Course code	Course name	Course credit	
CEMPCOR01T	Inorganic Chemistry - 1	4	

CEMPCOR02T Organic Chemistry - 1 4

CEMPCOR03T Physical Chemistry - 1 4

CEMPCOR04P Practical - 1

4

CEMPCOR05P	Practical -2		4

CEMPAEC01M	Computer Programming	2
------------	----------------------	---

CEMPCOR06T Inorganic Chemistry -2

CEMPCOR07T Organic Chemistry - 2

4

4

CEMPCOR08T Physical Chemistry - 2

CEMPCOR09P Practical - 3

CEMPCOR10P Practical - 4

4

4

4

CEMPSEC01M Chemical & Spectral Analysis

2

CEMPCOR11T	Inorganic Chemistry - 3	4
------------	-------------------------	---

CEMPCOR12T Organic Chemistry - 3 4

CEMPCOR13T Physical Chemistry - 3 4

CEMPCOR14P Practical - 5 4

CEMPDSE01T Spectroscopy 4

CEMPDSE01T Analytical Chemistry 4

CEMPCOR15T Inorganic Chemistry- 4 4

4

4	ŀ
	4

CEMPCOR17T Physical Chemistry-4 4

CEMPDSE02T	Inorganic Chemistry	4

CEMPDSE02T	Organic Chemistry	4
CLIMI DOL021	organic chemistry	-

CEMPDSE02T	Physical Chemistry	4
CEMPCOR18M	Research Project	8

## Couse\_OutCome

This course is designed to introduce the students to the basic inorganic chemistry of PG level. Some properties of metal complexes in solid state and in solution state will be discussed here. Basic bioinorganic chemistry will give the students the concept of different processes and role of metalloenzymes in vivo. The concepts that were dealt with qualitative approach like VB theory and MO theory will be established by theoretical calculations.

The students will be introduced to the basic theoretical methods and calculations that are involved in assuming and proving various organic molecular properties viz. aromaticity, acidity- basicity, reactivity, rate of reactions etc. This will impart a thorough knowledge about the mechanisms of reactions which will help them to detail understanding of a course of a reaction. The students would also be introduced to higher level of learning of stereochemical phenomena, their application towards the understanding to pericyclic and other reactions of organic molecules. The knowledge of new class of pericyclic reaction is another thrust area. This will impart basic idea of interaction between MO(s) and the concept of atom efficiency will be introduced too.

The students will primarily sharpen the concepts that they have learnt in the undergraduate classes with new extension and applications. Major focus in this semester will be on the four fundamental areas of quantum mechanics, group theory, kinetics and spectroscopy. Major thrust will be on the basic concep

**Inorganic Chemistry practical:** Practical is so designed to introduce the students to synthetic methodologies for the preparation of different coordination complexes. This hand on experiments will also help them to be skilful in dealing with various chemicals, purification, crystallisation etc. Students will be introduced to different quantitative analysis also including spectrophotometric estimation of single metal ion. This hands on training will help the students to handle the spectrophotometer and they will get the confidence to use the instruments for more detail analysis in the subsequent semesters. **Physical Chemistry Practical :** The students will learn to independently handle the basic equipments like spectrophotometer, potentiometer, pH-meter, and conductivity meter and carry out experiments using these instruments. The experiments have been so designed that they can verify the different fundamental laws and equations that they have learnt at the undergraduate level.

**Organic Chemistry Practical:** This part of the course is so designed to make the PG students able to analyse the organic compounds. They will learn to separate various mixtures of functionalised organic compounds on the basis of solubility and re- crystallize them accordingly. The students will study their physical and chemical properties and thus by identifying different organic molecules they will be able to get hand on experience related to their so far gathered theoretical knowledge. Also, by means of preparing relevant derivatives the students would be introduced to the understanding of nature of different chemicals and reaction conditions and thereby they will be able to develop their skills towards different organic transformations. Students will learn synthetic methodologies towards a few organic compounds along with their spectral characterization by UV-Vis and IR. Green methodologies are introduced to the students to impart the knowledge of sustainable chemistry.

Theoretical components have become a major part in physical chemistry research as well as understanding the new softwares for the different applications which are needed for data analysis in current day research in chemistry. The objective of this course is to make the students capable to write such computer programs which will give them the required expertise in this field.

