Department of Chemistry

The Departmental Board of Studies (BOS) meeting of Chemistry met on 27th February, 2016 at 11:30 am in the Department of Chemistry, Faculty of Science. Prof. T. R. Rao, BHU, Varanasi and Prof. Rita Kakkar, University of Delhi, Delhi were the external experts. The syllabus was discussed in detail and following additions were proposed in the existing syllabus.

Course No.	Existing	Suggested Additions	Justification
CHH 101	**SUGGESTED READINGS:** 1. Soni PL: TEXT BOOK OF INORGANIC CHEMISTRY 2. Madan RD: MODERN INORGANIC CHEMISTRY 3. Cotton FA & Wilkinson G: BASIC INORGANIC CHEMISTRY 4. Bahl BS & Bahl A: TEXT BOOK OF ORGANIC CHEMISTRY 5. Soni PL: TEXT BOOK OF ORGANIC CHEMISTRY 6. Mortimier Charles E: CHEMISTRY A CONCEPTUAL APPROACH 7. Hill & Hollman: CHEMISTRY IN CONTEXT 8. Puri BR & Sharma LR PRINCIPLES OF PHYSICAL CHEMISTRY 9. Brandy JE: General Chemistry-PRINCIPLE AND STRUCTURE	**Few new books have been added** 1. Organic Chemistry, R T Morrison and R N Boyd, 6th Edition (1992), Prentice-Hall of India (P) Ltd., New Delhi 2. Organic Chemistry, I L Finar, Vol. I, 6th Edition (1973), ELBS and Longman Ltd., New Delhi 3. Concise Inorganic Chemistry, J D Lee, 5th Edition (1996), Chapman & Hall, London **Book deleted** Existing book **'Puri BR & Sharma LR PRINCIPLES OF PHYSICAL CHEMISTRY'** has been deleted.	In addition to the existing books, some more books have been added The book is deleted from the existing syllabus on account of multiple errors present in it.
CHH 102	**SUGGESTED READINGS:** 1. Soni PL: TEXT BOOK OF INORGANIC CHEMISTRY 2. Madan RD: MODERN INORGANIC CHEMISTRY 3. Cotton FA & Wilkinson G: BASIC INORGANIC CHEMISTRY 4. Bahl BS & Bahl A: TEXT BOOK OF ORGANIC CHEMISTRY 5. Soni PL: TEXT BOOK OF ORGANIC CHEMISTRY 6. Mortimier Charles E: CHEMISTRY A CONCEPTUAL APPROACH 7. Hill & Hollman: CHEMISTRY IN CONTEXT 8. Puri BR & Sharma LR PRINCIPLES OF PHYSICAL CHEMISTRY **9.** Brandy JE: General Chemistry-PRINCIPLE AND STRUCTURE	**Few new books have been added** 1. Inorganic Chemistry, J E Huheey, E A Keiter and R L Keiter, 4th Edition (2006), Addison Wesley Publishing Co, NY 2. Inorganic Chemistry, D F Shriver and P W Atkins, 3rd Edition (1999), ELBS, London **Book deleted** Existing book **'Puri BR & Sharma LR PRINCIPLES OF PHYSICAL CHEMISTRY'** has been deleted.	In addition to the existing books, two new books have been added The book is deleted from the existing syllabus on account of multiple errors present in it.

Course No.	Existing	Suggested Additions	Justification
CHH 103	**Qualitative Analysis:** (a) Mixture of salts by semi-micro method containing not more than five ions including insoluble and interfering ions (b) Systematic identification of organic compounds. **Quantitative Analysis:** (a) Volumetric estimation {Hardness of water and Iodometry}	**In addition to existing experiments, some more experiments of applied nature have been added** 1. Analysis of cations and anions in milk. 2. Determination of acid value of milk using volumetric analysis. 3. Analysis of cations and anions in water extract of soil samples.	Few more experiments have been added in the List covering hitherto untouched aspects of the subject and giving a wider choice for selection to the students and the teacher concerned.
