Program Specific Outcomes (PSO) and Course Outcomes (CO)
Faculty – Science and Technology (PG)
AY-2019-20

Name of Faculty	Science and Technology
Name of Department	Chemistry
Departmental Email ID	chemnacsp@gmail.com
PG Programme	M.Sc. Organic and Analytical Chemistry

Programme Specific Outcomes (PSO)

1. Energetics and feasibility of the chemical reactions in designing the pilot projects.
2. The paths and intermediates and their nature during the chemical reactions.
3. Various methodologies for the determination of properties of newly obtained chemical compounds.
4. Which chemical compounds are to be synthesized and which innovative methods are to be employed for their synthesis?
5. Training regarding practical skills to synthesize and characterize the chemical compounds using simple laboratory techniques as well as sophisticated instruments.

Course Outcomes: M.Sc. Part I

Semester-I

Theory Courses:
CCTP-1: CHP-110, Physical Chemistry-I, (4 Credits)
Thermodynamics and Chemical Kinetics and Reaction Dynamics
1. The learner will be acquired with sound knowledge of energetics of chemical reactions, electron densities and orbitals involved in bonding.
2. The learner will be able to predict rate laws and reaction kinetics of simple and catalysed reactions.
3. The learner will be acquired with sound knowledge of molecular reaction dynamics

CCTP-2: CHI-130, Inorganic Chemistry-I, (4 credits)
Molecular Symmetry and Chemistry of Main Group Elements
The learner will be acquired with sound knowledge of:
1. Concept of symmetry, point group for determining stereochemistry and understanding spectroscopy.
2. Importance of Orthogonality Theorem to obtain the character table.
3. Concept of linear combinations of atomic orbitals and applications of symmetry in spectroscopy.
4. Chemistry of S and P block elements, their compounds, reactions and applications.
5. Advance chemistry of Boranes, fullerene, zeolites, polymers etc.
6. Organometallic chemistry of important elements from the main groups and their applications

CCTP-3: CHO-150, Organic Chemistry-I, Semester - I (4 Credits)
Basic Organic Chemistry

The learner will be acquired with:
1. Fundamental aspects of organic chemistry and heterocyclic compounds
2. Stereochemistry of organic compounds
3. Reactive intermediates; neighbouring group participation, rearrangement reactions
4. Oxidising and reducing agents and their applications.

CBOP-1: CHG - 190, General Chemistry-I, Semester-I (4 Credits)
SECTION-I: Theory Course   (2 Credits)
Option-A: Introduction to Solid State of Matter

After completing the course work the students will learn and master
1. Bonding in solids - band theory,
2. Electronic conductivity, semiconductors, photoconductivity, non-stoichiometry, ionic conductivity and their applications, superconductivity
3. Method of synthesis of solids

Option-B: Chemical Mathematics

The learner is acquainted with and master basic ideas about mathematics and their applications in chemistry regarding-
1. Functions
2. Differential Equations
3. Vectors Matrices and Determinants
4. Mathematics of changing properties during chemical reactions

Option-C: Introduction to Chemical Biology

After completing the course work the students will learn and master
1. Concepts in Chemical Biology and chemistry in molecular and cell biology.
2. Chemistry of carbohydrates, amino acids, proteins and nucleic acids etc.
3. Chemical basis for replication, transcription, translation

Practical Courses
CHG-190, SECTION-II: (2 Credits)
Option-A: Inorganic Material Synthesis and Analysis

The students will learn the theoretical basis as well as master practical skills regarding
Analysis of materials like ores and alloys.
Synthesis of nano-materials and their characterizations using laboratory and instrumental techniques.

Option - B: Chemical Biology-I Practical

The students will learn the theoretical basis as well as master practical skills regarding
Qualitative analysis of carbohydrates, lipids and amino acids
Chromatographic Techniques for identification and separation of mixture of amino acids and sugars.
Estimation of glucose and proteins, saponification and iodine value of fats.
Quantitative estimation of DNA, Determination of Inorganic Phosphate in Biological Samples

CCPP-1: CHP-107: Practical Course – I (4 Credits)
Basic Practical Chemistry

The students will learn the theoretical basis as well as master practical skills regarding
1. Statistical treatment of experimental data.
2. Understanding of reaction kinetics and dynamics.

