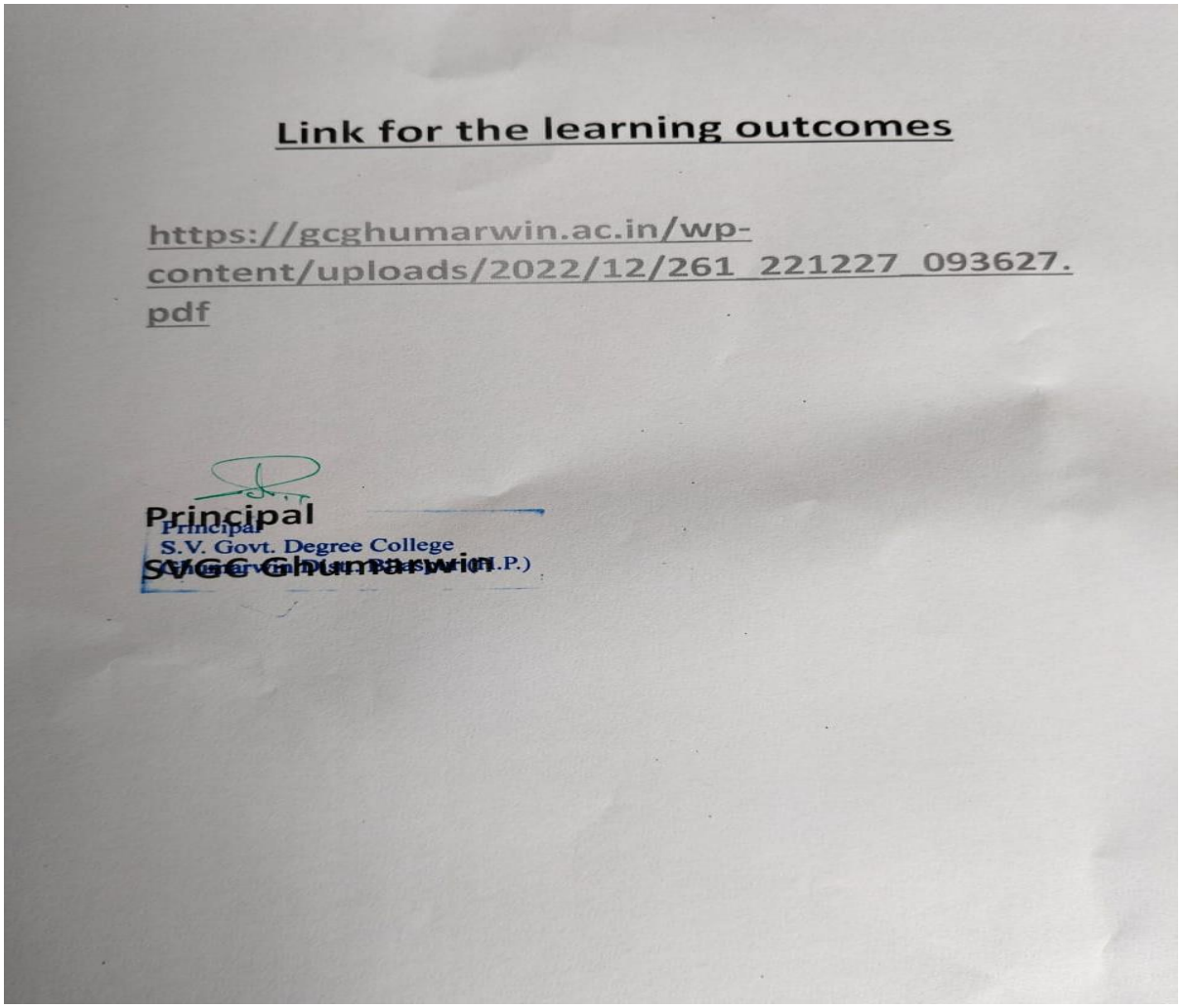
SWAMI VIVEKANAND GOVT. COLLEGE GHUMARWIN

Affiliated to Himachal Pradesh University Shimla(File No. 1-128/94-HPU (Acad.) Vol.-III

