SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)
Syllabus with effect from the Academic Year 2022-2023

PROGRAMME STRUCTURE
Master of Science in Chemistry
MSc (Inorganic Chemistry) Semester: IV

Programme Outcome (PO) - For MSc Chemistry Programme	Master of Science program provides extended theoretical and practical knowledge of different science subjects. Master of Science programme at Sardar Patel University is designed keeping the overall back ground preparation in mind for the student to either seek a job or to become an entrepreneur. The students, after completion of Bachelor of Science can select the master's programme in the subject they have had at the final year or in a related discipline (depending upon eligibility criteria prescribed by university). **Programme outcomes: At the end of the program, the students will be able to** 1. Have a deep understanding of both the theoretical and practical concepts in the respective subject. 2. Understand laboratory processes and use scientific equipments and work independently. 3. Develop research temperament as a consequence of their theory and practical learning. 4. Communicate scientific information in oral and written form. 5. Understand the issues related to nature and environmental contexts and think rationally for sustainable development. 6. The students are able to handle unexpected situations by critically analyzing the problem.
Programme Specific Outcome (PSO) - For MSc Chemistry Semester - IV	Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Chemistry and Industrial polymer Chemistry. After completing M.Sc. chemistry program, students will be able to: ■ Demonstrate and apply the fundamental knowledge of the basic principles in various fields of Chemistry. ■ Apply knowledge to build up small scale industry for developing endogenous product. ■ Collaborate effectively on team-oriented projects in the field of chemistry or other related fields. ■ Communicate scientific information in a clear and concise manner both orally and in writing. ■ Inculcate logical thinking to address a problem and become result oriented with a positive attitude.

	■ Enhance the scientific temperament among the students so as to develop a research culture and implementation of the policies to tackle the burning issues at global and local level. ■ Apply the knowledge to develop the sustainable and eco-friendly technology. ■ Take up global level research opportunities to pursue Ph.D programme targeted approach and specific competitive exams conducted by service commission ■ Accept enormous job opportunities at all level of chemical industries, pharmaceutical industries and placements in R & D.

To Pass	At least 40% Marks in the University Examination in each paper and 40% Marks in the aggregate of University and Internal examination in each course of Theory, Practical & 40% Marks in Viva-voce.

Course Type	**Course Code**	**Name of Course**	**Type of course**	**T /P**	**Credit**	Hours per Week	**Exam Duration in hrs**	**Component of Marks**		
								Internal	**External**	**Total**
								Total/ Passing	**Total/ Passing**	**Total/ Passing**
Core Course	PS04CINC51	Spectroscopy II	EM & EN	T	4	4	3	30/10	70/28	100/40
	PS04CINC52	Solid State Chemistry and Supra Molecular Chemistry	EM	T	4	4	3	30/10	70/28	100/40
	PS04CINC53	Bioinorganic Chemistry	EM	T	4	4	3	30/10	70/28	100/40
Core Course (Any One)	PS04CINC54	Practical OR	EM&SD	P	4	8	6	30/10	70/28	100/40
	PS04CINC55	Project	EM&SD	P	4	8		30/10	70/28	100/40
Core Course (Any One)	PS04CINC56	Practical OR	EM&SD	P	4	8	6	30/10	70/28	100/40
	PS04CINC57	Project	EM&SD	P	4	8		30/10	70/28	100/40
Core Course	PS04CINC58	Comprehensive Viva		-	1	1			50/20	50/20
Elective Course (Any one)	PS04ECHE51	Environmental Chemistry and analysis	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE52	Analysis of Pharmaceuticals drugs	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE53	Selected Topics in Advanced Inorganic Chemistry-II	EM& EN	T	4	4	3	30/10	70/28	100/40

	PS04ECHE54	Inorganic Polymers and Inorganic Materials	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE55	Selected Topics in Polymers-III	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE56	Selected Topics in Polymers- II	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE57	Surface Chemistry and Catalysis	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE58	Introduction to Different Materials	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE59	Topics in Organic Chemistry	EM& EN	T	4	4	3	30/10	70/28	100/40
	PS04ECHE60	Applied Organic Chemistry	EM& EN	T	4	4	3	30/10	70/28	100/40
					25					650
Add-on Course	MOOCs course from Swayam Portal									