In this course the students will learn some advanced topics in crystal filed theory and bioinorganic chemistry as a continuation of the earlier semester. Students will also get an idea about the evaluation of redox properties of metal complexes in solution by different advanced methods like CV, polarography etc. Solid state chemistry course will give an idea about band theory and introduce them to the field of superconductor. Slightly advanced level bioinorganic chemistry will be introduced keeping in mind mainly the different metalloenzymes present in vivo.

This course is to enable the students to get the knowledge of the probably most powerful spectroscopic technique, NMR and its application to interpret the structural features of molecules. The deliverable knowledge to the students based on how the spectroscopic technique could be used to judge the purity, architectural features, and properties of compounds is the key idea behind this course. The Post Graduate students will also learn some important manifestation of asymmetric organic chemistry and its application in various chiral compound syntheses including some bio-active molecules. The targeted organic molecules synthesis including bio- active compounds has been found to be the area of interest to the synthetic chemists. The knowledge of the different perspective of such targeted synthesis based on disconnection approach is also included here. Some aspects of biomimetic chemistry and related topics are included here to impart the key understanding to the students about the intimate relationship of the chemical world with the various phenomena taking place in the living world.

The course has been designed in such a manner that here the students are introduced to the mathematical concepts with application to chemistry both from quantum mechanical as well as statistical mechanical angles. Electrochemistry a fundamental area of chemistry is introduced to the masters students in this semester so that the students find answers to the different chemical phenomenon they see around them. Polymers have become a part of our daily existence. In this semester the students are given a brief introduction to the topic with some advanced knowledge which will guide them if they want to study the subject in the future.

**Inorganic Chemistry practical:** The practical classes are designed to impart the knowledge to the students by both qualitative and quantitative experiments. Students will be familiar with the different processes by which the metal ions can be determined in solution in presence of other metal ions. Composition of metal complexes will be determined by quantitative analysis. Interpreting skill and logical method of analysis of students would be augmented by means these studies. Modern day spectroscopic analysis will also be introduced so that the students can apply their knowledge to analyze the probable structure of synthesized metal complexes. The practical classes are designed to impart the knowledge to the students regarding Quantitative analysis of complex materials, such as, ores and alloys. This portion is totally relevant to industry as the methods are industrial methods. This will give the students an opportunity to get acquainted with hands on training on different methods

Inorganic Practical: Advanced Physicochemical Experiments, Kinetics studies on redox reactions, Semi-Micro Qualitative Inorganic Analysis, Analysis of Complex Materials, Analysis of Mixture, Spectroscopic Studies on Model Compounds

**Organic Practical**: The students will have hands on training to extract and purify natural product(s) and to explain the structural features of the same based on spectroscopic data. The students will handle the instruments like UV, FT-IR etc. on their own and thus skills to handle modern instruments will be developed. Students will learn few multistep organic syntheses and thereby the skill of purification of compounds using column chromatographic technique will also be introduced to them.

**Physical Chemistry:** The objective of the practical course is to experimentally verify the different concepts that the students have learnt from their theoretical classes. The experiments require more attention and precision and the data interpretation becomes slightly more complex. This will teach the students to think and analyze their results before coming to a conclusion.

Analysis of chemical sample forms a major component in chemistry. This course has been so designed that the students are given the knowledge to interpret the different data and identify and characterize the samples. This knowledge can be further used in terms of employment since all laboratories and research organizations need trained manpower for data interpretation and analysis. The department feels that this course will significantly add to the technical skill of the student. Introduction to crystallography will give them an idea for determining the structure by various methods. Different radiochemical methods and nuclear model study will enable to have a detailed idea about the core structure of an atom. A detailed group chemistry is given here as well as a portion of lanthanides and actinides will be here so that students become familiar with elements having similar property.

This portion is to develop the basic concepts of designing an organic molecule that is heavily dependent on the proper choice of various reagents. The knowledge of usage of specific organic reagents of some main group elements is introduced here. Accordingly, some advanced level of information of organo-main group reagents and reactions involving organometallic chemistry are incorporated here. This course is also to impart the knowledge of understanding to the students of a special type of method and mechanism of photochemical transformation. The students will be introduced to some naturally occurring macromolecules, their structural features and the challenges towards their synthesis.

The objective of the course is to introduce the students to slightly advanced quantum mechanical theories having relevance to chemical bonding, molecular properties and spectroscopy. The statistical mechanics course becomes more advanced and introduces the students to research in theoretical concepts of chemistry. The students will be introduced to nanomaterials, which give a new dimension to research in material science. In electrochemistry the students will learn the areas of electrode kinetics and corrosion. Physical Chemistry : The objective of this course is to enable the students to think on their own, design or modify certain reaction conditions and try to analyze the result. In addition the students will also carry out slightly critical experiments which will sharpen their data interpretation aptitude.

