course No.: **CHMHCC-101T**
(*Atomic Structure & Chemical Bonding*)

Course Outcomes

After successful completion of the course, student will be able to

- **Define** and get the detailed idea of atomic structure, their periodicity and chemical bonding along with redox reactions.
- **Explain** the principle and apply the knowledge for solving the problems related to their structure and bonding.
- **Apply** the idea to interpret changes in properties along the periods and group.

- **Analyze** the details of electrode potential as well as to critically determine Fe by volumetric analysis.

Course No.: **CHMHCC-102T**
(*States of Matter & Ionic Equilibrium*)

Course Outcomes

After successful completion of the course, student will be able to

- **Relate** the ideal and non-ideal behaviors of (real) gas, critical phenomena of gases, and properties of solids.
- **Explain** the properties of liquid and different types of electrolytes.
- **Apply** the concepts of solubility product concepts in qualitative analysis.
- **Analyze** the knowledge of acids, bases and salts.

Course No.: **CHMHCC-103L**
(*Practical*)

Course Outcomes

After successful completion of the course, student will be able to

- **Outline** the application of various apparatus.
- **Show** the preparation of solutions of different concentration units.
- **Demonstrate** the estimation of Fe by redox titrimetry.

Course No.: **CHMHCC-104L**
(*Practical*)

Course Outcomes

After successful completion of the course, student will be able to

- **Show** the pH-metric titrations that are useful in modern applied chemistry
- **Demonstrate** the preparation of various buffer solutions
- **Identify** the transition temperature of inorganic salts.
- **Inspect** and determine the surface tension of various mixtures.
- **Examine** acid-base pH-metric titration.

2nd Semester (Honours)

Course No.: **CHMHCC-201T**
(*Hydrocarbons and Stereochemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Illustrate** different parameters like resonance, inductive effect, aromaticity etc. which is vital to understand the chemical reaction
- **Apply** the concept of addition, elimination, substitution reaction mechanisms in establishing the product.
- **Identify** the stereochemistry of different synthetic molecules.
- **Examine** the conformations of cycloalkanes.

Course No.: **CHMHCC-203L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Apply** the chromatographic techniques to separate organic compounds.
- **Illustrate** the purification of different organic compounds.
- **Make use** of the paper chromatography in determination of R_f values of mixtures.

Course No.: **CHMHCC-202T**
(*Chemical Thermodynamics and its Applications*)

Course Outcomes

After successful completion of the course, students will be able to

- **Define** the thermodynamics terms.
- **Relate** the concept of free energy and spontaneity.
- **Apply** the concept in problem solving related to colligative properties and thermodynamics
- **Analyze** the changes in thermodynamic functions in ideal gas mixtures.

Course No.: CHMHCC-204L
(Practical)

Course Outcomes

After successful completion of the course, students will be able to

- **Show** the solubility of benzoic acid at different temperatures.
- **Demonstrate** the molecular mass by transition point method.
- **Experiment** with Abbe refractometer to find the refractive index.
- **Examine** the viscosity of solutions at different concentrations.

3rd Semester (Honsours)

Course No.: CHMHCC-301T
(s-, p- block Elements and Metallurgy)

Course Outcomes

After successful completion of the course, student will be able to

- **Recall** the general principles of metallurgy.
- **Explain** the chemistry of s- and p-block elements and their compounds.
- **Apply** the knowledge of VB, VSEPR and MO theory to analyze the structure of noble gas compounds.
- **Examine** the properties of acids and bases; and inorganic polymers.

Course No.: CHMHCC-304L
(Practical)

Course Outcomes

After successful completion of the course, students will be able to

- **Find** the amount of elements by iodo- and iodimetrically.
- **Illustrate** the preparation of inorganic compounds.

Course No.: **CHMHCC-302T**
(*Halogen and Oxygen Containing Functional Groups*)

Course Outcomes

After successful completion of the course, students will be able to

- **Understand** the chemistry of organic compounds.
- **Outline** the preparation and reactions mechanism of various organic compounds.
- **Construct** the synthesis of organometallic compounds.
- **Analyze** the physical and chemical properties of organic compounds.

Course No.: **CHMHCC-305L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Choose** a conventional method to synthesize the desired compounds.
- **Develop** a green approach for preparation of various organic compounds.
- **Make use** of the functional group analysis to detect simple organic compounds.

