The courses and distribution of marks are as follows:

<table>
<thead>
<tr>
<th>Courses</th>
<th>Title</th>
<th>Units</th>
<th>Credits</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem-201H</td>
<td>General Chemistry – II</td>
<td>0.5</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Chem-211F</td>
<td>Thermodynamics and Systems of</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Variable Composition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chem-221F</td>
<td>Organic Chemistry – II</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>Chem-231F</td>
<td>Inorganic Chemistry – II</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>Chem-201AH</td>
<td>Class Assessment-II</td>
<td>0.5</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Chem-201VH</td>
<td>Viva-voce in Chemistry-II</td>
<td>0.5</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>Chem-201L</td>
<td>Practical Chemistry –II</td>
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<td>75</td>
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<tr>
<td>PH-211F</td>
<td>Heat, Radiation &amp; Optics</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>PH-212F</td>
<td>Physics Practical</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>APE-211F</td>
<td>Electronics &amp; Instrumentation</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
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<tr>
<td>APE-212F</td>
<td>Practicals in APE</td>
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<td>75</td>
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<tr>
<td>Math-114F</td>
<td>Analytical Geometry</td>
<td>1.0</td>
<td>4</td>
<td>75</td>
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<tr>
<td>Math-215F</td>
<td>Matrices &amp; Differential Equation</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>9.5</strong></td>
<td><strong>38</strong></td>
<td><strong>750</strong></td>
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</tbody>
</table>

Of the four PH and APE courses students are required to take either two PH or two APE courses.

Examination of the theory courses of 75 marks (1.0 unit, 4 credit) shall be of 4 (four) hours duration, of 50 marks (0.5 unit, 2 credit) 3 (three) hours duration and of the practical course of 75 marks (1.0 unit, 4 credit) shall be of 18 (eighteen) hours duration (3 days). Marks of the practical course (Chem-201L) include 25 marks for continuous Lab. assessment. The students are required to submit a report after each Lab. class to the class teacher(s) for evaluation. After evaluation the report shall be returned to the students. The class teacher(s) shall submit the average marks of all Lab. evaluation in sealed envelopes to the Chairman of the relevant examination committee within three weeks from the last class held. The examination committee shall send a copy of each of the consolidated practical and lab. Evaluation marks is the controller of examination.

Course Chem-201AH (class assessment) includes tutorial, terminal, home assignment and/or class examinations on theoretical courses by the relevant course teacher(s) and attendance* of the students in the classes during the academic year. Class assessment comprises (a) 80% marks in tutorial, terminal, home assignment and/or class examinations and (b) 20% marks for attendance in the class. The class teacher of each course shall submit the average consolidated marks of class assessments and attendance in sealed envelope to the Chairman of the relevant examination committee within three weeks from the last class held. The relevant examination committee shall prepare the result by taking the average marks of class assessments as submitted by the class teachers of all the courses, and send a copy of the average consolidated marks to the controller of examinations.

Viva-voce examination (Chem-201VH) includes the assessment of the students through oral examination (of all the courses) by the members of the relevant examination committee. The examination committee shall send a copy of the marks to the controller of examinations.

*No student shall be allowed to sit for the examination having less than 60% class attendance

Course : Chem-201H  
General Chemistry-II  
Examination - 3 Hours  
Full Marks : 50 (0.5 unit, 2 credit)  
(50 lectures, 2 lectures per week, total 20 weeks)

1. Introductory Electrochemistry: (a) ionic equilibria (5 lectures) : Strong and weak electrolytes; true and potential electrolytes, the Arrhenius ionization theory; evidences in favour of Arrhenius theory and limitations of the theory; Ostwald dilution law; ionization of water; pH and pOH of solutions; acid ionization equilibria; calculations involving K_a; polyprotic acids; base ionization equilibria; hydrolysis of salts; common ion effects on equilibria; buffers; Henderson-Hasselbalch equation, principles of buffer action; buffer capacity and buffer range; preparation of buffer solutions; calculations involving buffers.