Website: www. https://gcghumarwin.org.in/e-mail:

gcghumarwin-hp@nic.inPhone No.01978255551

2.6.1 Program and course outcomes for all programs offered by the institution are stated and displayed on websites and communicated to teachers and students



Programme outcomes/learning outcomes defined in the PG syllabus:

M.Sc. chemistry syllabus link:

https://hpuniv.ac.in/hpuniv/upload/uploadfiles/files/Final%20MSc%20Chem%20HPU%20syll%2C%20CBCS%20for%2022-23(1).pdf

M.Sc. Physics syllabus link:

https://www.hpuniv.ac.in/hpuniv/upload/uploadfiles/files/M_Sc_%20Physics%20Course_CBCS%20proposed%202022-23%20and%20onwards(1).pdf

M.Com.(Programe outcomes) syllabus link :

https://www.hpuniv.ac.in/hpuniv/upload/uploadfiles/files/M_COM%20(1)(1).pdf

SYLLABI

FOR

M.Sc. Physics
(Semester System)

CREDIT BASED SYSTEM

(Effective from Session 2022-23 and Onwards)

DEPARTMENT OF PHYSICS
HIMACHAL PRADESH UNIVERSITY
SHIMLA-171005

Annexure- 1

HIMACHAL PRADESH UNIVERSITY

Courses of Study and Syllabi for M. Sc. Physics

Semester-I	Max. Marks	**(Credits)**
Course-PHYMS-I01 Mathematical Physics	80+ 20 I.A	**(4)**
Course- PHYMS-I02 Classical Mechanics	80+ 20 I.A	**(4)**
Course- PHYMS-I03 Electronics- I	80+ 20 I.A	**(4)**
Course- PHYMS-I04 Computational Methods in Physics	80+ 20 I.A	**(4)**
Course- PHYMS-I05 Laboratory	80+ 20 I.A	**(6)**
Additional Optional Course I-PHYMS-I06 Computer Application in Physics Nodal Center based	80 (Theory 40 + Practical40) + 20 I.A	**(3)**
Semester-II		
Course- PHYMS-201 Quantum Mechanics-1	80+ 20 I.A	**(4)**
Course- PHYMS-202 Condensed Matter Physics	80+ 20 I.A	**(4)**
Course- PHYMS-203 Statistical Physics	80+ 20 I.A	**(4)**
Course- PHYMS-204 Electrodynamics	80+ 20 I.A	**(4)**
Course- PHYMS-205 Laboratory	80+ 20 I.A	**(6)**
Additional Optional Course-II - PHYMS-206 Computer Application in Physics Nodal Center based	80 (Theory 40+ Practical 40) + 20 I.A	**(3)**
Semester-III		
Course- PHYMS-301 Quantum Mechanics-II	80+ 20 I.A	**(4)**
Course- PHYMS-302 Material Science	80+ 20 I.A	**(4)**
Course- PHYMS-303 Nuclear Physics	80+ 20 I.A	**(4)**
Course- PHYMS-304 High Energy Physics	80+ 20 I.A	**(4)**
Course- PHYMS-305 Laboratory	80+ 20 I.A	**(6)**

Semester-IV

Course- PHYMS-401 Electronics –II	80+ 20 I.A	**(4)**
Course- PHYMS-402 Elective Papers one of the following	80+ 20 I.A	**(4)**

i) PHYMS-402 (a) Advanced High Energy Physics
ii) PHYMS-402 (b) Nuclear & Particle Astrophysics
iii) PHYMS-402 (c) Advanced Quantum Mechanics

Course- PHYMS-403 Elective Papers one of the following	80+ 20 I.A	**(4)**

i) PHYMS-403 (a) Nano Physics
ii) PHYMS-403 (b) Mesoscopic Physics
iii) PHYMS-403 (c) Advanced Computational Physics .