EMPLOYABILITY = EM, ENTREPRENEURSHIP = EN and SKILL DEVELOPMENT = SD

* Project work **(as optional) in place of practicals; to be offered to some of the students, based on their merit, interest and placement with the teachers (Marks : 200). The project shall have to be carried out under the allotted teacher(s) and a dissertation shall be submitted and will be assessed for internal (60 marks) and external (140 marks), in the usual manner.**

Master of Science, Inorganic Chemistry
M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC51	Title of the Course	Spectroscopy-II
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. The students explain the theory of spectroscopic and and microscopic techniques used for characterization of inorganic materials. 2. The students apply spectroscopic techniques for qualitative and quantitative analysis of inorganic substances. 3. The students analyse spectral data to characterize inorganic species. 4. The students predict the possible uses of spectroscopic and microscopic techniques in material characterization.

Course Content

Unit	Description	Weightage* (%)
1.	Atomic Absorption/Atomic and Flame Emission Spectroscopy Absorption of radiation by atoms; equipment: radiation sources (Hollow cathode lamps and electrode less discharge lamps); atomizers (Flame and carbon); wavelength selector and detectors; interferences in atomic absorption spectroscopy; applications and problems: qualitative and quantitative analysis. Introduction to plasma, arc and spark emission spectroscopy; equipment: inductively coupled plasma spectrometer and flame photometer; applications and problems	25%
2.	Mossbauer Spectroscopy Mossbauer effect, and experimental methods, hyperfine interactions, molecular structure, electronic structure, applications of Mossbauer spectroscopy	25%
3.	Electron Spectroscopy Introduction, principle and theory of electron spectroscopy, Notations, X-ray Photoelectron Spectroscopy (XPS), Ultraviolet Photoelectron Spectroscopy (UPS), Auger Electron Spectroscopy (AES), Instrumentation of electron spectroscopy, Qualitative and Qualitative analysis by electron spectroscopy, Chemical shifts, Unwanted features in electron spectra, Applications of electron spectroscopy	25%
4.	Microscopic Techniques Introduction to scanning electron microscopy (SEM), Scanning tunneling microscopy (STM) and atomic force microscopy (AFM), basic principles and theory,	25%

	instrumentation and operating parameters and applications	

Teaching-Learning Methodology	Class room teaching, seminars, quizzes, and assignments

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Explain the theory and instrumentation of important spectroscopic techniques such as Atomic Absorption Spectroscopy, Mossbauer Spectroscopy and Electron Spectroscopy, and microscopic techniques.
2.	Apply spectroscopic and microscopic techniques for characterization of inorganic materials.
3.	Analyse spectroscopic and microscopic data of inorganic substances.
4.	Acquire the knowledge of instrumentation of various modern spectrometers.

Suggested References:	
Sr. No.	References
1.	Principles of Instrumental Analysis by Skoog, Holler and Neiman, Sunders College Publishers (USA).
2.	Undergraduate Instrumental Analysis by James W. Robinson, Marcel Dekker, Inc. (Ny.)
3.	Introduction to Instrumental Analysis by Robert D. Braun, Pharma Med Press Hyderabad- India.

4.	Instrumental Method of Analysis by Willard, Merritt, Jr., Dean and Settle Jr., CBS Publishers and distributors, New Delhi, India.
5.	Microscopic and Spectroscopic Imaging of the Chemical State by Michael D. Morris, Marcel Dekker, Inc. (NY.).
6.	Instrumental Methods of Chemical Analysis, 24th Edition 2005 by B. K. Sharma, Goel Publishing House, Meerut.