Course No.: **CHMHCC-303T**
(*Phase Equilibria and Chemical Kinetics*)

Course Outcomes

After successful completion of the course, students will be able to

- **Recall** the concepts of chemical kinetics, phase equilibria, adsorption and catalysis.
- **Explain** basic principles of phase rule, rate laws, catalysis and surface phenomena.
- **Apply** Langmuir, Freundlich, BET equations to attainment of Adsorption isotherms.
- **Construct** reaction mechanism using steady-state approximation.
- **Analyze** different mechanisms of catalyzed reactions.

Course No.: **CHMHCC-306L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Apply** the concept of distribution method to calculate equilibrium.
- **Make use** of the kinetics to study the acid hydrolysis, saponification and adsorption.

Course No.: **CHMSEC-301T**
Analytical Clinical Biochemistry

Course Outcomes

After successful completion of the course, students will be able to

- **Explain** the importance of biomolecules.
- **Classify** the biomolecules.
- **Analyze** the functions of biomolecules.
- **Examine** the composition of bodily fluids.
- **Identify** the molecules through experiments.

4th Semester (Honours)

Course No.: **CHMHCC-401T**
(*Coordination Chemistry and its Applications*)

Course Outcomes

After successful completion of the course, students will be able to

- **Recall** the detailed idea of structure, bonding and property of coordination compounds, transition elements, lanthanoids and actinoids.
- **Demonstrate** the knowledge of coordination compounds to solve the problems related to their structure, stability and reactivity.
- **Identify** the actions of metal ions in biological system.
- **Analyze** the physical, chemical and magnetic properties of d- and f-block elements.

Course No.: **CHMHCC-402T**
(*Heterocyclic Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Recall** the basic Chemistry of nitrogen containing compounds.
- **Outline** structure elucidation methods of important compounds.
- **Identify** the synthesis and reaction mechanisms of significant reactions
- **Distinguish** between 1°, 2° and 3°amines.

Course No.: **CHMHCC-403T**
(*Electrochemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Relate** the concepts of electrolytic conduction and electrode potential.
- **Explain** the electrical and magnetic properties of atoms and molecules.
- **Apply** the concept of Nernst equation to calculate EMF of cells.
- **Compare** the conductivity, equivalent and molar conductivity for weak and strong electrolytes.

Course No.: **CHMHCC-404L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Experiment with** gravimetric analysis of elements present in a compound.
- **Demonstrate** sample preparation and purity of the sample.

Course No.: **CHMHCC-405L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Demonstrate** the detection of special elements.
- **Make use** of the functional group analysis of simple organic compounds to synthesize different derivatives of simple organic molecules.

Course No.: **CHMHCC-406L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Show** the conductometric titrations that are useful in modern applied chemistry.
- **Demonstrate** the pH-metric titration.
- **Apply** conductometry to verify Onsager equation.
- **Utilize** potentiometric titration to determine redox potential of Fe (II)- Fe (III) system.

Course No.: **CHMSEC-401**
(*Fuel Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Outline** different sources of energy.
- **Categorize** the fuels and explain their applications.
- **Assess** the byproducts of petrochemicals.

5th Semester (Honours)

Course No.: **CHMHCC-501T**
(*Biomolecules*)

Course Outcomes

After successful completion of the course, students will be able to

- **Relate** the knowledge of biomolecules to their importance in living systems.
- **Demonstrate** the salient features of biomolecules.
- **Apply** the various phenomena in the field of biochemistry and pharmaceutical chemistry.
- **Examine** the medicinal properties of several natural products.

Course No.: **CHMHCC-502T**
(*Quantum Chemistry & Spectroscopy*)

Course Outcomes

After successful completion of the course, students will be able to

- **Define** the postulates and interpret the basic principles of quantum mechanics.
- **Apply** quantum mechanical treatment to various models.
- **Analyze** and **Explain** the various types of molecular spectra.
- **Explain** principle of photochemical processes.

Course No.: **CHMHCC-503L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Demonstrate** the organic synthesis of various compounds.
- **Experiment** with colorimeter for estimation of biomolecules.
- **Analyze** the determination of ester quantitatively.

Course No.: **CHMHCC-504L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Interpret** the concentration of unknown solution using Lambert-Beer's law.
- **Experiment with** the kinetics study of reactions.
- **Analyze** the concentrations of potassium compounds in mixture.
- **Explain** the process of dissociation constant of indicator.

Course No.: **CHMDSE-501T**
(*Analytical Methods in Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Relate** the importance of chemical analysis with instrumental techniques
- **Explain** the concept of separation techniques and chromatographic techniques.
- **Analyze** the accuracy and types of errors in experimental data.
- **Compare** the techniques to get desired information.