(b) Primary Idea about Electrochemical Cells; (5 lectures) : Electrochemical cells and cell reactions; notation of a voltaic cell; electromotive force (emf) and its measurement; some commercial Voltaic cells: Leclanché and alkaline dry cells, lead storage cell and fuel cell; cathodic protection of combating corrosion; electrolytic cells; aqueous electrolysis and stoichiometry of electrolysis.
2. **Introductory chemical kinetics (8 lectures):** The rates of reactions; rate laws and rate constants, order and molecularity, order of reactions and its determination, the rate law, integrated rate laws and half lives, reactions approaching equilibrium, the temperature dependence of reaction rates; Arrhenius parameters. Elementary reactions: molecularity; consecutive elementary reactions: the variation of concentration with time, the rate determining step, the steady state approximation, pre-equilibria, third order reactions, the Michaelis-Menten mechanism of enzyme action.

3. Factors influencing the mobility of electrons in the organic skeletons, inductive effect, resonance, hyperconjugation (4 lectures).

4. **Basic spectral studies (6 lectures):** UV-VIS, IR, NMR, MS, (definition, and applications to organic chemistry)

5. **Separation of mixtures of Common organic Compounds based on their physical and chemical properties (5 lectures):**
   a) Ethane and ethene;
   b) Ethanol, acetone and acetic acid;
   c) Ethanol, hexane and benzene;
   d) Toluene, ether and acetylene;
   e) Phenol and benzoic acid;
   f) Benzene sulphonic acid and sulphuric acid (isolation of benzene sulphonlic acid from sulphonation mixture where both are water soluble);
   g) Benzoic acid and benzene sulphonlic acid;
   h) Ester separation from esterification mixture;
   i) Enol separation from keto-enol equilibria.

6. **Titrimetric analysis (7 lectures):**
   a) Analytical and equilibrium concentrations, molarity, normality, ppm, equivalence point. Primary standard substance and standard solution.
   b) Neutralisation titrations: Strong acid strong base, strong acid- weak base and weak acid-strong base titration, titration curves, acid-base indicator, buffer solution.
   c) Redox titration: Redox reactions, reducing and oxidizing agents, Ce (IV) Fe(II), MnO₄⁻-Fe(II), Cr₂O₇²⁻ Fe(II), iodometric titrations, redox indicators.

7. **Air and water pollution (10 lectures):**
   (i) Air pollution: General consideration, pollution caused by carbon monoxide, oxides of nitrogen, hydrocarbons and photochemical oxidants, oxides of sulfur, particulate, temperature inversion, photochemical smog, Acid rain and greenhouse effect.
   (ii) Water pollution: General considerations, pollution caused by mercury, lead, detergents, synthetic organic insecticides and oil.

**Recommended Books:**
1. Darrel D. Ebbing: General Chemistry
2. D.A. McQuarrie & P.A. Rock: General Chemistry
3. N. Kundu & S.K. Jain: Physical Chemistry
4. P.W. Atkins: Physical Chemistry
5. W.J. Moore: Physical Chemistry
6. S. Glasstone: Introduction to Electrochemistry
7. N. Kundu and S.K. Jain: Chemical Kinetics (3rd edn.)
11. A.I. Vogel: A Textbook of Quantitative Inorganic Analysis
12. H.S. Storker and S.L. Seager: Environmental Chemistry: Air and Water Pollution
13. A.K. De: Environmental Chemistry
15. Rasur N. Reeve: Environmental Analysis (Analytical chemistry by open learning)

**Course : Chem-211F**
**Thermodynamics and Systems of Variable Composition**
**Examination - 4 hours**
**Full Marks : 75 (1 unit, 4 credit)**
(60 lectures, 3 lectures per week, total 20 weeks)

1. **Thermodynamics (25 lectures):** The second law of thermodynamics; spontaneous and nonspontaneous processes, Carnot's cycle, efficiency of a Carnot engine, entropy, entropy change in various processes, entropy of mixing, variation of entropy with temperature, pressure and volume, Cₚ - Cᵥ for van der Waals' and for ideal gases. Applications of the second law of thermodynamics: Characteristic thermodynamic functions, Gibbs' and Helmholtz free energy, conditions of equilibrium, temperature dependence of free energy change of a reaction and of equilibrium constant. Conditions for the occurrence of a spontaneous process, Gibbs - Helmholtz equation, partial molar quantities and chemical potential and their determination, Gibbs-Duhem equation, fugacity, activity and activity coefficients. Maxwell's relations, thermodynamics of phase-change, Clapeyron-Clausius equation. Nernst's heat theorem, the third law of thermodynamics and entropy determination, deviation of entropy from the third law.
2. **Solutions** (12 lectures): Henry’s law, ideal mixture, vapour pressure of liquid mixtures, ideal and non-ideal solutions and their vapour pressure with the variation of composition. Liquid pairs; phenol-water, water-triethylamine and water-nicotine systems, vapour pressure of partially and completely immiscible liquid pairs, steam distillation. Nernst’s distribution law; conditions for validity of the distribution law, thermodynamic derivation, deviations and applications of the distribution law.