3. Understanding of physical properties in finding their applications.
4. Use of spectral methods for characterization and measurement of reaction dynamics using labelling.
5. Simple methods of characterization of organic compounds useful for monitoring chemical reactions.
6. Green chemistry and role of green chemistry in pollution reduction.
7. Safety techniques for handling of chemicals.

Semester-II

Theory Courses
CCTP-4: CHP-210, Physical Chemistry-II (4 Credits)
Molecular Spectroscopy and Nuclear and Radiation Chemistry
After completing the course work the students will learn and master
1. Principle, instrumentation and Applications of various spectral methods in determining the properties of the compounds.
2. Reactions dynamics using spectral and radio methods.

CCTP-5: CHI-230, Inorganic Chemistry-II (4 Credits)
Coordination and Bioinorganic Chemistry
The learner will be acquired with sound knowledge of:
1. Term symbols, construction of microstate table for various configuration
2. Splitting of the free ion terms in weak and strong ligand field.
3. Correlations diagram, Orgel diagram and Magneto chemistry
4. Important metals in biology and physiology.
5. Metalloproteins and metalloenzymes and their role in biology.

CCTP-6: CHO - 250, Organic Chemistry-II, Semester-II (4 Credits)
Photochemistry and Spectroscopy
After completing the course work the students will learn and master
1. Reaction mechanism and stereochemistry of electro cyclic reactions.
2. Free radical reactions, mechanism and the stereo chemical outcomes.
3. Principles, applications of spectroscopy in structure elucidation of organic compounds

CBOP-2: CHG - 290, General Chemistry -II, (4 Credits)
SECTION-I: Theory Courses (2 Credits)
Option-A: Material Characterization Technique
The students will learn the theoretical basis as well as master practical skills regarding Characterization techniques of solids.
1. Principle and instrumentation of powder XRD, applications of XRD for crystal structure determination
2. SEM, surface morphology of solid. And TEM, interpretation of TEM images.
3. XRF, types of XRF, instrumentation, analysis
Option - B: Organometallic and Inorganic Reaction Mechanism
The students will learn the theoretical basis as well as master practical skills regarding Organometallic Compounds with special reference to-
1. Spectral characterization
2. Catalytic reactions and their mechanisms
3. Types of reactions
Option- C: Introduction to Chemical Biology-II
After completing the course work the students will learn and master

1. Fundamental concepts in Chemical Biology
2. Methods of Chemistry used to solve problems in molecular and cell biology.
3. Importance of chemical biology research and interdisciplinary work.

Practical Courses
CHG-290, SECTION-II: (2 Credits)
Electrochemical Methods of Analysis

After completing the course work the students will learn and master
1. Experiments involving use of conductometry, polarography, Potentiometry, pH metry,
2. Interpretation of spectral data and important conclusions.

CCPP-2: CHP-227: Practical Course-II (4 Credits)
Basic Practical Chemistry (Compulsory)

The students will learn the theoretical basis as well as master practical skills regarding
1. Synthesis of important inorganic materials and their characterizations.
2. Understanding of reaction kinetics in terms of rate as well as energetics.
3. Use of Purification techniques: recrystallization, distillation,   steam distillation and extraction during synthesis
4. Synthesis of important organic compounds using Green Chemistry Technology.
5. Use of spectral methods for their characterizations.

Name of Faculty	Science and Technology
Name of Department	Physics
Departmental Email ID	phynacsp@gmail.com
PG Programme	M.Sc. Physics

Programme Specific Outcomes (PSO)

- ➢ To create foundation for research and development in Physics.
- ➢ To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems.
- ➢ To train students in skills related to research, education, industry, and market.
- ➢ To help students to build-up a progressive and successful career in Physics.