Course No.: **CHMDSE-502L**
Practical

Course Outcomes

After successful completion of the course, students will be able to

- **Find** DO and COD in water.
- **Interpret** the ion exchange chromatography in separation technique.
- **Analyze** the quality of soil.
- **Determine** the presence of elements in drinks and juices.

Course No.: **CHMDSE-503T**
Green Chemistry

Course Outcomes

After successful completion of the course, students will be able to

- **Define** green chemistry and **outline** its importance.
- **Explain** the twelve principles of green chemistry and will build the basic understanding of toxicity, hazard, and risk of chemical substances.
- **Summarize** the innovative approaches of green synthesis.
- **Analyze** various chemical products and processes that are less toxic, than current alternatives.

Course No.: **CHMDSE-504L**
(Practical)

Course Outcomes

After successful completion of the course, students will be able to

- **Choose** renewable resources to prepare biofuel.
- **Demonstrate** various green reactions.
- **Select** safer starting materials to study a reaction.

6th Semester (Honours)

Course No.: **CHMHCC-601T**
(Organometallic Chemistry)

Course Outcomes

After successful completion of the course, students will be able to

- **Understand** the principles involved in qualitative analysis.
- **Build** mechanisms of catalysis and **apply** catalytic process in industries.
- **Determine** the structures of important inorganic compounds.
- **Construct** reaction mechanism and **measure** the thermodynamics of inorganic reactions.

Course No.: **CHMHCC-602T**
(Spectroscopy, Carbohydrates, Dyes and Polymers)

Course Outcomes

After successful completion of the course, students will be able to

- **Label** the configuration and conformation of carbohydrate molecules.
- **Apply** the knowledge of spectroscopy to analyze the structure of compounds.
- **Determine** the degree of polymerization and molecular weights of polymers
- **Discuss** the synthesis and applications of Azo dyes.

Course No.: **CHMHCC-603L**
(Practical)

Course Outcomes

After successful completion of the course, students will be able to

- **Outline** and **construct** schemes for qualitative analysis containing 6 ions.

Course No.: **CHMHCC-604L**
(Practical)

Course Outcomes

After successful completion of the course, students will be able to

- **Classify** carbohydrate molecules based on chemical analysis.
- **Identify** simple organic compounds.
- **Construct** the preparation methods for organic compounds and dyes.

Course No.: **CHMDSE-601T**
Inorganic Materials of Industrial Importance

Course Outcomes

After successful completion of the course, students will be able to

- **Find** sound knowledge on various engineering materials like glass, ceramics, cements, etc.
- **Explain** the various processes for the preparation of fertilizers, alloys etc.

- **Construct** batteries and cells.
- **Analyze** and apply the concepts of industrial chemistry to explore new innovative engineering materials like surface coatings.

Course No.: **CHMDSE-602L**
Practical

Course Outcomes

After successful completion of the course, students will be able to

- **Determine** the amount of calcium and level of acidity in fertilizer.
- **Estimate** composition of dolomite.
- **Identify** the coating materials.
- **Analyze** the composite elements of alloys and cement.

Course No.: **CHMDSE-603P**
Dissertation
(Project Work)

Course Outcomes

After successful completion of the course, students will be able to

- **Choose** a project, **explain** the theories, **experiment with** various instruments to **build** a conclusion based on data and **plan** its future prospective.

B. Sc. with CHEMISTRY (General Course)

1st Semester (General)

Course No.: **CHMDSC/GEC-101T**

*Atomic Structure, Bonding,
General Organic Chemistry and Aliphatic Hydrocarbons*

Course Outcomes

After successful completion of the course, students will be able to

- **Recall** the concepts of quantum theory.
- **Explain** the theories of chemical bonding.
- **Illustrate** the fundamentals of organic molecules.
- **Analyze** the reactions of organic molecules.

Course No.: **CHMDSC/GEC-102L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Demonstrate** the estimation of elements and compounds by titration.
- **Identify** the components of mixture by chromatography.
- **Assess** the composition of organic compounds.

2nd Semester (General)

Course No.: **CHMDSC/GEC-201T**
(*Chemical Energetics, Equilibria and Functional Organic Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Recall** the concept of thermodynamics, electrolytes and organic compounds.

- **Explain** the organic synthesis and named reactions.
- **Apply** the concept in problem solving related to thermodynamics and stereochemistry.