3. **Colligative properties** (12 lectures): Lowering of vapour pressure of a solvent due to dissolved solute, Raoult’s law and the molecular weight of the solute, elevation of boiling point and depression of freezing point. Separations of solid solutions, osmosis and laws of osmotic pressure, mechanism of action of semipermeable membrane, relation between osmotic pressure and other colligative properties, abnormal colligative properties of solutions.

4. **The phase equilibria** (11 lectures): Two component systems with solid and liquid phases at equilibrium, simple eutectic systems, antimony-lead system, systems forming congruent melting compounds, silver-strontium system, systems forming compounds with incongruent melting point, systems forming completely miscible solid solutions, silver-gold system. manganese-copper system. systems forming partially miscible solid solutions, two component solid-liquid systems with water as one phase, water-KCl/FeCl₃/Na₂SO₄ systems, iron-carbon system.

**Recommended Books:**
1. P.W. Atkins : Physical Chemistry
3. G.M. Barrow : A Textbook of Physical Chemistry
4. I. Klotz and Rossenberg : Chemical Thermodynamics
5. W.J. Moore : Physical Chemistry
6. P.W. Atkins : Elements of Physical Chemistry

**Course : Chem-221F**
**Organic Chemistry-II**
**Examination - 4 hours**

**Full Marks : 75 (1 unit, 4 credit, 60 lectures)**


2. **Aldehydes and Ketones (Aliphatic and Aromatic)** (6 lectures): Nomenclature, general methods of preparations and reactions; nucleophilic addition to carbonyl compounds.

3. **Carboxylic acids (Aliphatic and Aromatic)** (10 lectures): Nomenclature, role of resonance effect, inductive effect, acidity of carboxylic acid; general methods of preparations and reactions, derivatives of carboxylic acids (esters, amides, acid chlorides and anhydrides), dicarboxylic acids and their derivatives (malonic ester and acetooactic ester).


5. **Heterocyclic compounds** (10 lectures): Aromatic character, general methods of preparation and reactions; furan, pyrrole, thiophene, pyridine, pyrazole, imidazole, oxazole, pyrimidine, quinoline, isoquinoline and indole.

6. **Alicyclic compounds** (6 lectures): Synthesis of macrocyclic rings, ring expansion and contraction, isomerism and conformation of cyclohexane and disubstituted cyclohexanes, energy calculation between chair and boat conformers and between diequatorial and diaxial conformers.


8. **Difunctional compounds** (6 lectures): Nomenclature, preparations and reactions of diols (Cis- and trans), hydroxy acids and dicarboxylic acids.

**Recommended Books:**
3. J.D. Roberts and M.C. Casserio : Basic Principles of Organic Chemistry
4. E.L. Eliel : Stereochemistry of Carbon compounds
5. A. Streitwiesser, C.H. Heathcock and E.M. Kosower : Introduction to Organic Chemistry
6. Acheson : An Introduction to Heterocyclic Compounds
7. P.S. Kalsi : Stereochemistry, Conformation and Mechanism
Course : Chem-231F  
Inorganic Chemistry-II  
Examination- 4 hours  
Full Marks : 75 (1 unit, 4 credit, 60 lectures)

1. Chemical bonds:  
Covalent character of ionic bonds.  
b) Hydrogen bond (3 lectures): Definition, intermolecular and intramolecular hydrogen bonding, effect of H-bonding on physical and chemical properties of compounds, dimerisation of acids, structure of ice and HF$_2^-$.  

2. Chemistry of the main group elements (10 lectures): Group IA(1), IIA(2), IIIA (13) and IVA(14); properties of the elements, and their oxides, hydrides, and halides.

3. Transition and rare-earth elements (7 lectures): Electronic configuration, properties; low, negative and high oxidation states; occurrence, separation of lanthanides and lanthanide contraction.