CHW 101, 102, 103, 104	No reference books	**Reference books have been added** 1. Principles of Instrumental Analysis, D A Skoog, F J Holler and T A Nieman, 5th Edition (1998), Horcourt Brace & Company, Florida 2. Instrumental Methods of Analysis, H H Willard, L L Merritt and J A Dean, 6th Edition (1986), CBS Publishers & Distributors, Shahdra, New Delhi 3. Modern Methods of Chemical Analysis, R L Pecscock, L D Shields, T Cairns and I C Mc William, 2nd Edition (1976), John Willey, New York 4. Basic Concepts of Analytical Chemistry, S K Khopkar, 2nd Edition (1998) New Age International Publications, New Delhi 5. Environmental Chemistry, A K De, 3rd Edition (1994), Willey Eastern, New Delhi	Reference books have been added

Course No.	Existing	Suggested Additions	Justification
CHM 101	**SUGGESTED READINGS:** 1. Cotton F.A. and G. Wilkinson,"Basic Inorganic Chemistry", Wiley (InterScience) New York, 1976. 2. Day M.C. and J. Selbin "Theoretical Inorganic Chemistry", Van Nostrand Reinhold, N.Y. 3. Lee J.D.,"Concise Inorganic Chemistry", Van Nostrand Reinhold, N.Y. 4. Huheey, James E.,"Inorganic Chemistry- Principles of Structure and Reactivity", Harper and Row. 5. Pauling L."The Nature of Chemical Bond" Cornwell University Press(for V.B. Theory only). 6. Lee J.D.,"A New Concise Inorganic Chemistry". 7. Puri and Sharma,"Principles of Inorganic Chemistry". 8. G.S.Manku,"Inorganic Chemistry",Tata McGraw Hill. 9. Sienko and Plane,"Chemistry:Principles and applications International Student Edition, McGraw Hill.	**Book deleted** Existing book **'Puri and Sharma, Principles of Inorganic Chemistry'** has been deleted.	The book is deleted from the existing syllabus on account of multiple errors present in it.
CHM 102	**SUGGESTED READINGS:** 1. Bahl B.S. & Bahl A.,"Advanced Organic Chemistry", Sultan Chand & Co., New Delhi. 2. Soni P.L.,"Text Book of Organic Chemistry", Sultan Chand & Co., New Delhi. 3. Berselow R.,"Organic Reaction Mechanism", Benjamin Inc., 6 California. 4. Brown G.I.,"An Introduction to Electronic Theory of Organic Chemistry", ELBS. Longmans, U.K. 5. Morrison and Boyd, Organic Chemistry, Gurney and Jackson, Edinburg.	**Few new books have been added** 1. Organic Chemistry, I L Finar, Vol I, 6th Edition (1973), ELBS and Longman Ltd, New Delhi 2. Organic Chemistry, Paula Y Bruice, 2nd Edition (1998) Prentice Hall, International Edition	In addition to the existing books, two new books have been added
CHM 103	**SUGGESTED READING:** 1. Atkins PW & Paula J. de Atkin's: PHYSICAL CHEMISTRY, (8th Edition), Oxford University Press (2006). 2. Bahl BS, Bahl Arun and Tuli GD: ESSENTIALS OF PHYSICAL CHEMISTRY, S. Chand and Company Ltd, New Delhi (2006).	**New book is added in the list** 1. Physcial Chemistry, K. J. Laidler and J.M. Meiser, 3rd Edition , (1999) Houghton Mifflin Comp., New York, International Edition.	In addition to the existing books, a new book is added The book is deleted

	3. Engel T & Reid P: PHYSICAL CHEMISTRY, Pearson Education (2005). 4. Mortimer RG: PHYSICAL CHEMISTRY, 3rd Edition, Academic Press, USA (2008). 5. Silbey RJ, Alberty RA & Bawendi MG: PHYSICAL CHEMISTRY, 4th Edition, Wiley (2004). 6. Puri BR, Sharma LR and Pathania Madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing Co. Jalandhar (2007). 7. Kapoor KL: TEXT BOOK OF PHYSICAL CHEMISTRY, Vol. 1, Macmillan India Limited (2008). **8.** Rakshit PC: PHYSICAL CHEMISTRY, Revised and Enlarged (7th Edition), Sarat Book House.	**Book deleted** Existing book **'Puri BR, Sharma LR and Pathania Madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing Co. Jalandhar (2007)'** has been deleted.	from the existing syllabus on account of multiple errors present in it.
CHH 231	**SUGGESTED READING:** 1. Sienko, M.J. and Plane R.A., Chemistry: Principles and Applications, McGraw Hill Book Company, 1979. 2. Puri and Sharma, Principles of Inorganic Chemistry, S & N Publications, 1992. 3. M.P.Arora, Animal Physiology, Himalaya Publishing House. 4. B.K. Sharma and H.Kaur, Water Pollution, Goel Publishing House.	**Book deleted** Existing book **'Puri and Sharma, Principles of Inorganic Chemistry, S & N Publications, 1992'** has been deleted.	The book is deleted from the existing syllabus on account of multiple errors present in it.
CHW 201, 202, 203, 204	No reference books		
CHM 201	**SUGGESTED READING:** 1. Cotton F.A., Wilkinson G., "Advanced Inorganic Chemistry", Wiley Eastern Limited. 2. Bartlet N., "The chemistry of Noble gases" Elseveir, N.Y. 3. Huheey J.E., "Inorganic Chemistry Principles of Structure and Reactivity", Harper and Row. 4. Puri and Sharma, "Principles of Inorganic Chemistry." 5. Sharpe A.G. "Inorganic Chemistry" ELBS and Longman.	**New book is added in the list** 1. Concise Inorganic Chemistry, J.D. Lee 5th Edition (1996), Chapman & Hall, London **Book deleted** Existing book **'Puri and Sharma, "Principles of Inorganic Chemistry'** has been deleted.	In addition to the existing books, a new book is added The book is deleted from the existing syllabus on account of multiple errors present in it.

Course No.	Existing	Suggested Additions	Justification
CHM 203	**SUGGESTED READING:** 1. Atkins PW & Paula J de: ATKIN'S PHYSICAL CHEMISTRY (8th Edition), Oxford University Press (2006). 2. Bahl BS, Bahl Arun and Tuli GD: ESSENTIALS OF PHYSICAL CHEMISTR, S. Chand and company Ltd, New Delhi (2006). 3. Barrow GM: PHYSICAL CHEMISTRY (6th Edition), McGraw-Hill: New York (1996). 4. Engel T & Reid P: PHYSICAL CHEMISTRY PEARSON EDUCATION (2005). 5. Mc Quarrie DA & Simon JD: PHYSICAL CHEMISTRY: A Molecular Approach 3rd Edition, University Science Books (2001). 6. Mortimer RG: PHYSICAL CHEMISTRY, 3rd Edition, Academic Press: USA (2008). 7. Silbey RJ, Alberty RA & Bawendi MG: PHYSICAL CHEMISTRY, 4th Edition, Wiley (2004). 8. Campbell IM: CATALYSIS AT SURFACES, Chapman & Hall: New York/London (1988). 9. Chorkendorff IB & Niemantsverdriet JW: CONCEPTS OF MODERN CATALYSIS AND KINETICS, Wiley-VCH (2003). 10. Thomas JM & Thomas MJ: PRINCIPLES AND PRACTICE OF HETEROGENEOUS CATALYSIS, John Wiley & Sons (1996). 11. Puri BR, Sharma LR and Pathania madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing Co. Jalandhar (2007). 12. Kapoor KL: TEXT BOOK OF PHYSICAL CHEMISTRY, Vol. I, Macmilan India Limited (2008). **13.** Rakshit PC: PHYSICAL CHEMISTRY, Revised and Enlarged (7th Edition), Sarat Book House.	**Few new books have been added** 1. Physical Chemistry, K. J. Laidler and J. M. Meiser, 3rd Edition, (1999) Houghton Mifflin Comp., New York, International Edition. 2. Physical Chemistry, I.N. Levine, 5th Ed. (2010), Tata Mc Graw Hill Pub. Co. Ltd., New Delhi. **Book deleted** Existing book **'Puri BR, Sharma LR and Pathania madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing Co. Jalandhar (2007)'** has been deleted.	In addition to the existing books, two books have been added The book is deleted from the existing syllabus on account of multiple errors present in it.

Course No.	Existing	Suggested Additions	Justification
CHM 204	1. Refractive index measurements of (i) Pure liquids [Calculation of molar refractions] (ii) Solutions. 2. Determination of an equivalent weight of an acid volumetrically. 3. Titrations:(i) Iodometric [Determination of Cu] (ii) Oxidation Reduction [Determination of Fe with $K_2Cr_2O_7$]. 4. Purification of organic compounds, sublimation, crystallization, simple distillation, Fractional distillation and steam distillation. 5. Single and double step synthesis of Organic Compounds, viz., pthalimide, Benzanilide, Phenyl benzoate and Benzamide. 6. Chemical Equilibrium: Experiments regarding verification of LeChatelier's Principle. SEMINAR: Topics related to CHM 201, CHM 202, CHM 203	**In addition to existing experiments, some more experiments based on Green Synthesis have been added** 1. Green synthesis of acetanilide. 2. Green synthesis of dibenzal propanone (Base catalyzed aldol condensation). 3. Green Diels alder reaction between furan and malic acid. 4. Green approach to benzal-benzilic acid rearrangement	In the Organic chemistry section green synthesis of organic compounds has been added.
CHM 301	**SUGGESTED READINGS:** 1. Arniker HL: NUCLEAR CHEMISTRY, H.L. Dai and W. Ho (1995). 2. Cotton FA and Wilkinson G: ADVANCED INORGANIC CHEMISTRY, John-Wiley & Sons, 5th Ed. (1988). 3. Modler T: CHEMISTRY OF LANTHANIDE ELEMENT, Van Nostrand Reinhold, New York (1983). 4. Seaborg GT: MAN MADE TRANSITION ELEMENTS, Prentice Hall, England (1963). 5. Speddy FH and Daane AH: THE RARE EARTHS, Wiley, N.Y (1954). 6. Lee JD: CONCISE INORGANIC CHEMISTRY, Van Nostrand Reinhold, New York, 5th Ed. (2006). 7. Puri BR and Sharma LR: PRINCIPLES OF INORGANIC CHEMISTRY, Vishal Publication, 4th Ed. (2007). 8. Drago RS and Matariyoff NA: ACIDS AND BASES, Heath, Lexington (2000). 9. Shriver DJ, Atkins PW and Langford CH: INORGANIC CHEMISTRY, ELBS, 2nd Ed. (1994). 10. Kettle SFA: *Physical Inorganic Chemistry*: A COORDINATION CHEMISTRY APPROACH, Spektrum (1996).	**New book is added in the list** 1. B.N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd. New Delhi (1976) **Book deleted** Existing book **'Puri BR, Sharma LR and Pathania madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing Co. Jalandhar, 4TH Edition (2007)'** has been deleted.	In addition to the existing books, a new book is added The book is deleted from the existing syllabus on account of multiple errors present in it.

	11.Huheey JE, Keiter EA and Harper RL: INORGANIC CHEMISTRY: PRINCIPLES OF STRUCTURE AND REACTIVITY, Collins, 4th Ed. (1993).		
CHM 303	**SUGGESTED READING:** 1. Glasstone S. "Textbook of Physical Chemistry", Macmillan and Co., London. 2. Barrow G.M., " Physical Chemistry", McGraw Hill International. 3. Rastogi R.P. and Mishra R.R., "An Introduction to Chemical Thermodynamics", Vikas Publishing House. 4. Crow D.R., "Principles and application of electrochemistry", Chapman and Hall, London. 5. Kapoor K.L., "A textbook of Physical Chemistry, Vol. I-IV , Macmillan India Limited. **6.** Puri B.R. and Sharma L.R., "Principles of Physical chemistry", S. Chand and Co., New Delhi.	**New book is added in the list** 1. Modern Electrochemistry, Vol. 2 A & B, J.O'M Bockris and A.K. N. Reddy, 2nd Ed. Plenum Press, New York (1998). **Book deleted** Existing book **'Puri B.R. and Sharma L.R., "Principles of Physical chemistry", S. Chand and Co., New Delhi'** has been deleted.	In addition to the existing books, a new book is added The book is deleted from the existing syllabus on account of multiple errors present in it.
CHM 403	**SUGGESTED READINGS:** 1. Atkins PW& Paula J de: ATKIN'S PHYSICAL CHEMISTRY, (8th Ed.) Oxford University Press (2006). 2. Bahl BS, Bahl Arun and Tuli GD: ESSENTIALS OF PHYSICAL CHEMISTRY, S.Chand and company Ltd., .New Delhi (2006). 3. Barrow GM : PHYSICAL CHEMISTRY , (6th Ed.) McGraw-Hill: New York (1996). 4. Castellan GW: PHYSICAL CHEMISTRY, (3rd ed.) Benjamin Cummings Pub. Co. (1983). 5. Engel T & Reid P: PHYSICAL CHEMISTRY, Pearson Education (2005). 6. McQuarrie DA. & Simon JD: PHYSICAL CHEMISTRY: A Molecular Approach, 3rd Ed., Univ. Science Books (2001). 7. Moore WJ: PHYSICAL CHEMISTRY, 4th Ed. Prentice-Hall (1972). 8. Mortimer RG: PHYSICAL CHEMISTRY, 3rd Ed. Academic Press: USA (2008). 9. Silbey RJ, Alberty RA & Bawendi MG : PHYSICAL CHEMISTRY, 4th Ed. Wiley (2004). 10. Crow DR: PRINCIPLES AND APPLICATIONS OF	**Book deleted** Existing book **'Puri BR, Sharma LR and Pathania madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing CO. Jalandhar (2007)'** has been deleted.	The book is deleted from the existing syllabus on account of multiple errors present in it.

	ELECTROCHEMISTRY, Chapman and Hall, London(1994). 11. Reiger PH: ELECTROCHEMISTRY, Prentice Hall International(1987). 12. Puri BR, Sharma LR and Pathania madan S: PRINCIPLES OF PHYSICAL CHEMISTRY, Vishal Publishing CO. Jalandhar (2007). 13. Kapoor KL: TEXT BOOK OF PHYSICAL CHEMISTRY , Vol. I - IV, Macmillan India Limited(2008). 14. Glasstone S : TEXTBOOK OF PHYSICAL CHEMISTRY, Macmillan and Co.(1974). 15. Rastogi RP and Mishra RR : AN INTRODUCTION TO CHEMICAL THERMODYNAMICS, Vikas Publishing House(2000). 16. Rakshit PC: PHYSICAL CHEMISTRY, Revised And Enlarged (7th Edition), Sarat Book House.		
CHM 503	**SUGGESTED READINGS:** 1. Bahl BS, Bahl Arun and Tuli GD: ESSENTIALS OF PHYSICAL CHEMISTRY, S.Chand and company LTD.New Delhi (2006). 2. Glasstone S: "THERMODYNAMICS FOR CHEMISTS", Macmillan (1974). 3. Minstu A: "STATISTICAL THERMODYNAMICS". 4. Hill TL: Statistical Mechanics: PRINCIPLES AND SELECTED APPLICATIONS DOVER PUBLICATIONS INC.: New York (1987). 5. Landau LD & Lifshitz IM:STATISTICAL PHYSICS Vol. 5, Part 1, 3rd Ed., Pergamon Press (1980). 6. McQuarrie DA: STATISTICAL MECHANICS VIVA BOOKS Pvt. Ltd.: New Delhi (2003). 7. Nash LK: ELEMENTS OF STATISTICAL THERMODYNAMICS 2nd Ed. Addison Wesley (1974). 8. Bard AJ, Faulkner LR: ELECTROCHEMICAL METHODS: FUNDAMENTALS AND APPLICATIONS, 2nd Ed., John Wiley & Sons: New York (2002). 9. Bockris JO' M & Reddy AKN: MODERN ELECTROCHEMISTRY 1:	**New book is added in the list** 1. Atomic and Molecular Spectroscopy, Rita Kakkar, Cambridge University Press (2015)	In addition to the existing books, a new book is added

IONICS 2nd Ed. Springer (1998).
10. Bockris JO' M & Reddy AKN: MODERN ELECTROCHEMISTRY 2B: ELECTRODICS IN CHEMISTRY, Engineering, Biology and Environmental Science 2nd Ed. Springer (2001).
11. Bockris JO' M, Reddy A KN. & Gamboa-Aldeco, ME.: MODERN ELECTROCHEMISTRY 2A: FUNDAMENTALS OF ELECTRODICS 2nd Ed. Springer (2001).
12. Crow DR: "PRINCIPLES AND APPLICATIONS OF ELECTROCHEMISTRY", Chapman and Hall, London. (1994).
13. Reiger PH: "ELECTROCHEMISTRY", Prentice Hall International (1987).
14. Brett CMA & Brett AMO: ELECTROCHEMISTRy Oxford University Press (1993).
15. Koryta J, Dvorak J & Kavan L: PRINCIPLES OF ELECTROCHEMISTRY John Wiley & Sons: NY (1993).
16. Barrow GM: INTRODUCTION TO MOLECULAR SPECTROSCOPY McGraw-Hill (1962).
17. Banwell CN & McCash EM: FUNDAMENTALS OF MOLECULAR SPECTROSCOPY 4th Ed. McGraw-Hill (1994).
18. Banwell CN:"FUNDAMENTALS OF MOLECULAR SPECTROSCOPY", McGraw Hill, N.Y., (1972).
19. Dyer JR: APPLICATION OF ABSORPTION SSPECTROSCOPY OF ORGANIC COMPOUNDS.
20. Silverstein: SPECTROSCOPIC IDENTIFICATION OF ORGANIC MOLECULES (1991).
21. Kalsi PS: SPECTROSCOPY OF ORGANIC COMPOUNDS. NEW AGE INTERNATIONAL (p) limited.New Delhi (2005).
22. Brand JCD. & Speakman JC: MOLECULAR STRUCTURE: THE PHYSICAL APPROACH 2nd Ed., Edward Arnold: London (1975).
23. Chang R: BASIC PRINCIPLES OF SPECTROSCOPY MCGRAW-HILL: New York/N.Y. (1970).

	24. Harris DC & Bertolucci M D: SYMMETRY AND SPECTROSCOPY: AN INTRODUCTION TO VIBRATIONAL AND ELECTRONIC SPECTROSCOPY DOVER PUBLICATIONS: New York (1990). 25. Hollas JM: MODERN SPECTROSCOPY 4th Ed., John Wiley & Sons (2004). **26.** Rakshit PC: PHYSICAL CHEMISTRY, Revised and Enlarged (7th Edition), Sarat Book House.		
CHM 505	**SUGGESTED READINGS:** 1. C.J. Brooks, I.G. Bettley & S.M.Loxoston, Fundamentals of Mathematics & Statistics, John Wiley & Sons. 2. R.S. Lugani, M.L. Minocha & S. Devasundram, A Textbook of Mathematics, Oxford Univ. Press, 1979.	**Few new books have been added** 1. McQuarrie, D. A. Mathematics for Physical Chemistry University Science Books (2008). 2. Mortimer, R. Mathematics for Physical Chemistry. 3rd Ed. Elsevier (2005). 3. Steiner, E. The Chemical Maths Book Oxford University Press (1996). 4. Yates, P. Chemical Calculations. 2nd Ed. CRC Press (2007).	In addition to the existing books, some new books have been added
CHM 705	**SUGGESTED READINGS:** 1. Barrow GM: INTRODUCTION TO MOLECULAR SPECTROSCOPY, McGraw-Hill (1962). 2. Banwell CN and McCash EM: FUNDAMENTALS OF MOLECULAR SPECTROSCOPY 4th Ed. McGraw-Hill (1994). 3. Brand JCD and Speakman JC: MOLECULAR STRUCTURE: THE PHYSICAL APPROACH, Edward Arnold: London, 2nd Ed. (1975). 4. Chang R: BASIC PRINCIPLES OF SPECTROSCOPY, McGraw-Hill: New York, (1970). 5. Harris DC and Bertolucci MD: SYMMETRY AND SPECTROSCOPY: An Introduction To Vibrational And Electronic Spectroscopy Dover Publications: New York, (1990). 6. Hollas JM: MODERN SPECTROSCOPY, John Wiley & Sons, 4th Ed. (2004). 7. Ghosh PK: INTRODUCTION TO PHOTOELECTRON SPECTROSCOPY, John Wiley, (1988).	**New book is added in the list** 1. Atomic and Molecular Spectroscopy, Rita Kakkar, Cambridge University Press (2015)	In addition to the existing books, a new book is added

	8. Holls JM: MODERN SPECTROSCOPY, John Wiley (1988). 9. Windwi H and Ho FL: APPLIED ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS, Wiley Inter Science, (1990). 10. Drago RS: PHYSICAL METHODS IN CHEMISTRY, Saunders College (1992). 11. Barrow GM: INTRODUCTION TO MOLECULAR SPECTROSCOPY, McGraw Hill, N.Y. (1962). 12. Chang R: BASIC PRINCIPLES OF SPECTROSCOPY, Mc Graw Hill, N.Y. (1990). 13. Jaffe HH and Orehin M: THEORY AND APPLICATION OF UV SPECTROSCOPY, IBH (1994). 14. Baker AD and Bettridge D: PHOTOELECTRON SPECTROSCOPY: AN INTRODUCTION TO UVEPS: CHEMICAL AND ANALYTICAL ASPECTS, Pergamon Press (1988). 15. Eland JHD: PHOTOELECTRON SPECTROSCOPY. An Introduction to UPES in Gas Phase (1999). 16. Lever ABP: INORGANIC ELECTRONIC SPECTROSCOPY, Elsevier, 2nd Ed. (1984).		
CHM 706	**Inorganic Chemistry** 1. Colorimetric estimations of heavy metals such as Cr, Pb, Hg, Cu etc. using spectrophotometry and AA spectroscopy (any two). **Organic Chemistry** 1. Separation of dyes using TLC method. 2. Separation of organic compounds (phenol, catechol, resorsenol and pyrogallol) using TLC method 3. Monitoring of the progress of chemical reaction by TLC 4. Separation of amino acids using paper chromatography method 5. Separation of Anthracene from anthracence picrate using column chromatographic method	**In addition to existing experiments, some more experiments based on Green Synthesis have been added** **Inorganic Chemistry** 1. Estimation of chromium using certified standard materials colorimetrically 2. Estimation of Cd, Cr and Ni by using Atomic Absorption Spectroscopy **Organic Chemistry** 1. TLC and column separation of organic compounds (Ortho, meta & Para (nitro phenols and nitro anilines). 2. Paper chromatographic separation of Cu^{2+} and Cd^{2+} 3. Paper chromatographic separation of amino acids from coconut water. 4. Isolation and chromatographic separation of lycopene from tomatoes. 5. Isolation of piperine from	Few more experiments have been added in the List covering hitherto untouched aspects of the subject and giving a wider choice for selection to the students and the teacher concerned. Few more experiments have been added in the List covering hitherto untouched aspects of the subject and giving a wider choice for selection to the students and the teacher concerned.

	Physical Chemistry 1. To determine the equilibrium constant for the formation of complex-ion $[Ag(NH_3)_2]^+$ potentiometrically. 2. A kinetic study of a solvolysis reaction-solvolysis of t-butyl chloride in acetone-water mixture. 3. Effect of solvent medium on the rate of solvolysis of t-butylchloride.	pepper and its chromatographic characterization. 6. Isolation, chromatographic separation and estimation of Aspirin from market available drugs. 7. Isolation of ascorbic acid from fruit juices, its characterization and estimation. **Physical Chemistry: (Below given list of Experiments will replace the previous list)** **Any five of the following** 1. A kinetic study of a solvolysis reaction-solvolysis of t-butyl chloride in acetone-water mixture. 2. Effect of solvent medium on the rate of solvolysis of t-butylchloride. 3. Determine the equilibrium constant of the reaction, $KI + I_2 \leftrightarrow KI_3$, by distribution method. 4. Study the kinetics of base hydrolysis of ethyl acetate conductometrically and determine the rate constant and order of the reaction. 5. Study spectrophotometrically the kinetics of the decomposition of the complex formed by the interaction of sodium sulphide and sodium nitropruside. Report the rate and order of the reaction. 6. Study spectrophotometrically the kinetics of the reaction between potassium per sulphate and potassium iodide and determine the order and rate constant of the reaction. 7. Determine the equilibrium constant of the reaction $Ag(NH)_2^+ \leftrightarrow Ag^+ + 2NH_3$ potentiometrically. 8. Perform pH-metric and potentiometric titration of phosphoric acid solution against standard NaOH solution. Compare the two results.	Few more experiments have been added in the previous list covering hitherto untouched aspects of the subject and giving a wider choice for selection to the students and the teacher concerned.

Course No.	Existing	Suggested Additions	Justification
CHM 803	**SUGGESTED READINGS:** 1. Levine IL: QUANTUM CHEMISTRY 5th Ed., Prentice-Hall Inc.: New Jersey (2000). 2. Lowe JP & Peterson K: QUANTUM CHEMISTRY Academic Press (2005). 3. McQuarrie DA: QUANTUM CHEMISTRY VIVA BOOKS Pvt. Ltd.: New Delhi (2003). 4. Pilar FL: ELEMENTARY QUANTUM CHEMISTRY 2nd Ed., Dover Publication Inc.: N.Y. (2001). 5. Bishop DM: GROUP THEORY AND CHEMISTRY, Clarendon Press: Oxford, U.K. (1973). 6. Cotton FA: CHEMICAL APPLICATIONS OF GROUP THEORY 3rd Ed. (1991). 7. Douglas BE & Hollingsworth CA: SYMMETRY IN BONDING AND SPECTRA Academic Press (1985). 8. Harris DC & Bertolucci MD: SYMMETRY AND SPECTROSCOPY DOVER (1978). 9. Jaffrey HH. et al., SYMMETRY IN CHEMISTRY, Wiley(2002). 10. Raman KV. GROUP THEORY AND ITS APPLICATION TO CHEMISTRY. Tata McGraw Hill(1990). 11. Bard AJ, Faulkner LR: ELECTROCHEMICAL METHODS: FUNDAMENTALS AND APPLICATIONS, 2nd Ed., John Wiley & Sons: New York (2002). 12. Bockris J O' M. & Reddy AKN. MODERN ELECTROCHEMISTRY 1: IONICS 2nd Ed. Springer (1998). 13. Bockris J O' M. & