Department of Chemistry

Suren Das College, Hajo, Kamrup, Assam

Program Outcome, Program Specific Outcome

Non CBCS Core-Course under Gauhati University

B. Sc. Chemistry (Non-CBCS)

Program Outcomes (POs)

Department of Chemistry	After successfully completion of three years degree program in Chemistry under non CBCS, a student should be able to
Program Outcomes (POs)	**POs-1.** To impart knowledge of General Chemistry covering all the aspects viz. inorganic, organic, physical and analytical Chemistry. **POs-2.** Solve the problem and also think methodically, independently and draw a logical conclusion. **POs-3.** Employ critical thinking and the scientific knowledge to design, carry out, record and analyse the results of chemical reactions. **POs-4.** Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community. **POs-5.** Find out the green route for chemical reaction for sustainable development. **POs-6.** To inculcate the scientific temperament in the students and outside the scientific community.

Semester-I

PAPER M 101 Physical Chemistry **(**Credits: Theory-06, Lab-04)

PAPER M 102 Organic Chemistry **(**Credits: Theory-06)

Semester-II

PAPER M 201 Physical Chemistry (Credits: Theory-06)

PAPER M 202 Organic Chemistry (Credits: Theory-06, Lab-04)

Semester-III

PAPER M 301 Structure and Bonding (Credits: Theory-06, Lab-04)

PAPER M 302 Chemical Bonding (Credits: Theory-06)

Semester-IV

PAPER M 401 Inorganic Chemistry I (Credits: Theory-06)

PAPER M 402 Inorganic Chemistry II (Credits: Theory-06, Lab-04)

Semester-V

PAPER M 501: Quantum Chemistry (Credits: Theory-06, Lab-02)

PAPER M 502 Physical Chemistry (Credits: Theory-06, Lab-02)

PAPER M 503 Organic Chemistry (Credits: Theory-06, Lab -04)

PAPER M 504 Inorganic Chemistry (Credits: Theory-06, Lab -04)

Semester-VI

PAPER M 601 Spectroscopy (Credits: Theory-06)

PAPER M 602 Physical Chemistry (Credits: Theory-06, Lab -04)

PAPER M 603 Organic Chemistry (Credits: Theory-06)

PAPER M 604 Inorganic Chemistry (Credits: Theory-06)

Programme Specific Outcomes (Chemistry Core non-CBCS)

Programme Specific Outcomes (PSOs)	**PSOs-1.** Gain the knowledge of Chemistry through theory and practicals. **PSOs-2.** To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions. **PSOs-3.** Identify chemical formula and solve numerical problems. **PSOs-4.** Use modern chemical tools, Models, UV Spectrophotometer, Chemdraw, Charts and Equipments. **PSOs-5.** Know structure-activity relationship. **PSOs-6.** Understand good laboratory practices and safety. **PSOs-7.** Develop research-oriented skills. **PSOs-8.** Make aware and handle the sophisticated instruments/equipments.

Course Outcomes (Chemistry Core non-CBCS)

Semester-I	
Course	**Outcome** (After completion of these courses students should be able to)
PAPER M 101	**CO-1.** The students will understand the principles of Chemical

Physical Chemistry	thermodynamics, first law and second law. **CO-2.** To know about the concept of entropy. **CO-3.** Understanding will be gained on the concept of rate constant and rate law. **CO-4.** The laboratory course will help the students to understand the column chromatography, adsorption, conductometry.
PAPER M 102 Organic Chemistry	**CO-1.** The students will learn about the IUPAC nomenclature of Organic compounds. **CO-2.** The students will able to understand the bond length, bond angle, bond energy. **CO-3.** Conformational and configurational isomers will be understood. **CO-4.** The students will learn the basic of optical activity, asymmetry, dissymmetry or chirality, racemic modification.
Semester-II	
Course	**Outcome** (After completion of these courses students should be able to)
PAPER M 201 Physical Chemistry	**CO-1.** The students will learn the ideal behaviour of gases, van der Waals equations of state. **CO-2.** The students will able to understand the kinetic gas theory. **CO-3.** Students will be able to explain/analyze the principle of equipartition of energy. **CO-4.** Knowledge will be gained on the Debye-Huckel-Onsager equation, Stokes-Einstein relation. **CO-5.** The basic concept will be understood on electrochemical cells, Nernst equations.
PAPER M 202 Organic Chemistry	**CO-1.** Students will learn about the conformation of ethane, ethane, butane, cyclohexane. **CO-2.** The students will be able to understand the mechanism of electrophilic aromatic substitution. **CO-3.** The students will be able to understand the mechanism of nucleophilic aromatic substitution. **CO-4.** The laboratory course will help the students to practically determine the different unknown organic compounds.
Semester-III	