Course- PHYMS-404 Elective Papers one of the following	80+ 20 I.A.	**(4)**

i) PHYMS-404 (a) Advanced Nuclear Physics
ii) PHYMS-404 (b) Nuclear Technology
iii) PHYMS-404 (c) Opto – Electronics

Course- PHYMS-405 **Project**	100	**(10)**

Note: *Each theory course is given 4 credits as per 4 hours of lectures per week and each practical course is given 6 credits for 12 hours of engagements per week. The Project work in the IV semester is given 10 credits for 20 hours of engagement per week. Therefore M.Sc in Physics programme is given 92 credits. Student will have to earn 92 credits to pass M.Sc. Physics programme. Nodal Centre based Additional Optional course is given 3 credits each.*

Program Outcomes

1. Becoming Masters of physics by gaining advanced knowledge of the courses proposed in the syllabus.
2. Developing analytical thinking to correlate experimental and theoretical aspects of various specialized branches of physics
3. Developing integrative approach while learning diverse courses which leads to unified thinking towards Physics and all natural phenomena.
4. Learning basic aspects of various courses to develop problem solving aptitude to strengthen the learning of Physics
5. Apply the knowledge and skill in the design and development of Electronic circuits and characterization of material properties
6. Becoming professionally trained in the various specialized areas of physics for their application in industry.
7. To develop inter-disciplinary outlook, collaborative thinking and team work for quality research output
8. Becoming aware and successful in their career outlets in India and abroad as excellent professionals such as Scientists, scientific officers (in BARC, ISRO, DRDO, Meteorology & Geology, and Forensic Sciences etc.), teachers and technicians
9. To develop rational thinking and scientific temperament in all pursuits of life of aspirants for their own benefit and society.
10. Demonstrate highest standards of ethical conduct and professional behaviour, critical, interpersonal and communication skills as well as a commitment to life-long learning.

Program Specific Outcome for M.Sc. Physics:

1. Understanding the basic concepts of physics particularly in Mathematical Physics, quantum mechanics, computational physics, electronics, electrodynamics and statistical physics and to realize how diverse phenomena observed in nature can be derived from a small set of fundamental laws
2. Learn to carry out experiments in basic as well as certain advanced areas of physics such as condensed matter physics, nuclear physics and electronics
3. Learning computational modelling for the purpose of research in the frontline specific areas of the Physical Sciences
4. A career oriented learning that develops analytical and problem-solving skills that contributes to the professional development of aspirants

HIMACHAL PRADESH UNIVERSITY, SHIMLA-171005

DEPARTMENT OF CHEMISTRY

FACULTY OF PHYSICAL SCIENCES

REVISED SYLLABI

FOR M.Sc. CHEMISTRY

Under

Choice Based Credit System (CBCS)

(SEMESTER SYSTEM)

(Effective from SESSION 2022-23 AND ONWARDS)

DEPARTMENT OF CHEMISTRY
HIMACHAL PRADESH UNIVERSITY
SHIMLA, HIMACHAL PRADESH-171005 -INDIA

HIMACHAL PRADESH UNIVERSITY
DEPARTMENT OF CHEMISTRY

PROCEEDINGS OF THE MEETING OF THE BOARD OF STUDIEIS IN (PG) IN THE SUBJECT OF CHEMISTRY

A meeting of the Board of Studies in PG in the subject of Chemistry was held on 24.12.2021 at 2.00PM in the Departmental Library of the Chemistry Department. The following were present:

1	Prof. Baljit Singh	Chairman & Convener
2	Prof. Suman Lata Department of Chemistry, Deenbandu Chhotu Ram University of Science and Technology, Murathal, Haryana.	External Expert
3	Prof. Gurjaspreet Singh, Department of Chemistry, Punjab University Chandigarh.	External Expert (attended online meeting)
4	Prof. Suvarcha Chauhan	Member
5	Dr. Sandeep Chauhan	Member
6	Dr. Kiran Kumar	Member
7	Dr. Rajesh Kumar	Member

The following decisions were taken:

1. The scheme as well as the course contents of the syllabi of M. Sc. Chemistry (CBCS), spread over four semesters (I-IV) applicable w. e. f. the Academic Session 2022-2023 i.e. July, 2022 onwards, was discussed and recommended for the consideration of the Faculty of Physical Sciences (as per annexure "A") .

2. In order to maintain the academic standard in respect of research and teaching and also to maintain the uniformity in PG courses offered by HP University to the affiliated institutes (both private and Govt. colleges), the BOS recommended that the all the affiliated institutes will conduct the P.G. practical examinations by the panel of examiners recommended by the chairman of the BOS with subsequent approval of the competent authorities of the University. The practical examination conducted without approved panel of the examiner will not be considered valid for M.Sc. Chemistry degree.