Course Outcomes: M.Sc. Part I

PHYUT-111: Mathematical Methods in Physics

- ➢ Students will demonstrate competence with the basic ideas of linear algebra including concepts of linear systems, independence, theory of matrices, linear transformations, bases and dimension, eigenvalues, eigenvectors and Diagonalization.
- ➢ Use the method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients.
- ➢ Solve a Cauchy problem for the wave or diffusion equations using the Fourier Transform.

PHYUT-112: Classical Mechanics
- ➢ Students learn about Lagrangian and Hamiltonian formulation of Classical Mechanics.
- ➢ state the conservation principles involving momentum, angular momentum and energy and understand that they follow from the fundamental equations of motion
- ➢ Have a deep understanding of Newton's laws,
- ➢ Students learn about motion of a particle under central force field.

PHYUT-113: Quantum Mechanics

- ➢ Students will be able to appreciate the beauty of quantum mechanics. They will know all types of representations of operators and ways to apply them in different problems.
- ➢ The most important thing students learned from this course was how to solve the hydrogen atom problem by using quantum mechanics.
- ➢ Students learned about time independent degenerate and non-degenerate perturbations and to apply them in harmonic oscillator.
- ➢ Students got an idea of Pauli spin matrices which are very important in nuclear and particle physics as well as atomic and molecular physics.

PHYDT-114: Electronics

- ➢ To get the knowledge of many circuits Containing mainly IC's
- ➢ Students Understand concept of light to electricity conversion.
- ➢ The study of semiconductor devices makes the base of student in the electronic field.
- ➢ Apply the laws of Boolean algebra and K-map to simplify circuits and Boolean algebra expressions.
- ➢ Understand the basic electronics of logic circuits, counters, registers and be able to use integrated circuit packages

PHYUT- 121: Electrodynamics

- ➢ To have a deep understanding of the theoretical foundations of electromagnetic phenomena
- ➢ Be able to solve the Maxwell equations for simple configurations
- ➢ They have learnt about wave guides and transmission lines and propagation of waves through them.

PHYUP-122: Solid State Physics
- ➢ Understand the physics behind structural properties of the solids.
- ➢ Tailor the properties of solids with proper understanding.
- ➢ Pursue the research work in the field of material science and nanotechnology.

PHYUT-123: Statistical Mechanics
- ➢ Define and discuss the concepts of microstate and macrostate of a model system
- ➢ Define and discuss the concepts and roles of entropy and free energy from the view point of statistical mechanics
- ➢ Apply the machinery of statistical mechanics to the calculation of macroscopic properties
- ➢ Apply the Fermi-Dirac distribution to the calculation of thermal properties of electrons in metals
- ➢ Apply the Bose-Einstein distribution to the calculation of properties of black body radiation

PHDT-124:Atoms and Molecules
- ➢ They should be able to calculate the effects of an electric field on the energy levels of the hydrogen atom (the Stark effect).
- ➢ They should be able to discuss the rotational spectra of molecules.
- ➢ You will understand how the new theory could explain the fine structure in the spectra of hydrogen and hydrogen-like ions, and how this theory can be extended to atoms which have a single electron in their outermost shell, i.e. the alkali metal atoms.
- ➢ Students learn about rotational and vibrational energy levels of diatomic molecules and Raman spectroscopy.

PHUP-115 and PHUP-125: Laboratory Courses
- ➢ Correlation between practical experiments with theory to improve the understanding.

- ➢ Development of practical skills and innovative in experimentation.

Name of Faculty	Science and Technology
Name of Department	**Botany**
Departmental Email ID	botnacsp@gmail.com
PG Programme	**M.Sc. Botany**

Programme Specific Outcomes (PSO)

1. Understanding the classification of plants from cryptogams to phanerogams. Identification of the flora within field enhances basics of plants.

2. Study of biodiversity in relation to habitat will correlates with climate change, land and forest degradation. Application of Botany in agriculture is through study of plant pathology.

3. Understand the ultra-structure and function of cell membranes, cell communications, signalling, genetics, anatomy, taxonomy, ecology and plant Physiology and biochemistry.

4. To understand the multi functionality of plant cells in production of fine chemicals and their wide spread industrial applications.

5. Molecular and Physiological adaptations in plants in response to biotic and abiotic stress. Genes responsible for stress tolerance genetic engineering of plants.