On-line resources to be used if available as reference material
On-line Resources
www.nptel.ac.in
www.swayam.gov.in
www.epgp.inflibnet.ac.in (e-PG pathshala)
www.ndl.iitkgp.ac.in (National Digital Library)

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Master of Science, Inorganic Chemistry

M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC52	Title of the Course	Solid State and Supramolecular Chemistry
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. The students explaincrystal systems, crystal classes, lattice structure and types of lattices. 2. The studentsexplainthe classification of perfect and imperfect crystals, intrinsic and extrinsic defects, point defects, line and plane defects, Schottky defects and Frenkel defects. 3. The students know optical reflectance, photoconduction and photoelectric effects. 4. The students apply supramolecular chemistry for various applications. 5. The studentsexplainthe principles and types of solid-state reactions. 6. The students explainthe classification of supramolecular Host-Guest compounds and cation, anion and neutral binding hosts.

Course Content		
Unit	Description	Weightage* (%)
1.	Solid State Chemistry Classification of Solids, Symmetry In Crystals, Crystallography and Its Law, Interfacial Angles, Miller Indices, And Bravais Lattices, Crystal Lattice and Unit Cell, Packing In Solids (Simple, FCC, BCC and HCP Lattices), Radius ratio, Efficiency, Voids, Density, Radii, and Coordination Number, Bragg's Equation and Its Application, Separation of Planes, Electron Neutron Diffraction, Imperfection In Solids (All Defects), Band Model and Bonding In Metals	25%
2.	Optical Properties: Optical reflectance, photoconduction and photoelectric effects, Lasers, Organic solids – electrically conducting solids, organic charge transfer complex, organic metals, new superconductors Solid State Reactions: General Principles, types of solid-state reactions, experimental procedures, co-precipitation as a precursor to solid state reactions, Wagner mechanism of solid-state reactions, sol-gel method, kinetics of solid-state reactions	25%
3.	Basics of Supramolecular Chemistry Definition and development of supramolecular chemistry, Classification of supramolecular Host-Guest compounds, Receptors,	25%

	coordination and lock and key analogy, Binding constants, Cooperativity and the chelate effect, Preorganization and complementarity, Thermodynamic and kinetic selectivity and discrimination, Nature of supramolecular interactions, Solvation and hydrophobic effects, Supramolecular concepts and design	
4.	Cation binding hosts Selectivity of cation complexation, Soft ligands for soft metals, Different cation binding hosts Anion binding hosts Introduction, From cation hosts to anion hosts- a simple change in pH, Some anion hosts Binding of neutral molecules Interactivity complexes of neutral molecules: solution and solid-state binding, Some neutral binding hosts	25%

Teaching-Learning Methodology	Class room teaching, seminars, quizzes, and assignments

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand crystal systems, crystal classes, lattice structure and types of lattices.
2.	Know the classification of perfect and imperfect crystals, intrinsic and extrinsic defects, point defects, line and plane defects, Schottky defects and Frenkel defects.
3.	Learn and appraise optical reflectance, photoconduction and photoelectric effects.
4.	Acquire the knowledge of development of supramolecular chemistry.
5.	Explain the principles and types of solid-state reactions.

6.	Explain the classification of supramolecular Host-Guest compounds and cation, anion and neutral binding hosts.

Suggested References:	
Sr. No.	References
1.	Principles of Inorganic Chemistry by Puri, Sharma and Pathania.
2.	Introduction to Solids by L. V. Azaroff, McGraw Hill Co., New York
3.	Principles of the Solid State by H. V. Kheer, Wiley Eastern
4.	Solid State Chemistry by D. K. Chakrabarthy by New Age International
5.	Solid State Chemistry and Its Applications by Anthony R. West, John Willey & Sons
6.	Crystal – Structural Analysis by M. J. Buerger, John Wiley and Sons, New York
7.	Elements of X-ray Diffraction by B. D. Cullity Addision – Wesley Publ. Co., London
8.	Supramolecular Chemistry by Jonathan W. Steed, Jerry L. Atwood, John Wiley & Sons, Ltd.
9.	Supramolecular Chemistry- Fundamentals and Applications by Katsuhiko Ariga, Toyoki Kunitake Springer

On-line resources to be used if available as reference material
On-line Resources
www.nptel.ac.in
www.swayam.gov.in
www.epgp.inflibnet.ac.in (e-PG pathshala)
www.ndl.iitkgp.ac.in (National Digital Library)

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Master of Science, Inorganic Chemistry
M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC53	Title of the Course	Bioinorganic Chemistry
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. The students identify the elements important in living systems and their biological roles. 2. The studentsexplainthe mechanism of carbonic anhydrase and carboxy peptidases. 3. The students explainthe electron transfer processes in biological systems. 4. The students knowthe important role of metals in medicine. 5. The students study the chelation therapy for detoxification, Drugs for neurological disorders, arthritis antibiotics and MRI agents. 6. The students learn the metal- nucleic acid interactions, application of fluorescence quenching in drug-DNA binding studies and structure activity relationship, mechanism of action, aspects of Pt binding to DNA. 7. The students learn nonplatinum antitumor metal complexes.

Course Content		
Unit	Description	Weightage* (%)
1.	**BioinorganicChemistry-1** Theelementsoflivingsystem:Thebiologicalrolesofmetalions,Calciumbiochemistry: Biochemical roles of Calcium, Intracellular Calcium binding proteins, Role of extracellular Calcium binding proteins,Ironbiochemistry: Types of Heme, Cytochrome P-450 and its enzymatic activity, Catalase and peroxidase activity, Iron sulphur proteins.	25%
2.	**BioinorganicChemistry-II** Zincbiochemistry: Carbonicanhydrase,Carboxypeptidases, Copperbiochemistry: Blue copper proteins, Cobaltbiochemistry: Vitamin B12, Coenzyme B_{12}, Roles of Vitamin B12, Effect ofdeficiency and excess of essential metal ions, anddiseases,chelationtherapyformetaliondetoxification,chelating ligands as drugs.	25%

3.	**MetalionsandcomplexesinMedicine–I** Lithiumdrugsinneurologicaldisorders,goldantiarthritisdrugs,pharmacology ofauranofin,Roleof metal ions in the action of antibiotics, Metal ions in clinical diagnosis: MRI agentsRadiopharmaceuticals:UseofTc, Re, Sm,Sr, Ga,Co,andIisotopes.	25%
4.	**MetalionsandcomplexesinMedicine–II** Metal- nucleic acid interactions: Coordination, Non-covalent interactions - intercalationand hydrogen bonding, hydrophobic interactions, DNA strand cleavage, Applicationoffluorescencequenchingindrug-DNAbindingstudies.DNAbinding and mechanistic possibility, Platinum anticancer drugs, structure activityrelationship, mechanism of action, aspects of Pt binding to DNA, Nonplatinum antitumor metal complexes:Ruthenium complexes in cancer therapy, DNAbinding and cleavage, Anticancer activity of metallocenes, Structure and chemicalpropertiesofstreptonigrinanditsmetalcomplexes,antitumoractivity and mechanism.	25%

Teaching-Learning Methodology	Class room teaching, seminars, quizzes, and assignments

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Know the elements important in living systems and their biological roles.
2.	Explain the mechanism of carbonic anhydrase and carboxy peptidases.

3.	Explainthe electron transfer processes in biological systems.
4.	Acquire the knowledge of important role of metals in medicine.
5.	Know chelation therapy for detoxification, Drugs for neurological disorders, arthritis antibiotics and MRI agents.
6.	Learn the metal- nucleic acid interactions.
7.	Apply fluorescence quenching in drug-DNA binding studies.
8.	Learn the structure activity relationship, mechanism of action, aspects of Pt binding to DNA.
9.	Know about nonplatinum antitumor metal complexes.

Suggested References:

Sr. No.	References
1.	Elements of Bioinorganic Chemistry, G.N. Mukherjee and Arabinda Das
2.	Bioinorganic Chemistry, G. R. Chatwal and A. K. Bhagi
3.	Principles of Bioinorganic Chemistry, S.J. Lippard and J. M. Bersa
4.	Inorganic Chemistry, James E. huheey, Ellen A. Keiter and Richard L. Keiter
5.	Bio-inorganic Chemistry, R.W. Hay – R.W. Hay, Ellis Horwood Limited Publishers chichester 1984
6.	Metal ions in Biological Systems Ed by H. Sigel Vol I to XIX, Marcel Dekker, Basel
7.	Principles of Bio Inorganic Chemistry, S. J. Lippard and J. M. Berg, University Science Books 199.
8.	Facets of coordination chemistry Ed by B.V. Agarwal & K.N. Munshi, World Scientific, Singapore, NJ, London.
9.	Bioinorganic Chemistry, Bertini, Gray, Lippard, & Valentine Viva books pvt ltd (1998)
10.	Bioinorganic Chemistry an introduction, J.A. Cowan, Wiley-VCH

On-line resources to be used if available as reference material

On-line Resources
www.nptel.ac.in
www.swayam.gov.in
www.epgp.inflibnet.ac.in (e-PG pathshala)
www.ndl.iitkgp.ac.in (National Digital Library)

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Master of Science, Inorganic Chemistry
M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC54 (Practical)	Title of the Course	Ores analysis
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	1. The students analyze different ore samples. 2. The students analyse the percentage of various metal ions in inorganic samples. 3. The students analyze metal ions from the industrial waste. 4. The students analyze inorganic samples such as silica, cement, etc.

Course Content	
Description	Weightage* (%)
1. Analysis of Hematite 1) Acid insoluble residue 2) Iron as Fe_2O_3 3) Iron by redox method (volumetrically) 2. Determine the amount of Ca(II), Mg(II), Fe(III) and Carbonate in the given sample of Dolomite ore. 3. Determine the amount of Ca(II), Mg(II), Fe(III) and Carbonate in the given sample of Calcite ore. 4. To analyze the given sample of Pyrolusite 1) Acid insoluble residue 2) Iron as Iron oxide 3) Mn by using EDTA 4) MnO_2 oxalic acid method/Iodometric method 5. To analyze the given sample of Galena ore. 1) Determine the amount of Pb as $PbSO_4$ 2) Determine the amount of Sulphur as $BaSO_4$ 3) Insoluble mass Si as SiO_2 6. To determine the amount of Al and Fe in the given sample of Bauxite ore 1) Al as Al_2O_3 2) Fe as Fe_2O_3 7. Analysis of Industrial waste Determination of Calcium fluoride, Calcium and Carbonate from Industrial waste 8. Analysis of Cement: (White/Black Cement) Determination of SiO_2, Fe^{+3}, Al^{+3}, Ca^{+2}, Mg^{+2} in a given sample. 9. Determine percentage of metal ions in g 10. Miscellaneous	100%

Teaching-Learning Methodology	Laboratory exercises

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Analyze different ore samples.
2.	Analyse the percentage of various metal ions in inorganic samples and in the industrial waste.

Suggested References:	
Sr. No.	References
1.	Qualitative Chemical semimicro analysis by V. N. Alexeyev, Mir Publishers Moscow.
2.	Vogel's Qualitative Inorganic Analysis by G. Svehla, Orent Longman, New Delhi.
3.	Vogel's Textbook of Quantitative Chemical Analysis, 5th edition by G. H. Jeffery, J. Bassett, J. Mendham and R. C. Denney, ELBS Publication, 1996, Chapter 2, 3, 11.

On-line resources to be used if available as reference material
On-line Resources
www.nptel.ac.in
www.swayam.gov.in

www.epgp.inflibnet.ac.in (e-PG pathshala)
www.ndl.iitkgp.ac.in (National Digital Library)

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Master of Science, Inorganic Chemistry
M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC55	Title of the Course	Project work
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. The students apply theoretical knowledge of synthetic and analytical chemistry to synthesize and characterize the compounds/ materials important as drug delivery and release systems, adsorbents, gas storage materials, catalysts, etc. 2. The students analyse the inorganic compounds/ materials using modern analytical and spectroscopic techniques. 3. The students apply the synthesized compounds/ materials for various applications. 4. The students learn about research for pursuing higher studies in research and working in industry.

Course Content	
Description	Weightage* (%)
Research work in laboratory on a topic given by the supervisor	100%

Teaching-Learning Methodology	Laboratory exercise and thesis writing

Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Presentation and Viva-voce Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to proceed for literature survey, synthesis and characterization of inorganic compounds/ materials using modern analytical and spectroscopic techniques and their study for various applications. They will be trained in research for pursuing higher studies. They will get training for working in

research in academic and industries.

Suggested References: Published research articles on given research topic.

On-line resources to be used if available as reference material
Published papers by reputed publishers like American Chemical Society, Royal Society of Chemistry, Wiley, Elsevier, etc.

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Master of Science, Inorganic Chemistry
M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC56 (Practical)	Title of the Course	Alloys analysis
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	1. The students analyze different alloys such as German silver, BRONZE, Solder, Brass, Steel, Aluminum, etc. 2. The students analyze the purity of sample having multi metal ions using different techniques.

Course Content	
Description	Weightage* (%)
1. Analysis of German silver 2. Analysis of BRONZE 3. Analysis of Solder 4. Analysis of Brass 5. Analysis of Steel 6. Analysis Aluminum alloy 7. Percentage of metal ions in given mixtures 8. Miscellaneous	100%
Teaching-Learning Methodology	Laboratory exercises

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Analyze different alloys such as German silver, BRONZE, Solder, Brass, Steel, Aluminum, etc.

2.	Analyze the purity of sample having multi metal ions using different techniques.

Suggested References:	
Sr. No.	References
1.	Modern Analytical Chemistry, 1st Edition by D. Harvey, The McGraw-Hill Pub, 2000.
2.	Instrumental Methods of Analysis, 4th edition by G.W. Ewing, McGraw Hill Ltd., 1970.
3.	Physical Methods in Inorganic Chemistry by R. S. Drago, John-Wiley Pub., 1975.

On-line resources to be used if available as reference material
On-line Resources
www.nptel.ac.in
www.swayam.gov.in
www.epgp.inflibnet.ac.in (e-PG pathshala)
www.ndl.iitkgp.ac.in (National Digital Library)

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Master of Science, Inorganic Chemistry
M.Sc. Inorganic Chemistry, Semester (IV)

Course Code	PS04CINC57	Title of the Course	Project work
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. The students apply theoretical knowledge of synthetic and analytical chemistry to synthesize and characterize the compounds/ materials important as drug delivery and release systems, adsorbents, gas storage materials, catalysts, etc. 2. The students analyse the inorganic compounds/ materials using modern analytical and spectroscopic techniques. 3. The students apply the synthesized compounds/ materials for various applications. 4. The students learn about research for pursuing higher studies in research and working in industry.

Course Content	
Description	Weightage* (%)
Research work in laboratory on a topic given by the supervisor	100%

Teaching-Learning Methodology	Laboratory exercise and thesis writing

Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage
1.	Internal Presentation and Viva-voce Examination (As per CBCS R.6.8.3)	30%
2.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to proceed for literature survey, synthesis and characterization of inorganic compounds/ materials using modern analytical and spectroscopic techniques and their study for various applications. They will be trained in research for pursuing higher studies. They will get training for working in

research in academic and industries.

Suggested References: Published research articles on given research topic.

On-line resources to be used if available as reference material
Published papers by reputed publishers like American Chemical Society, Royal Society of Chemistry, Wiley, Elsevier, etc.

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Master of Science, Inorganic Chemistry
M. Sc. Inorganic Chemistry, Semester – IV

Course Code	PS04CINC58	Title of the Course	Comprehensive Viva
Total Credits of the Course	01	Hours per Week	01

Course Objectives:	To assess the overall knowledge of the student in the relevant subjects covered in core as well as elective courses.

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