Spectroscopy is an essential tool for the identification and analysis of chemical compounds. In this course the students will be exposed to the different areas of the electromagnetic spectrum which shows the spectra corresponding to the different vibrations, relaxations and transitions in a chemical compound. The basic theoretical alongwith application and analysis of the different types of spectroscopy will be taught to the students. The course should give the student enough idea as to interpret when a spectra of an unknown compound is given to him.

This course is designed to introduce the students to different methods of analytical chemistry. Different classical methods of analysis will be discussed along with basic aim of analytical chemistry. Solvent extraction and different chromatographic methods will give an idea of modern day separation and purification techniques used in chemical industry. Moreover, kinetics of reactions will give students an opportunity to learn catalytic reactions.

This course is designed for students undergoing postgraduate studies in WBSU other than those in the Chemistry department. This is an interdepartmental course which is open to students from all other disciplines. The idea of the course is to familiarize the students with the fundamental concepts of chemistry. Since research in science has become interdisciplinary in nature this course has been so designed that a student is introduced to the principles in the fields of spectroscopy, crystal filed theory, organic reaction mechanisms and thermodynamics. This knowledge should help students who want to pursue higher studies in allied disciplines

This course would enable the students to get the knowledge of cluster compounds. Concept of different structural topologies will be discussed here along with their effectiveness as catalysts. Students will also be introduced to electron transfer processes in solution which will enable them to interpret electron transfer mechanism. The course of organometalic chemistry will be introduced here. This portion will enable them to understand different kinds of bonding including  $\eta$  bonding. This course will help the PGstudents towards the understanding of advanced level of organometallic chemistry including some catalytic cycles. This portion will give them an idea about the industrial methods of preparation of alkenes and alkynes by oligomerization and metathesis reactions.

This course will give insight to some advanced level of reagents that are being used in chemical transformations. The students will be introduced to the advance level of knowledge regarding the important heterocyclic organic compounds including some bio-active molecules. Chemicals and Chemistry are basically intimate part of our day to day life and lifestyle whether we name them as food or drug. Naturally, this portion of course is designed to impart some elementary ideas about what happens to a particular species as well as to our body when we take them and thereby to create awareness among the students towards what to be accepted and what to be avoided during our choice of foods and drugs. The Post Graduate students will also learn the host-guest chemistry which remains one of the interesting areas to be studied and explored by the organic synthetic chemists as well as by the biochemists.

This course has been designed so that the students learn the theoretical basis of spectroscopic selection rules based on time-dependent perturbation theory, principle of LASER and its function. Also the concept of non equilibrium thermodynamics and certain concepts of bio physical chemistry have been included in the syllabus. The objective of the course if to give the students an advanced understanding of the above concepts in physical chemistry

This course will be advanced level course comprising of some topics of modern inorganic chemistry. Application of group theory in inorganic complex chemistry will be discussed and students will get familiar with transition of different levels and MO representation followed by advanced level magnetic chemistry. This will be helpful to the student to predict about the magnetic property of an unknown compound and the different transitions involved leading to a particular colour of the compound. An advanced level chemistry dealing with metalloenzymes chemistry and DNA interaction with an incoming ligand will help the students to predict the way of interaction of an unknown compound. Students will also get an idea to establish the probable structure of a metal complex by analyzing different spectroscopic data like IR, Uv-vis, Mossbauer, NMR, ESR, CV, TGA, DTA and DSC, etc.

This course will help the PG-students towards the understanding of advanced level of learning of stereo chemical aspects of organic molecules and their studies and their features hereby could be rationalised using pertinent measurement techniques. The advanced level insight related to pericyclic reaction and important carbohydrate motifs are introduced here. Advance level NMR studies including correlation spectroscopy and their application towards molecular structure determination, drug screening, MRI will also be introduced to the students.

This course is for the students who want to study physical chemistry in future. Hence, the nature of the course is slightly advanced in nature. The topics covered under advanced quantum mechanics include non-degenerate and degenerate perturbation theory to simple systems and Hartree-Fock theory. In statistical mechanics application to some selected problems will be discussed. Recent research directions in material chemistry alongwith advanced photophysics form the rest of the course content. The objective of the course shall be fulfilled if the students undergo future research and studies in physical chemistry.

Students will obtain first hand experience of pursuing research during the postgraduate course and will be able to choose independently a research problem and try to solve it successfully.