Course Outcomes: M.Sc. Part I of Semester I

BOUT 111: Botany Theory Paper I-Plant Systematics I

The learner will be acquired with sound knowledge of

1. Systematics and Taxonomy of Algae and Fungi– Principles, Concept of species and hierarchical taxa, Classification of algae and fungi and commercial application of algae, fungi and bryophytes.

2. Bryophytes with reference to distribution, distinguishing characters, morphology and anatomy of gametophyte and sporophytes of different orders.

BOUT 112: Botany Theory Paper II- Cell Biology

The learner will be acquired with sound knowledge of

1. Universal features of cells, cell chemistry and biosynthesis, chemical organization of cells, biogenesis of cell organelles and chromosome.

2. Cellular signalling, transport and trafficking. Cellular Processes like Cell cycle and its regulation, Phases of cell cycle, Method of study of cell cycle, Programmed cell death, Cell-ECM and cell-cell interactions and Role of hormones.

3. Genome instability and cell transformation

BOUT 113: Botany Theory Paper III-Cytogenetics, plant breeding and evolution

The learner will be acquired with sound knowledge of

1. Principles of Mendelian inheritance and Interaction of genes, Cytoplasmic inheritance, Quantitative inheritance, Linkage, Recombination and Crossing Over and mutation.
2. Microbial & Phage Genetics, Karyotype and Chromosome Banding, Numerical alterations of chromosomes, Structural alterations of chromosomes and Model systems in Genetics.
3. Concept, Objectives, applications and various methods of plant breeding.
4. Theories of Evolution, cellular, molecular evolution and mechanism of evolution.

BODT 114: Botany Theory paper 4-Biofertilizer and Algal Technology

The learner will be acquired with sound knowledge of

1. Biofertilizer: Various types of biofertilizers, mass cultivation, methods of application and use of genetically engineered microorganisms for improvement of biofertilizers.
2. Algal Technology: Algal products, Seaweed fertilizer, biodiesel and bio-hydrogen production from algae.

BODP 114: Botany practical paper 4

1. Correlation between practical experiments with theory to improve the understanding.
2. The learner will be acquired with sound knowledge of isolation of microorganisms, culture establishment, mass cultivation and application as a biofertilizers.

BOUP 115: Botany practical paper 5

1. Morphological observations, documentation (description and illustrations) and classification of various algal and fungal members.
2. Morphological, anatomical and reproductive studies of the various members of bryophytes
3. Practically understanding of polytene chromosome, mitotic and meiotic cell division.
4. How to isolate chloroplast, mitochondria and estimation of related biomolecules are practically studied.
5. Karyotype analysis, Meiotic configuration, polygenic inheritance, population genetics, giant chromosome, Floral Biology and various fossils.

Course Outcomes: M.Sc. Part I of Semester II

BOUT 121: Botany Theory Paper 1- Plant Systematics II

The learner will be acquired with sound knowledge of

1. Pteridophytes: Classification, stellar evolution, distribution, distinguishing characters, morphology and anatomy of sporophyte and gametophyte of various orders of pteridophytes.

2. Gymnosperms: Classification, Affinities with Pteridophytes and Angiosperms, Distribution, Economic aspects, General characters and morphology of various orders of gymnosperms.

3. Angiosperms: Study of various plant families with respect to general characters, morphology, economic importance, affinities and classification.

BOUT 122: Botany Theory Paper II- Molecular Biology

The learner will be acquired with sound knowledge of

1. Techniques and Tools in Molecular Biology: Applications, Enzymes, minor and major equipment's and techniques are used in molecular biology.

2. DNA – Structure, Functions and Damage: Structure, forms, properties, packaging, replication, damage and repair of DNA.