Course No.: **CHMDSC/GEC-202L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Show** the pH-metric measurements of different liquids.
- **Demonstrate** the preparation of various buffer solutions.
- **Apply** the concept in thermochemistry to calculate thermodynamic parameters.
- **Determine** the melting and boiling points of organic compounds.

3rd Semester (General)

Course No.: **CHMDSC/GEC-301T**
(*Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II*)

Course Outcomes

After successful completion of the course, students will be able to

- **Explain** basic principles of phase rule, solution, conductance, electrochemistry and organic chemistry.
- **Identify** the configuration of sugar molecules.
- **Apply** the concept in Nernst equation to calculate thermodynamic properties of cells.
- **Predict** the product formed in various organic reactions.

Course No.: **CHMDSC/GEC-302L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Illustrate** the detection of functional groups present in organic compounds.
- **Construction** of the phase diagram and **determine** the CST and MST.
- **Determine** the cell constant by conductance measurements.
- **Measure** the point of neutralisation via conductometric titration.

Course No.: **CHMSEC-301T**
(*Analytical Clinical Biochemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Explain** the importance of biomolecules.
- **Classify** the biomolecules.
- **Analyze** the functions of biomolecules.
- **Examine** the composition of bodily fluids.
- **Identify** the molecules through experiments.

4th Semester (General)

Course No.: **CHMDSC/GEC-401T**

(*Transition metals, Coordination Chemistry, States of Matter and Chemical Kinetics*)

Course Outcomes

After successful completion of the course, students will be able to

- **Define** the VBT and CFT to **understand** chemistry of coordinate compounds.
- **Illustrate** Kinetic theory of gases to critically analyze gaseous behaviours.
- **Apply** the chemistry of transition elements for understanding of their properties.

- **Analyze** the basic properties of solids and liquids.
- **Inspect** the reaction kinetics and advanced theories of molecular reactions.

Course No.: **CHMDSC/GEC-402L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Demonstrate** the Semi-micro qualitative analysis.
- **Experiment with** Job's method.
- **Apply** gravimetry, Flame Photometry and complexometric titrations to carry out various estimations.
- **Compare** the strengths of two acids by kinetic study.
- **Assess** the physical properties of liquids.

Course No.: **CHMSEC-401T**
(*Fuel Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Outline** different sources of energy.
- **Categorize** the fuels and explain their applications.

Assess the byproducts of petrochemicals.

5th Semester (General)

Course No.: **CHMDSE-501T**
(*Analytical Methods in Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Define** qualitative and quantitative estimation of samples in terms of analytical data.

- **Apply** the knowledge of molecular spectroscopic techniques to **analyze** samples.
- **Select** a separation technique depending on nature of sample mixtures.
- **Inspect** the atomic spectroscopic techniques for quantitative analysis.
- **Outline** the thermal and electro-analytical methods.

Course No.: **CHMDSE-502L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Show** the chromatographic separation of ions, sugars from a sample and pigments and active ingredients of plants.
- **Demonstrate** the estimation of DO and COD in water samples.
- **Experiment** with photometer and pH meter.

Course No.: **CHMSEC-501T**
(*Chemistry of Cosmetics and Perfumes*)

Course Outcomes

After successful completion of the course, students will be able to

- **Define** the products used in cosmetics and perfumes.
- **Explain** the importance of essential oils in cosmetic industry.
- **Inspect** different types of creams.
- **Evaluate** the preparation methods for various cosmetic products.

6th Semester (General)

Course No.: **CHMDSE-601T**
(*Inorganic Materials of Industrial Importance*)

Course Outcomes

After successful completion of the course, students will be able to

- **Find** sound knowledge on various engineering materials like glass, ceramics, cements, etc.
- **Explain** the various processes for the preparation of fertilizers, alloys etc.
- **Construct** batteries and cells.
- **Analyze** and apply the concepts of industrial chemistry to explore new innovative engineering materials like surface coatings.

Course No.: **CHMDSE-602L**
(*Practical*)

Course Outcomes

After successful completion of the course, students will be able to

- **Determine** the amount of calcium and level of acidity in fertilizer.
- **Estimate** composition of dolomite.
- **Identify** the coating materials.
- **Analyze** the composite elements of alloys and cement.

Course No.: **CHMSEC-601T**
(*Pesticide Chemistry*)

Course Outcomes

After successful completion of the course, students will be able to

- **Define** pesticides and explain their classification.
- **Outline** the advantages and disadvantages of pesticides.
- **Compare** pesticides and formulation in terms of environmental sustainability.
- **Assess** the structure and mode of activity of significant insecticides.
- **Discuss** commercially available pesticides.