Course	Outcome (After completion of these courses students should be able to)
PAPER M 301 Structure and Bonding	**CO-1.** Students will learn about the basic quantum mechanical ideas and principles leading to atomic structure. **CO-2.** Students will be able to understand the postulates and explanation for black body radiation. **CO-3.** Students will be able to gain knowledge on the dual character of particles. **CO-4.** Definition of micro and macro particles.
PAPER M 302 Chemical Bonding	**CO-1.** The students will be able to gather knowledge on the chemistry of Valence bond approach to bonding in diatomic molecules outline of concept of overlap (HF and H_2). **CO-2.** Students will be able to describe Bond moments and dipole moments. **CO-3.** Concept of electro negativity -explanation of molecular properties on the basis of electro negativity. **CO-4.** Shapes of molecules- VSEPR theory. **CO-5.** Students will learn about the Molecular orbital theory of homonuclear diatomic molecules (N_2, O_2, F_2, CO, NO etc). **CO-6.** In laboratory experiments, students will learn about the inorganic salt analysis/preparation.
Semester-IV	
Course	**Outcome** (After completion of these courses students should be able to)
PAPER M 401 Inorganic Chemistry I	**CO-1.** Students will be able to understand the groupwise and period wise trends in physical and chemical properties of elements and their compounds. **CO-2.** Students will be able to learned Ionization energy and electron affinity of atoms. **CO-3.** Non aqueous solvents: liquid ammonia, liquid sulphur dioxide, liquid HF and liquid N_2O_4.
PAPER M 402 Inorganic Chemistry II	**CO-1.** Students shall demonstrate the ability to describe the non transition compounds. **CO-2.** Students will gain knowledge on noble gas compounds-xenon oxides and fluorides. **CO-3.** Students will be able to gain knowledge on electronic configuration and general periodic trends, comparative study of first transition series

	elements, preparation, properties and reactivity of oxides. **CO-4.** Coordination Compounds: Werner's theory, structural and stereo isomers of complex compounds, survey of different types of ligands, IUPAC nomenclature of coordination compounds. **CO-5.** Through the experiments students will also be able to know the hardness of water by EDTA and preparation of inorganic compounds.
Semester-V	
Course	**Outcome** (After completion of these courses students should be able to)
PAPER M 501: Quantum Chemistry	**CO-1.** Through this course the students will be introduced to black body radiations, photoelectric effect and Compton effect. **CO-2.** Students will be introduced to the importance of Wave functions, Operators, eigen functions and eigen values. **CO-3**. Students will able to understand Schrodinger wave equation. **CO-4**. Model system (both 1-D & 3-D boxes) particles in a ring. **CO-5**. The Hamiltonian and Schrodinger equation for hydrogen atom, energy levels and quantum numbers.
PAPER M 502 Physical Chemistry	**CO-1.** Students will be able to explain/describe the important features of Collision theory, activated complex theory; Eyring equation – thermodynamic formulation. **CO-2.** Theory of unimolecular reactions (Lindemann) – dynamic molecular collisions. **CO-3.** Laws of photochemical equivalence, quantum yield, chemical kinetics of H_2-Br_2, H_2-Cl_2 reaction. **CO-4**. Definition of phase, meaning of components and degrees of freedom. Derivation of phase rule. Phase diagram of one component system (water).
PAPER M 503 Organic Chemistry	**CO-1.** The course helps in introducing the student's different organic mechanism (witting reaction, Whitmore 1,2 Shift, Wagner-Meerwein, Wolff, Hofmann, Lossen, Curtius, Schmidt, Beckman, Favorskii, Benzil- benzilic acid, Baeyer Villiger. **CO-2.** Fries rearrangement (aromatic electrophilic substitution). **CO-3.** The students will able to understand direct electron transfer: Clemmensen (Nakabayashi mechanism).