3. Gene structure and Function: Structure, Transcription, Translation, gene regulation, Transposable elements, Genomics and Proteomics

BOUT 123: Botany Theory Paper III- Biochemistry

The learner will be acquired with sound knowledge of

1. Fundamental aspects of biochemistry, biomolecules like carbohydrates, lipids and nucleic acids.

2. Protein biochemistry and nitrogen metabolism.

3. Phytochemistry and Metablomics and phytochemical investigations.

BODT 124: Botany Theory paper 4- Floriculture and Nursery Management

The learner will be acquired with sound knowledge of

1. Concept, definition, Scope and Importance of floriculture, global scenario, Pre-requisites of commercial floriculture, Harvesting and processing of flowers and Commercial production of flowers.

2. Nursery Management: Types of Nurseries, primary requirements, site preparation, Design and Layout of Nurseries, Producing Plants from Seed, Vegetatively and growing media.

BODP 124: Practical based on BODT 124 Floriculture and Nursery Management

The learner will be acquired with sound practical knowledge of

1. Correlation between practical experiments with theory to improve the understanding of theoretical knowledge.

2. Students are practically prepared for construction of different protective structures of green houses, special cultural practices and methods of post-harvest technology for cut flowers.

3. Students are motivated for preparation of project on cut flower, preparation of bed, method of seed germination, growing media, grafting, budding, air layering and cutting methods.

BOUP 125: Botany practical paper 5

The learner will be acquired with sound practical knowledge of

1. Studies of different plant families of dicotyledonae and monocotyledonae, artificial keys and different forms of fossils.

2. Isolation and quantification of plant genomic DNA and effect of temperature and alkali on DNA.

3. Separation of seed storage proteins of legumes by SDS-PAGE.

4. Electrophoretic separation of plasmid isoforms restriction digestion study of plasmid DNA

5. Study of instruments or equipment's used in Molecular Biology techniques.

6. Study of Thin Layer chromatography, Spectrophotometry and Effect of pH and enzyme concentration on enzyme.

7. Estimation of proteins by Lowry and Bradford Method

Name of Faculty	Science and Technology
Name of Department	**Computer Science**
Departmental Email ID	**compscinacsp@gmail.com**
PG Programme	**M.Sc. (Computer Science)**

Programme Specific Outcomes(PSO)

1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
2. An ability to identify, formulates, and develop solutions to computational challenges.
3. An ability to design, implements, and evaluate a computational system to meet desired needs within realistic constraints.
4. An ability to function effectively on teams to accomplish shared computing design, evaluation, or implementation goals.
5. An understanding of professional, ethical, legal, security, and social issues and responsibilities for the computing profession.
6. An ability to communicate and engage effectively with diverse stakeholders.
7. An ability to analyse impacts of computing on individuals, organizations, and society.
8. Recognition of the need for and ability to engage in continuing professional development.
9. An ability to use appropriate techniques, skills, and tools necessary for computing practice.
10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computational systems in a way that demonstrates comprehension of the trade-offs involved in design choices.
11. An ability to apply design and development principles in the construction of software systems of varying complexity.
12. **Broadly Educated and Versatile**.
    Able to draw upon foundational knowledge, learn, adapt and successfully bring to bear analytical and computational approaches on changing societal and technological challenges.
13. **Inspiring and Collaborative**.
    Is a leader and a responsible citizen whose strengths come from an ability to draw on and contribute to diverse teams, expertise, and experiences.
14. **Innovative.**
    Drives scientific and societal advancement through technological innovation and entrepreneurship.

Course Outcomes(CO): M.Sc.(Computer Science)
CSUT111 : Paradigm of Programming Language

1. To Prepare student to think about programming languages analytically
2. Separate syntax from semantics
3. Compare programming language designs
4. Understand their strengths and weaknesses
5. Learn new languages more quickly
6. Learn small programs in different programming Languages
7. Understand basic language implementation techniques

CSUT112 : Design and Analysis of Algorithm

1. To design the algorithms
2. To select the appropriate algorithm by doing necessary analysis of algorithms
3. Understand different design strategies
4. Understand the use of data structures in improving algorithm performance
5. Understand classical problem and solutions

6. Learn a variety of useful algorithms
7. Understand classification of problems
8. To provide foundation in algorithm design and analysis
9. To develop ability to understand and design algorithms in context of space and time complexity.
10. To learn basic Algorithm Analysis techniques and understand the use of asymptotic notation

CSUT113 : Database Technologies

1. Provide an overview of the concept of NoSQL technology
2. Provide an insight to the different types of NoSQL databases
3. Make the student capable of making a choice of what database technologies to use, based on their application needs.

