

B.Sc. DEGREE PROGRAMME
IN
CHEMISTRY

(CBCSSUG 2019)

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

PROGRAMME OUTCOMES
&
COURSE OUTCOMES

2019 ADMISSION ONWARDS

PROGRAMME OUTCOMES

- Understand basic facts and concepts in chemistry.
- Apply the principles of chemistry.
- Appreciate the achievements in chemistry and to know the role of chemistry in nature and in society.
- Familiarize with the emerging areas of chemistry and their applications in various spheres of chemical sciences and to apprise the students of its relevance in future studies.
- Develop skills in the proper handling of instruments and chemicals.
- Familiarize with the different processes used in industries and their applications.
- Develop an eco-friendly attitude by understanding the green methods adopted in chemistry
- Acquaint with the applications of chemistry in our day-to-day life.

SEMESTER I

Course Code: CHE1B01

Core Course I: Theoretical and Inorganic Chemistry- I

Total Hours: 32; Credits: 2; Hours/Week: 2; Total Marks 75 (Internal 15 & External 60)

CHE1B01	Theoretical and Inorganic Chemistry-I	L*	T**	P***	C#
		2	0	0	2
Objective (s)	To gain detailed knowledge of the principle of volumetric analysis and properties of <i>s</i> and <i>p</i> block elements. To provide the basic groundwork for a research project. Students will be able to analyse basic theory of acid base concept.				
Course outcome (s)					
CO1	To apply the methods of a research project.				
CO2	To understand the principles behind volumetry.				
CO3	To analyse the characteristics of different elements.				
CO4	To distinguish between different acid base concepts.				
CO5	To analyse the stability of different nuclei.				

*Lecture, **Tutorial, ***Practical, #Credit

SEMESTER II

Course Code: CHE2B02

Core Course II: Theoretical and Inorganic Chemistry- II

Total Hours: 32; Credits: 2; Hours/Week: 2; Total Marks 75 (Internal 15 & External 60)

CHE2B02	Theoretical and Inorganic Chemistry- II	L	T	P	C
		2	0	0	2
Objective(s)	Module I – To introduce the students to the failures of classical physics theories in explaining many experiments and the emergence of quantum theory with which all of them could be satisfactorily explained. Module II – To enable the students to understand the basic postulates of quantum mechanics and how to solve the time-independent Schrödinger wave equation of different systems including H atom. Module III – To introduce the quantum mechanical treatment of chemical bonding in diatomic molecules using VB and MO theories. Module IV - To introduce the students to the quantum mechanical treatment of hybridisation and bonding in polyatomic systems.				
Course outcome (s)					
CO1	To understand the importance and the impact of quantum revolution in science.				
CO2	To understand and apply the concept that the wave functions of hydrogen atom are nothing but atomic orbitals.				

CO3	To understand that chemical bonding is the mixing of wave functions of the two combining atoms.
CO4	To understand the concept of hybridization as linear combination of orbitals of the same atom.
CO5	To inculcate an atomic/molecular level philosophy in the mind.

SEMESTER III

Course Code: CHE3B03

Core Course III: PHYSICAL CHEMISTRY - I

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE3B03	PHYSICAL CHEMISTRY - I	L	T	P	C
		3	0	0	3
Objective (s)	To introduce the concepts of chemical thermodynamics, equilibria and group theory.				
Course outcome (s)					
CO1	To understand the properties of gaseous state and how it links to thermodynamic systems.				
CO2	To understand the concepts of thermodynamics and its relation to statistical thermodynamics.				
CO3	To apply symmetry operations to categorize different molecules.				

SEMESTER IV

Course Code: CHE4B04

Core Course IV: ORGANIC CHEMISTRY– I

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE4B04	ORGANIC CHEMISTRY– I	L	T	P	C
		3	0	0	3
Objective (s)	To enable the students to analyse basic theory and concepts of organic chemistry and appreciate different organic reaction mechanism and their stereochemistry.				
Course outcome (s)					
CO1	To apply the concept of stereochemistry to different compounds.				
CO2	To understand the basic concepts of reaction mechanism.				
CO3	To analyse the mechanism of a chemical reaction.				
CO4	To analyse the stability of different aromatic systems.				

SEMESTER IV

Course Code: CHE4B05(P)**Core Course V: INORGANIC CHEMISTRY PRACTICAL – I**

Total Hours: 128; Credits: 4; Hours/Week: 2 (I, II, III & IV Semesters); Total Marks 100
(Internal 20 & External 80)

CHE4B05 (P)	INORGANIC CHEMISTRY PRACTICAL – I	L	T	P	C
		0	0	2	4
Objective (s)	To enable the students to gain skills in preparation of standard solutions and quantitative volumetric analysis.				
Course outcome (s)					
CO1	To enable the students to develop skills in quantitative analysis and preparing inorganic complexes.				
CO2	To understand the principles behind quantitative analysis.				
CO3	To apply appropriate techniques of volumetric quantitative analysis in estimations.				
CO4	To analyse the strength of different solutions.				

SEMESTER V**Course Code: CHE5B06****Core Course VI: INORGANIC CHEMISTRY – III**

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE5B06	INORGANIC CHEMISTRY – III	L	T	P	C
		3	0	0	3
Objective (s)	To enable the students to gain detailed knowledge of the chemistry of different analytical principles and to develop concerns for environment. To give a basic understanding of different metallurgical processes, interhalogen compounds and inorganic polymers.				
Course outcome (s)					
CO1	To understand the principles behind qualitative and quantitative analysis.				
CO2	To understand basic processes of metallurgy and to analyse the merits of different alloys.				
CO3	To understand the applications of different inorganic polymers.				
CO4	To analyse different polluting agents.				
CO5	To apply the principles of solid waste management.				

SEMESTER V

Course Code: CHE5B07**Core Course VII: ORGANIC CHEMISTRY – II**

Total Hours: 64; Credits: 3; Hours/Week: 4; Total Marks 75 (Internal 15 & External 60)

CHE5B07	ORGANIC CHEMISTRY – II	L	T	P	C
		4	0	0	3
Objective (s)	To give the students a thorough knowledge about the chemistry of selected functional groups and their applications in organic preparations.				
Course outcome (s)					
CO1	To understand the difference between alcohols and phenols.				
CO2	To understand the importance of ethers and epoxides.				
CO3	To apply organometallic compounds in the preparation of different functional groups.				
CO4	To apply different reagents for the inter conversion of aldehydes, carboxylic acids and acid derivatives.				
CO5	To apply active methylene compounds in organic preparations.				

SEMESTER V**Course Code: CHE5B08****Core Course VIII: PHYSICAL CHEMISTRY – II**

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE5B08	PHYSICAL CHEMISTRY – II	L	T	P	C
		3	0	0	3
Objective (s)	To familiarise the students with the concepts of kinetics, catalysis and photochemistry and to familiarize the applications of molecular spectroscopy and phase equilibrium.				
Course outcome (s)					
CO1	To apply the concept of kinetics, catalysis and photochemistry to various chemical and physical processes.				
CO2	To characterise different molecules using spectral methods.				
CO3	To understand various phase transitions and its applications.				

SEMESTER VI**Course Code: CHE6B09****Core Course IX: INORGANIC CHEMISTRY – IV**

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B09	INORGANIC CHEMISTRY – IV	L	T	P	C
		3	0	0	3
Objective (s)	To gain detailed knowledge of the electronic configuration and properties of transition and inner transition elements and their role in biological systems. To introduce the importance of different instruments used in analysis.				
Course outcome (s)					
CO1	To understand the principles behind different instrumental methods.				
CO2	To distinguish between lanthanides and actinides.				

CO3	To appreciate the importance of CFT.
CO4	To understand the importance of metals in living systems.
CO5	To distinguish geometries of coordination compounds.

SEMESTER VI

Course Code: CHE6B10

Core Course X: ORGANIC CHEMISTRY – III

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B10	ORGANIC CHEMISTRY – III	L	T	P	C
		3	0	0	3
Objective(s)	To gain detailed knowledge of the chemistry of different bio molecules. To provide a basic understanding of different spectral techniques and their application in simple molecules. To differentiate diverse pericyclic reactions.				
Course outcome (s)					
CO1	To elucidate the structure of simple organic compounds using spectral techniques.				
CO2	To understand the basic structure and tests for carbohydrates.				
CO3	To understand the basic components and importance of DNA.				
CO4	To understand the basic structure and applications of alkaloids and terpenes.				
CO5	To distinguish different pericyclic reactions.				

SEMESTER VI

Course Code: CHE6B11

Core Course XI: PHYSICAL CHEMISTRY – III

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B11	PHYSICAL CHEMISTRY – III	L	T	P	C
		3	0	0	3
Objective (s)	To get a thorough knowledge of electrochemistry, colligative properties and solid state.				
Course outcome (s)					
CO1	To understand the basic concepts of electrochemistry.				
CO2	To understand the importance of colligative properties.				
CO3	To relate the properties of materials/solids to the geometrical properties and chemical compositions.				

SEMESTER VI

Course Code: CHE6B12

Core Course XII: Advanced and Applied Chemistry

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B12	Advanced and Applied Chemistry	L	T	P	C
		3	0	0	3
Objective (s)	To initiate the students to the role and opportunities of chemistry as a discipline in modern civilization.				
Course outcome (s)					
CO1	To understand the importance of nanomaterials.				
CO2	To appreciate the importance of green approach in chemistry.				
CO3	To understand the uses and importance of computational calculations in molecular design.				
CO4	To understand the role of chemistry in human happiness index and life expectancy.				

SEMESTER VI

Course Code: CHE6B13(E1)

Core Course XIII: Elective 1. INDUSTRIAL CHEMISTRY

Total Hours: 48; Credits: 2; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B13(E1)	INDUSTRIAL CHEMISTRY	L	T	P	C
		3	0	0	2
Objective (s)	To familiarise the students with the role and opportunities of chemistry as a discipline in modern civilization. To create awareness among the students about different chemical industries.				
Course outcome (s)					
CO1	To understand the importance of petrochemicals.				
CO2	To appreciate the importance and to familiarise the opportunities of pharmaceutical, leather and sugar industries.				
CO3	To analyse the role of catalysts in industrial processes.				

SEMESTER VI

Course Code: CHE6B13(E2)

Core Course XIII: Elective 2. POLYMER CHEMISTRY

Total Hours: 48; Credits: 2; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B13(E2)	POLYMER CHEMISTRY	L	T	P	C
		3	0	0	2
Objective (s)	To gain detailed knowledge about the classification of polymers and various mechanisms and technology adopted for polymerisation. To give a basic understanding of the properties of polymers like glass transition temperature, molecular weight and degradation of polymers. To give a detailed idea about different commercial polymers.				
Course outcome (s)					
CO1	To understand various classification of polymers and types of polymerisation methods.				

CO2	To understand the important characteristics of polymers such as average molecular weight, glass transition temperature, viscoelasticity and degradation.
CO3	To appreciate the importance of processing techniques.
CO4	To characterise different commercial polymers and to understand the significance of recycling.

SEMESTER VI

Course Code: CHE6B13(E3)

Core Course XIII: Elective 3. MEDICINAL AND ENVIRONMENTAL CHEMISTRY

Total Hours: 48; Credits: 2; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE6B13(E3)	MEDICINAL AND ENVIRONMENTAL CHEMISTRY	L	T	P	C
		3	0	0	2
Objective (s)	To introduce the students to the importance of chemistry in medicinal field and to get ideas about various diseases. To help the students to get information about various toxic substances in environment and their control.				
Course outcome (s)					
CO1	To understand the importance of drugs in human health.				
CO2	To understand the facts about common diseases and treatment.				
CO3	To identify the presence of toxic substances in atmosphere.				
CO4	To apply chemistry in treatment of water and sewage.				

SEMESTER VI

Course Code: CHE6B14(P)

Core Course XIV: PHYSICAL CHEMISTRY PRACTICAL

Total Hours: 80; Credits: 4; Hours/Week: 5 (Semester V); Total Marks 100 (Internal 20 & External 80)

CHE6B14(P)	PHYSICAL CHEMISTRY PRACTICAL	L	T	P	C
		0	0	5	4
Objective (s)	To familiarise the students with the relation between physical properties and chemical composition used for analysis. To provide students an idea of designing experimental methods to analyse the physical properties of molecules or materials.				
Course outcome (s)					
CO1	To enable the students to develop analytical skills in determining the physical properties (physical constants).				
CO2	To develop skill in setting up an experimental method to determine the physical properties.				
CO3	To understand the principles of Refractometry, Potentiometry and Conductometry.				

SEMESTER VI

Course Code: CHE6B15(P)

Core Course XV: ORGANIC CHEMISTRY PRACTICAL

Total Hours: 80; Credits: 4; Hours/Week: 5 (Semester V); Total Marks 100 (Internal 20 & External 80)

CHE6B15(P)	ORGANIC CHEMISTRY PRACTICAL	L	T	P	C
		0	0	5	4
Objective (s)	To empower the students to prepare different compounds without compromising yield. Characterisation and analysis of different organic compounds based on functional groups. To develop skill in separation and purification of mixtures.				
Course outcome (s)					
CO1	To enable the students to develop analytical skills in organic qualitative analysis.				
CO2	To develop talent in organic preparations to ensure maximum yield.				
CO3	To apply the concept of melting or boiling points to check the purity of compounds.				
CO4	To analyse and characterise simple organic functional groups.				
CO5	To analyse individual amino acids from a mixture using chromatography.				

SEMESTER VI

Course Code: CHE6B16(P)

Core Course XVI: INORGANIC CHEMISTRY PRACTICAL-II

Total Hours: 80; Credits: 4; Hours/Week: 5; Total Marks 100 (Internal 20 & External 80)

CHE6B16(P)	INORGANIC CHEMISTRY PRACTICAL-II	L	T	P	C
		0	0	5	4
Objective (s)	To develop skill in quantitative analysis using gravimetric and colorimetric methods.				
Course outcome (s)					
CO1	To enable the students to develop analytical skills in inorganic quantitative analysis.				
CO2	To understand the principles behind gravimetry and to apply it in quantitative analysis.				
CO3	To understand the principles behind colorimetry and to apply it in quantitative analysis.				

SEMESTER VI

Course Code: CHE6B17(P)

Core Course XVII: INORGANIC CHEMISTRY PRACTICAL-III

Total Hours: 80; Credits: 4; Hours/Week: 5; Total Marks 100 (Internal 20 & External 80)

CHE6B17(P)	INORGANIC CHEMISTRY PRACTCAL-III	L	T	P	C
		0	0	5	4
Objective (s)	To develop skill in quanlitative analysis of inorganic compounds.				
Course outcome (s)					
CO1	To enable the students to develop skills in inorganic quanlitative analysis.				
CO2	To understand the principles behind inorganic mixture analysis and to apply it in quanlitative analysis.				
CO3	To analyse systematically mixtures containing two cations and two anions.				

SEMESTER VI

Course Code: CHE6B18(Pr)

Core Course XVIII: PROJECT WORK

Total Hours: 32; Credits: 2; Hours/Week: 2 (Semester V); Total Marks 75 (Internal 15 & External 60)

CHE6B18(Pr)	PROJECT WORK	L	T	P	C
		0	0	2	2
Objective (s)	To develop skill in scientific research, critical thinking and reasoning.				
Course outcome (s)					
CO1	To understand the scientific methods of research project.				
CO2	To apply the scientific method in life situations.				
CO3	To analyse scientific problems systematically.				

**COMPLEMENTARY
COURSES
IN
CHEMISTRY**

(CBCSSUG 2019)

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

**PROGRAMME OUTCOMES
&
COURSE OUTCOMES**

2019 ADMISSION ONWARDS

SEMESTER I**Course Code: CHE1C01****Complementary Course I: GENERAL CHEMISTRY**

Total Hours: 32; Credits: 2; Hours/Week: 2; Total Marks 75 (Internal 15 & External 60)

CHE1C01	GENERAL CHEMISTRY	L	T	P	C
		2	0	0	2
Objective(s)	To provide the students a thorough knowledge about the chemistry of quantitative and qualitative analysis and the theories of chemical bonding. It will also impart the ideas about atomic nucleus and the importance of metals in biological systems.				
Course outcome (s)					
CO1	To understand and to apply the theories of quantitative and qualitative analysis.				
CO2	To understand the theories of chemical bonding.				
CO3	To appreciate the uses of radioactive isotopes.				
CO4	To understand the importance of metals in biological systems.				

SEMESTER II**Course Code: CHE2C02****Complementary Course II: PHYSICAL CHEMISTRY**

Total Hours: 32; Credits: 2; Hours/Week: 2; Total Marks 75 (Internal 15 & External 60)

CHE2C02	PHYSICAL CHEMISTRY	L	T	P	C
		2	0	0	2
Objective(s)	To provide the students a thorough knowledge about different terminologies in thermodynamics and the continuity between different states of matter. To impart an idea about the basic principles of electrochemistry.				
Course outcome (s)					
CO1	To understand the importance of free energy in defining spontaneity.				
CO2	To realise the theories of different states of matter and their implication.				
CO3	To understand the basic principles of electrochemistry.				

SEMESTER III**Course Code: CHE3C03****Complementary Course III: ORGANIC CHEMISTRY**

Total Hours: 48; Credits: 2; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE3C03	ORGANIC CHEMISTRY	L	T	P	C
		3	0	0	2
Objective(s)	To provide the students a thorough knowledge about basic theory and concepts of organic chemistry.				
Course outcome (s)					
CO1	To understand the basic concepts involved in reaction intermediates.				

CO2	To realise the importance of optical activity and chirality.
CO3	To appreciate the importance of functional groups and aromatic stability.
CO4	To understand the basic structure and importance of carbohydrates, nucleic acids, alkaloids and terpenes.

SEMESTER IV

Course Code: CHE4C04

Complementary Course IV: PHYSICAL AND APPLIED CHEMISTRY

Total Hours: 48; Credits: 2; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

CHE4C04	PHYSICAL AND APPLIED CHEMISTRY	L	T	P	C
		3	0	0	2
Objective (s)	To provide the students a thorough knowledge about colloidal chemistry, nanochemistry and the importance of chemistry in daily life. It also provides a basic idea related to separation and spectral techniques. It also imparts the idea of green processes with special emphasis on environment.				
Course outcome (s)					
CO1	To understand the basic concepts behind colloidal state and nanochemistry.				
CO2	To understand the importance of green chemistry and pollution prevention.				
CO3	To appreciate the importance of different separation methods and spectral techniques.				
CO4	To understand the extent of chemistry in daily life.				

SEMESTER IV

Course Code: CHE4C05(P)

Complementary Course V: CHEMISTRY PRACTICAL

Total Hours: 128; Credits: 4; Hours/Week: 2 (I, II, III & IV Semesters); Total Marks 100
(Internal 20 & External 80)

CHE4C05(P)	CHEMISTRY PRACTICAL	L	T	P	C
		0	0	2	4
Objective (s)	To develop proficiency in quantitative and qualitative analysis and expertise in organic preparation and determination of physical constants.				
Course outcome (s)					
CO1	To understand the basic concepts of inter group separation.				
CO2	To enable the students to develop analytical and preparation skills.				

**OPEN COURSES
IN
CHEMISTRY**

(CBCSSUG 2019)

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

**PROGRAMME OUTCOMES
&
COURSE OUTCOMES**

2019 ADMISSION ONWARDS

OPEN COURSE STRUCTURE

(FOR STUDENTS OTHER THAN B.Sc. CHEMISTRY) Total Credits: 3 (Internal 20%; External 80%)

<i>Semester</i>	<i>Code No</i>	<i>Course Title</i>	<i>Hrs/Week</i>	<i>Total Hrs</i>	<i>Marks</i>
V	CHE5D01	Open Course 1: Environmental Chemistry	3	48	75
	CHE5D02	Open Course 2: Chemistry in Daily Life			
	CHE5D03	Open Course 3: Food Science and Medicinal Chemistry			

SEMESTER V

Course Code: CHE5D01

Open Course 1: ENVIRONMENTAL CHEMISTRY

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

Course outcomes

At the end of the course, students will be able to:

CO 1: Recall the technical/scientific terms involved in pollution.

CO 2: Understand the causes and effects of air pollution.

CO 3: Understand the sources, types and effects of water pollution.

CO 4: Describe water quality parameters.

CO 5: Know soil, noise, thermal and radioactive pollutions and their effects.

CO 6: Study various pollution control measures.

CO 7: Understand the basics of green chemistry.

SEMESTER V

Course Code: CHE5D02

Open Course 2: CHEMISTRY IN DAILY LIFE

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

Course outcomes

At the end of the course, students will be able to:

CO 1: Understand the basics of polymer chemistry.

CO 2: Explain the functions of biomolecules, vitamins, enzymes, hormones and nucleic acid.

CO 3: Describe food additives and food habits.

CO 4: Explain the uses of pesticides and fertilizers and their impacts on the environment.

CO 5: Understand advantages and disadvantages of cleansing agents and cosmetics.

CO 6: Recognize the common classes of drugs in pharmaceutical industry and their application.

CO 7: Understand the basic concepts and processes in petroleum industry.

SEMESTER V

Course Code: CHE5D03

Open Course 3: FOOD SCIENCE AND MEDICINAL CHEMISTRY

Total Hours: 48; Credits: 3; Hours/Week: 3; Total Marks 75 (Internal 15 & External 60)

Course outcomes

At the end of the course, students will be able to:

CO 1: Understand food adulteration and preservation methods.

CO 2: Understand food additives.

CO 3: Compare modern food with natural food.

CO 4: Describe the harmful effects of alcohol and modern food habits.

CO 5: Exhibit a broad and coherent body of knowledge on the biomolecules, vitamins, enzymes, hormones and nucleic acids.

CO 6: Recognize the uses of Indian medicinal plants and plant extracts.

CO 7: Recall the chemical, generic and trade names of drugs and their uses.

CO 8: Describe the treatment methods used in medical field.

CO 9: Illustrate first aids and the safety steps to be taken for common illnesses.