4. Coordination compounds (10 lectures): Introduction, nomenclature, structures, coordination number and coordination geometries; coordination number 2 – 6, types of ligands, isomerisation in coordination compounds.

5. Boron hydrides (8 lectures): Reactions, structure and bonding; molecular orbital concepts; the styx number; synthesis and reactivity of neutral boron hydrides, carboranes.

6. Radioactivity (12 lectures): Fundamental particles, nuclear charge, mass and radius, packing fraction, binding energy, neutron-proton ratio and stability of nuclei, natural and artificial radioactivity, group displacement laws, radioactive series, laws of disintegration, unit of radioactivity, nuclear potential barrier, artificial transmutation. Isotope: definition, detection, separation and application.

Recommended Books:
2. D.K. Sabera : Electronic Structure and Chemical Bonding  
7. R.C. Day and J. Selbin : Theoretical Inorganic Chemistry  
8. R.K. Modan : Inorganic Chemistry

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Course : PH-211F  
Heat, Radiation and Optics  
Examination - 4 hours  
Full Marks : 75 (1 unit, 4 credit), 60 lectures

1. Thermometry: Base thermometers and their corrections; measurement of low and high temperatures; platinum resistance thermometers, thermocouple.

2. Kinetic Theory of Gases: Kinetic theory of a gas; deduction of Boyle’s, Charle’s and Avogardo’s laws; determination of gas constants; mean free path.

3. Equation of States for Gases: Equation of state for a perfect gas and its experimental study; van der Waal’s equation deduction; physical significance of ‘a’ and ‘b’ defects.

4. Liquefaction of Gases: Different methods of liquefaction; liquefaction of air and nitrogen; refrigeration.

5. Thermal Conduction: Thermal conductivity; Fourier’s equation of heat flow; thermal conductivities of good and bad conductors.

6. Radiation: Radiation pressure: Kirchhoff’s law, black-body radiation; Stefan-Boltzmann’s law: Wein’s law; Rayleigh-Jean’s law; Planck’s quantum law.

Interference: Young's experiment; colour of thin films interferometers; Newton's ring.  
Diffraction: Fraunhooffer and Fresnel diffraction; diffraction by single slit, double slit and diffraction gratings, dispersive and resolving powers of gratings. Polarization; polarimeter.
Recommended Books:

2. Halliday and Resnick : Physics (I and II)
3. Haque : Principles of Heat, Thermodynamics and Radiation
6. Lee and Sears : Thermodynamics
8. Zemansky : Heat and Thermodynamics
11. Matheu : Principle of Optics

Course : PH-212F
Practicals in Physics
Examination - 12 hours (Two days)
Full Marks : 75 (1 unit, 4 credit)

(Experiment - 60 marks, Laboratory assessment – 10 marks, Class records - 5 marks)

1. Determination of moment of inertia of a flywheel.
2. Determination of \( g \) by a compound pendulum.
3. Determination of Young’s Modulus by the method of bending.
4. Determination of rigidity modulus by dynamical method.
5. Determination of rigidity modulus by statical method.
6. Determination of the surface tension of mercury by Quincke’s method.
7. Determination of viscosity of water by capillary flow method.
8. Determination of the surface tension of water by capillary rise method.
10. Determination of the ratio of the specific heats of a gas by Clement and Desorme’s apparatus.
11. Determination of the figure of merit of a galvanometer.
12. Measurement of low resistance by the method of fall of potential.
15. Determination of end-corrections of a meter-bridge wire.
16. Determination of specific resistance of the material of a wire.
17. Measurement of resistance per unit length of a meter bridge wire.
18. Calibration of a meter bridge wire.
19. Determination of \( J \) by an electrical method.
20. Determination of refractive index of a prism by using a spectrometer.

Course : APE-211F
Electronics and Instrumentation
Examination - 4 hours
Full Marks : 75 (1 unit, 4 credit)

1. Semiconductors: n and p type materials; pn junctions, semiconductor diodes, rectifier & filters; voltage regulators.
2. Transistors and FETs: Transistors & FETs, biasing, bias stabilization of transistor and FETs.
3. Amplifiers: Small signal amplifiers; large signal amplifiers, frequency response, noise, distortion.
4. Feedback: Negative feedback and its effects, operational amplifiers, positive feedback, oscillators.