3 The BOS authorized the Chairman & Convener of the BOS (PG) to make typographic corrections and mistakes if any.

4. It was resolved by the BOS (PG) that the pass percentage will be 40% for the M. Sc (Chemistry) . The detail of pass percentage will be as under:

A. In Theory - 40% (32/80)
B. In I.A. - 40% (08/20)
C. In Practical - 40% (20/50)

The meeting ended with a vote of thanks to the chair.

Prof. Suman Lata
External Expert

Prof. Gurjaspreet Singh
External Expert

Prof. Suvarcha Chauhan
Member

Dr. Sandeep Chauhan
Member

Dr. Kiran Kumar
Member

Dr. Rajesh Kumar
Member

Prof. Baljit Singh
Chairman & Convener

Annexure-"A"

A Detailed Scheme and Course Contents of the Syllabi for M.Sc. Chemistry Spread Over Four Semesters (I-IV) For Session 2022-23 and Onwards

Course number	Course Title	Course Type	Credits	Teaching Hours per week	Maximum marks theory + Internal assessment =Total Marks
		Semester I			
CHEM 101	Inorganic Chemistry Theory -1	CP	4	4	80+20=100
CHEM 102	Organic Chemistry Theory -1	CP	4	4	80+20=100
CHEM 103	Physical Chemistry Theory -1	CP	4	4	80+20=100
CHEM 104	Mathematics for Chemists	GE	3	3	40+10=50
CHEM 105	Applications of computer in Chemistry	SEC	3	3	40+10=50
CHEM 106	Inorganic Chemistry Practical -1	CP	3	6	50
CHEM 107	Organic Chemistry Practical -1	CP	3	6	50
CHEM 108	Physical Chemistry Practical -1	CP	3	6	50
Total			27		550
		Semester II			
CHEM 201	Inorganic Chemistry Theory -2	CP	4	4	80+20=100
CHEM 202	Organic Chemistry Theory -2	CP	4	4	80+20=100
CHEM 203	Physical Chemistry Theory -2	CP	4	4	80+20=100
CHEM 204	Chemistry of Life Science	GE	3	3	40+10=50
CHEM 205	Environmental Chemistry	GE	3	3	40+10=50
CHEM 206	Inorganic Chemistry Practical -2	CP	3	6	50
CHEM 207	Organic Chemistry Practical -2	CP	3	6	50
CHEM 208	Physical Chemistry Practical -2	CP	3	6	50
Total			27		550
		Semester III			
CHEM 301	Inorganic Chemistry Theory -3	CP	4	4	80+20=100
CHEM 302	Organic Chemistry Theory -3	CP	4	4	80+20=100
CHEM 303	Physical Chemistry Theory -3	CP	4	4	80+20=100
CHEM 304	Inorganic Chemistry Special Theory -1	DSE	4	4	80+20=100
CHEM 305	Organic Chemistry Special Theory -1	DSE	4	4	80+20=100
CHEM 306	Physical Chemistry Special Theory -1	DSE	4	4	80+20=100
CHEM 307	Inorganic Chemistry Practical -3	CP	3	6	50
CHEM 308	Organic Chemistry Practical -3	CP	3	6	50
CHEM 309	Physical Chemistry Practical -3	CP	3	6	50
Total			25		550
	Candidate will choose only one specialization in Semester III & Semester IV				
		Semester IV			
CHEM 401	Inorganic Chemistry Special Theory -2 (Advanced Organometallic)s	DSE	4	4	80+20=100
CHEM 402	Inorganic Chemistry Special Theory -3 (Modern Techniques of Chemical Analysis)	DSE	4	4	80+20=100
CHEM 403	Inorganic Chemistry Special Theory -4 (Inorganic Spectroscopy)	DSE	4	4	80+20=100
CHEM 404	Inorganic Chemistry Special Theory -5 (Bio-Inorganic Chemistry)	DSE	4	4	80+20=100
CHEM 405	Organic Chemistry Special Theory -2 (Organic Synthesis)	DSE	4	4	80+20=100
CHEM 406	Organic Chemistry Special Theory -3 (Natural products)	DSE	4	4	80+20=100
CHEM 407	Organic Chemistry Special Theory -4 (Medicinal Chemistry)	DSE	4	4	80+20=100
CHEM 408	Organic Chemistry Special Theory -5 (Polymer Chemistry)	DSE	4	4	80+20=100
CHEM 409	Physical Chemistry Special Theory -2 (Advanced Quantum Chemistry)	DSE	4	4	80+20=100
CHEM 410	Physical Chemistry Special Theory -3 (Solid State Chemistry)	DSE	4	4	80+20=100
CHEM 411	Physical Chemistry Special Theory -4 (Biophysical Chemistry)	DSE	4	4	80+20=100
CHEM 412	Physical Chemistry Special Theory -5 (Chemistry of Macromolecules)	DSE	4	4	80+20=100
CHEM 413	Inorganic Chemistry Special Practical -1	DSE	6	8	100
CHEM 414	Organic Chemistry Special Practical-1	DSE	6	8	100
CHEM 415	Physical Chemistry Special Practical-1	DSE	6	8	100
CHEM 416	Two Seminar*	AEC	4	8	50 (Single award list) [25] x 2 =50
Total			26		550
For practical examination, single award list will be prepared which includes marks of practical and internal assessment of practical (20%) for each practical course.					

[1] The abbreviations use in the above course types are as follows:

Core papers = CP
Discipline Specific Elective= DSE
Generic Elective = GE
Ability Enhancement Courses= AEC
Skill Enhancement Courses =SEC

[2] Students will opt DSE course as per their specialization i.e. Inorganic, Organic and Physical chemistry.

[3] The examination time for each theory paper will be of three hours.

[4] The examination time for practicals of first, second and third semester will be of 6 hrs in two sessions (i.e. both morning and evening).

[5] The examination time for practical's of fourth semester will be of 12 hrs in four sessions (i.e. in two days both morning and evening)

[6] For Internal Assessment (I.A.), the following criteria will be implemented with regards to the award of internal assessment:

i) Internal Assessment (I.A.) of 20 % Marks will be added to each paper.
ii) These marks would , however be split as following: (a) 5 Marks for attendance in theory as well as in practical classes. The Weightage to attendance will be as follows: upto 75% with condonation from competent authority as per provision under ordinance-ZERO. Without condonation upto 75%- ONE MARK. 76-80%- TWO MARKS. 81-85% THREE MARKS. 86-90%- FOUR MARKS and above 91% FIVE MARKS.
iii) The award of 15 Marks would be based on the performance of one class test of 15 Marks and this Test will consist of both subjective as well as objective type questions.

[7] Total Marks of all Four Semesters

Semester	**Credits**	**Marks**
Semester I	27	550
Semester II	27	550
Semester III	25	550
Semester IV	26	550
Grand Total	105	2200

SEMESTER-I
CHEM 101
Inorganic Chemistry Theory -1

Lectures-60
Max. Marks-80

Course Objectives: This is an introductory inorganic chemistry course which will help in thoroughly understanding the concepts and the applications of group theory, non aqueous solvents, clusters, supramolecular chemistry and consequently in development of the aptitude for academic and professional skills.

*Note: i. Ten questions will be set by the examiner selecting **TWO** from each unit. As far as possible every question will be divided into **Two – Three Parts**. The students shall attempt **FIVE** questions selecting **ONE** from each unit .ii. Students can ask for Character Tables (except for C2V and C3V point groups) if required.*

UNIT-I
Group theory: The concept of group, Symmetry elements and symmetry operations, Assignment of point groups to Inorganic molecules, some general rules for multiplications of symmetry operations, Multiplication tables for water and ammonia, Representations (matrices, matrix representations for C_2V and C_3V point groups irreducible representations), Character and character tables for C_2V and C_3V point groups. Applications of group theory to chemical bonding (hybrid orbitals for σ-bonding in different geometries and hybrid orbitals for π-bonding. Symmetries of molecular orbitals in BF_3, C_2H_4 and B_2H_6.

UNIT-II
Non-Aqueous Solvents: Factors justifying the need of Non-Aqueous solution Chemistry and failure of water as a Solvent. Solution chemistry of Sulphuric acid: Physical properties, Ionic self-dehydration in H_2SO_4, high electrical conductance in spite of high viscosity, Chemistry of H_2SO_4 as an acid, as a dehydrating agent, as an oxidizing agent, as a medium to carry out acid-base neutralization reaction and as a differentiating solvent. Liquid BrF3: Physical properties, solubilities in BrF3, self-ionization, acid base neutralization reactions, solvolytic reactions and formation of transition metal fluorides.

UNIT-III
Inorganic Hydrides: Classification, preparation, bonding and their applications. Transition metal compounds with bonds to hydrogen, carbonyl hydrides and hydride anions. Classification, nomenclature, Wade's Rules, preparation, structure and bonding in boron hydrides (boranes) and carboranes.

UNIT-IV
Organic Reagents in Inorganic Chemistry: Chelation, factors determining the stability of chelates (effect of ring size, oxidation state of the metal, coordination number of the metal); Use of the following reagents in analysis:
(a) Dimethylglyoxime (in analytical chemistry)
(b) EDTA (in analytical chemistry and chemotherapy)
(c) 8-Hydroxyquinoline (in analytical chemistry and chemotherapy)
(d) 1.10-Phenanthroline (in analytical chemistry and chemotherapy)
(e) Thiosemicarbazones (in analytical chemistry and chemotherapy)
(f) Dithiazone (in analytical chemistry and chemotherapy)

UNIT-V
Supramolecular Chemistry (Ref. Book 15): Introduction, Some important concepts, Introduction to Recognition, information and complementarity, Principles of molecular receptor designs, Spherical recognition (cryptates of metal cations) Tetrahedral recognition by macrotricyclic cryptands, Recognition of ammonium ions, Recognition of neutral molecules and anionic substrates (anionic coordination)

Books Recommended:

1. Chemical applications of Group Theory – F. A. Cotton
2. Inorganic Chemistry – Durrant and Durrant
3. Symmetry in Chemistry- Jaffe and Orchin
4. Non-aqueous solvents – H.Sisler
5. Non-aqueous solvents – T.C.Waddington
6. Non-aqueous solvents – Logowsky
7. Advanced Inorganic Chemistry:Cotton&Wilkinson.VthEdn.
8. Concise course in Inorganic Chemistry- J.D.Lee
9. Nature of Chemical Bond – L. Pauling
10. Chemistry of Elements – Greenwood and Earnshaw
11. Inorganic Chemistry – T. Moeller
12. Inorganic Chemistry – J.E.Huheey 3rd Edn.
13. Topics in Current Chemistry (Inorganic/Bio-Chemistry)–Vol. 64
14. A Text Book of Quantitative Inorganic Analysis- A.I. Vogel
15. Supramolecular Chemistry (Concepts and Perspectives) - Jean Marie Lehn(VCH-1995).

Course Outcomes:
CO 1: Apply the concepts of symmetry operation, character tables, group representation to describe the geometries and chemical bonding of molecules
CO2: Explain the chemistry and mechanisms of transition metal fluorides in the presence of non-aqueous solvents.
CO 3: Classify the various kind of metal clusters with reference the metal boranes and carboranes
CO 4: Understand and describe the role of some organic reagents in inorganic chemistry.
CO 5: Know the basic concepts associated with supramolecular chemistry and their applications.

SEMESTER-I
CHEM 101
Inorganic Chemistry Theory -1

Lectures-60
Max. Marks-80

Course Objectives: This is an introductory inorganic chemistry course which will help in thoroughly understanding the concepts and the applications of group theory, non aqueous solvents, clusters, supramolecular chemistry and consequently in development of the aptitude for academic and professional skills.

Note: i. Ten questions will be set by the examiner selecting TWO from each unit. As far as possible every question will be divided into Two – Three Parts. The students shall attempt FIVE questions selecting ONE from each unit. ii. Students can ask for Character Tables (except for C2V and C3V point groups) if required.

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(e) Thiosemicarbazones (in analytical chemistry and chemotherapy)
(f) Diferrone (in analytical chemistry and chemotherapy)

UNIT-V

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Principal
S.V.G.D.C., Ghumarwin