CSDT114C : Web Services

1. To understand the details of web services technologies like WSDL,UDDI, SOAP
2. To learn how to implement and deploy web service client and server
3. To explore interoperability between different frameworks

To understand the concept of Restful system.

CSUT111 : Paradigm of Programming Language

8. To Prepare student to think about programming languages analytically
9. Separate syntax from semantics
10. Compare programming language designs
11. Understand their strengths and weaknesses
12. Learn new languages more quickly
13. Learn small programs in different programming Languages
14. Understand basic language implementation techniques

CSUT112 : Design and Analysis of Algorithm

11. To design the algorithms
12. To select the appropriate algorithm by doing necessary analysis of algorithms
13. Understand different design strategies
14. Understand the use of data structures in improving algorithm performance
15. Understand classical problem and solutions
16. Learn a variety of useful algorithms
17. Understand classification of problems
18. To provide foundation in algorithm design and analysis
19. To develop ability to understand and design algorithms in context of space and time complexity.
20. To learn basic Algorithm Analysis techniques and understand the use of asymptotic notation

CSUT113 : Database Technologies

4. Provide an overview of the concept of NoSQL technology
5. Provide an insight to the different types of NoSQL databases
6. Make the student capable of making a choice of what database technologies to use, based on their application needs.

CSDT114C : Web Services

4. To understand the details of web services technologies like WSDL,UDDI, SOAP
5. To learn how to implement and deploy web service client and server
6. To explore interoperability between different frameworks
7. To understand the concept of Restful system.

Name of Faculty	Science and Technology
Name of Department	Mathematics
Departmental Email ID	**mathsnacsp@gmail.com**
PG Programme	**M.Sc. Mathematics**

Programme Specific Outcomes (PSO)

1. To maintain updated curriculum.
2. To take care of fast development in the knowledge of Mathematics
3. To enhance the quality and standards of Mathematics Education
4. To provide a broad common frame work, for exchange, mobility and free dialogue across the Indian Mathematical and Associated Community.
5. To create and aptitude for Mathematics in those students who show a promise for higher studies and creative work in Mathematics.
6. To create confidence in others, for equipping themselves with that part of Mathematics which is needed for various branches of Sciences or Humanities in which they have aptitude for higher studies and original work.
7. A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

Course Outcomes: M.Sc. Part I

MTUT 111: Linear Algebra

i)A student should be able to understand the proof techniques in Linear Algebra and importance of theorems for sorting out typical examples.

MTUT 112: Real Analysis

i)A student should acquire sufficient technical competence to solve the problems of Real Analysis varying difficulty levels and high notational complexity.

MTUT 113: Ordinary Differential Equation

i)A student should be able to make observations, experimentation and pattern recognition which would stimulate the research potential of Ordinary Differential Equation.

MTUT 114: Advance Calculus

i) A student be able to apply their skills and knowledge ,that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

MTUT 115: Group Theory

i)Introducing advanced theories of Group theory in an orderly manner with a clearly defined path of interdependence

MTUT 121: Complex Analysis

i)Introducing the specializations in different areas of Complex Analysis and at the same time

emphasizing the underlying interconnections in different branches of Mathematics.

MTUT 122: Topology

i)Generating more interest in the subject by giving examples and motivating students for self-learning beyond the realm of syllabi and examinations.

MTUT 123: Ring Theory

i)Inculcating the spirit of inquiry of subject among the students and preparing them to take up the research in Ring Theory.

MTUT 124: Advance Numerical Analysis

i)Exhibiting the wide range of applications of Advance Numerical Analysis and preparing students to apply their knowledge in diverse areas such as Physics, Astronomy, Biology, Social Sciences, etc.

MTUT 125: Partial Differential Equation

i)A student should get a relational understanding of Partial Differential Equation concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.

A student should get adequate exposure to global and local concerns that explore them many aspects of PDE.