Recommended Books:

1. V.K. Jain : Switching Theory & Digital Electronics
2. A. Mottershead : An Introduction to Electronic Devices
3. Millan & Halkias : Electronic Devices and Circuits
4. Rambhauran : Telecommunications
5. Shardar : Electronic Communications
6. B.L. Theraza : Basic Electronics
7. Martin : Satellite Communication
8. AK. Sowhney : A course in Electrical Measurements and Electronic Instrumentations

Course : APE 212 F
Practicals in APE
Examination - 12 hours (Two days)
Full Marks : 75 (1 unit, 4 credit)

(Expt- 60 marks, Lab. assessment - 10 marks, Class records - 5 marks)

1. Measurement of \( g \) by a compound pendulum
2. Determination of Young’s modulus by the method of bending.
3. Determination of rigidity modulus by dynamical method.
4. Surface tension measurement by Quincke’s method.
5. Measurement of surface tension of water by capillary rise method.
7. To verify the (I) laws of resistance, (ii) Kirchhoff’s laws.
8. Measurement of low and high resistances.
9. Calibration of meter-bridge wire and measurement of an unknown resistance.
12. Determination of wavelength in a spectrum using a plane diffraction grating.
13. To construct coil of unknown resistance.
15. Laws of capacitance in series and in parallel.
16. To measure the inductance by Anderson’s bridge.
17. Half-wave and full-wave rectifiers.
18. To obtain Vc-Ic curve of a transistor.
19. To find C-E amplifier response.
20. To find R-C coupled amplifier response.
21. Experiments on logic gates.
22. Experiments with operational amplifiers.

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Course : Math-114F
Analytic Geometry
Examination - 4 hours
Full Marks : 75 (1 unit, 4 credit, 60 lectures)
(Three lectures per week)

1. Change of axes. The general equation of second degree.
   The pair of straight lines.
2. The circle and the system of circles
3. The parabola and the ellipse
4. Direction cosines and the plane
5. The straight line
6. The sphere and the cone.

Course : Math-215F
Matrics and Differential Equations
Examination - 4 hours
Full Marks : 75 (1 unit, 4 credit, 60 lecture)
(Three lectures per week)

1. Algebra of matrices, adjoint, inverse and rank of a matrix, definition, properties and evaluation.
2. Elementary transformations — echelon, canonical and normal forms. Solution of system of linear equations — consistency and solution of homogeneous and non-homogeneous systems by matrix method and reduction to equivalent system.
4. Solution of first order and first degree and first order and higher degree equations.
5. Solution of higher order linear differential equations.

Course : Chem-201L
(Practical Chemistry -II)
Examination - 18 hours (6x3)
Full Marks : 75 (1 unit, 4 credit)

Section A: Physical Chemistry Practical
Section B: Organic Chemistry Practical
Section C: Inorganic Chemistry Practical

(i) Experiment: 50* (Section : A+B+C), (ii) Continuous Lab. Assessment: 25** (Section : A+B+C)

* The examiners in the three sections shall mark the experiment(s) out of 50 and submit the marks to the chairman of the relevant examination committee. Average marks shall be computed by dividing the total marks of three sections by three.
** The Lab. teachers of the three sections shall evaluate continuously the Lab. classes out of 25 marks and submit the average marks of Lab. evaluation in sealed envelopes to the Chairman of the relevant examination committee within three weeks from the last Lab. held. The average marks shall be computed by the examination committee.

The total marks for the practical course shall be obtained by adding the above two marks (i) & (ii). The examination committee shall send a copy of the consolidated marks to the controller of examinations.

Section A: Physical Chemistry Practical
1. Determination of the molecular weight of a solute by depression of freezing point method.
2. Determination of the molecular weight of a solute by elevation of boiling point method.
3. Determination of the composition of a liquid mixture by viscometric method.
4. Determination of viscosity coefficient of a liquid at two different temperatures and finding out the temperature coefficient for the given liquid.
5. Determination of the solubility product of sparingly soluble salts viz. (a) Ca (OH)₂, (b) Cu(II) iodate, (c) Hydrogen 2,3-dihydroxy butanedioate from cyclohexanol (viii) 3-aminoacetoephonone from reduction of 3-nitroacetophenone with Sn/HCl (ix) dibenzalacetones (x) p-bromacetanilide (some other synthesis may also be included if facilities are made available).

Section B: Organic Chemistry Practical Synthesis
i) Simple techniques used in organic laboratory, viz. crystallization, distillation, sublimation etc.
ii) Organic preparations involving typical reactions, e.g., Perkin reaction, Grignard reaction, Friedel-Crafts reactions, permanganate and chromic acid oxidation, esterification etc.
iii) Preparation of (i) acetaldehyde, (ii) benzoic acid, (iii) nitrobenzene, (iv) p-nitroacetanilide, (v) p-nitroaniline (vi) aspirin, (vii) cyclohexanone from cyclohexanol (viii) 3-aminoacetoephonone from reduction of 3-nitroacetophenone with Sn/HCl (ix) dibenzalacetones (x) p-bromacetanilide (some other synthesis may also be included if facilities are made available).

Section C : Inorganic Chemistry Practical
(i): Inorganic quantitative analysis (Volumetric)
a. Application of the knowledge of significant figures and brief idea about the evaluation of analytical data
b. Calibration of volumetric apparatus
c. Acid-base titrations:
   i) Preparation of decinormal sulphuric acid and hydrochloric acid and their standardisation with sodium carbonate
   ii) Standardisation of sodium hydroxide solution by potassium hydrogen phthalate/oxalic acid
   iii) Determination of equivalent weight of a weak acid
   iv) Analysis of commercial caustic soda and soda ash
   v) Determination of acid content in vinegar
d. Oxidation-reduction titrations:
   i) Standardisation of potassium permanganate solution by sodium oxalate
   ii) Estimation of iron (ferrous and ferric) in solution / ore / oxide by titration with KMnO₄ / K₂Cr₂O₇ / Ce(IV) solutions
   iii) Standardisation of thiosulphate solution against K₂Cr₂O₇ / KIO₃ / KMnO₄ solution
   iv) Estimation of copper in solution/brass/ore iodometrically
   v) Determination of calcium in limestone by KMnO₄
   vi) Estimation of available chlorine in bleaching powder / solution iodometrically.

(ii): Inorganic synthesis

Synthesis of
i) Potassium dichromate, K₂Cr₂O₇
ii) Potassium permanganate, KMnO₄
iii) Hexamminecobalt (III) chloride, Co(NH₃)₆Cl₃

NB: A few more experiments, relevant to the theoretical courses may be done, subject to the availability of the Lab. facilities.
iv) Tetramminecopper (II) Sulphate, Cu(NH$_3$)$_4$SO$_4$·H$_2$O

v) Chromealum, K$_2$SO$_4$·Cr$_2$(SO$_4$)$_3$·24H$_2$O

vi) Potassium cobaltinitrite, 6KNO$_2$, 2Co(NO$_2$)$_3$·3H$_2$O

vii) Mohr’s salt, FeSO$_4$·(NH$_3$)$_2$SO$_4$·6H$_2$O

viii) Chloropentaamminecobalt (III) chloride, [Co(NH$_3$)$_5$Cl]Cl$_2$

ix) Potassium trioxalatocobaltate (III)trihydrate, K$_3$Co(OX)$_3$·3H$_2$O

x) Potassium trioxalatochromate(III), K$_3$[Cr(OX)$_3$]

xi) Tris (o-phenylenediamine) nickel (II) thiocyanate

xii) Bis - pyridene-2 carboxylatonickel (II)

Recommended Books:

1. D.P. Shoemaker et al : Experiment in Physical Chemistry
2. G.S. Weiss et al : Experiments in General Chemistry
3. A. Findlay : Practical Physical Chemistry
4. R.C. Das : Experimental Physical Chemistry
5. J.N. Gurtu : Advanced Experimental Chemistry
7. J.C. Muhler et al : Introduction to Experimental Chemistry
8. J. Rose : A Textbook of Practical Physical Chemistry
9. J.B. Yadav : Advanced Practical Physical Chemistry
11. Daniels et al : Practical Physical Chemistry
13. S.R. Palit : Practical Physical Chemistry
15. R.C. West et al : CRC Handbook of Physics and Chemistry
16. L.A. Lange : Handbook of Chemistry
20. A.I. Vogel : Inorganic Quantitative Analysis
24. W.L. Jolly : Synthetic Inorganic Chemistry
25. C. Harris : Analytical Chemistry