	CO-4. The students will able to understand the basics addition- elimination reactions. **CO-5.** Experiments in this course will boost their knowledge on UV-visible spectroscopic technique and Colourimetry
PAPER M 504 Inorganic Chemistry	**CO-1.** Students will able to understand on the topic of group theory, symmetry elements and symmetry operation, point group classification. **CO-2**. Students will able to understand Crystal field theory and ligand field theory and their application. **CO-3.** Molecular orbital theory of octahedral complexes (without and with p bonding). **CO-4.** Some important homogeneous catalysis by transition metal complexes (isomerization, hydrogenation, hydroformylation and Ziegler-Natta Polymerization).
Semester-VI	
Course	**Outcome** (After completion of these courses students should be able to)
PAPER M 601 Spectroscopy	**CO-1.** The course helps in introducing the students with three important areas-molecular spectroscopy **CO-2.** Interaction between spin and magnetic field – Nuclear spin – Nuclear magnetic resonance spectroscopy. **CO-3.** In spectroscopy unit, rotational, vibrational, Raman, electronic, spin resonance, and electronic spectroscopy are introduced. **CO-4.** The students will able to understand the basics of various aspects of photochemistry. **CO-5.** Experiments in this course will boost their knowledge on UV-visible spectroscopic technique and Colourimetry CO-6. Students will gain knowledge on the topic of mass spectroscopy.
PAPER M 602 Physical Chemistry	**CO-1.** Students will learn about the laws of Crystallography, Miller indices etc. **CO-2.** Students shall be learning about Bragg's equation. **CO-3.** Students will learn about Schottky and Frenkel defects. **CO-4.** Macromolecules and colloids and the difference between the p-type, n-type semiconductors will be learned. **CO-5**. Able to understand Molecular energy levels and Boltzmann

	distribution, molecular partition function. **CO-6.** Translational, rotational and vibrational partition functions.
PAPER M 603 Organic Chemistry	**CO-1.** Gain knowledge on the theory of photochemistry: photophysical processes. **CO-2**. The complete knowledge will be gained on Jablonski diagram, Franck-Condon Principles. **CO-3**. The different between fluorescence and phosphorescence will be studied. **CO-4**. Students will learn about Norrish type I & Norrish type II reactions, *cis-trans* isomerisation and dimerization, cycloaddition of olefins.
PAPER M 604 Inorganic Chemistry **+** **PAPER M 605**	**CO-1.** Students are able to understand the concept of Orgel diagram, Laporte selection rule. **CO-2.** Gain knowledge on the vibronic coupling and colour complexes. **CO-3.** Students are able to explain/gain knowledge on the metalloproteins and their role in photosynthesis, respiration, Nitrogen fixation. **CO-4.** Students are able to understand the concept nuclear chemistry and also able to understand the group of lanthanides and actinides series. **CO-5**. In laboratory experiments, students are able to understand how to calculate the coefficient of viscosity by using Oswald viscometer, surface tension of liquids by stalagmometer and also learn about the Beer-Lambert law using colorimeter.
PAPER M 606 Project work (6 months)	**CO-1.** Students will be able to understand the connotation of research through literature survey. **CO-2** Students will be able to use and apply new software's for research purpose. **CO-3** Students will be able to develop some interests and ideas to pursue research as their career.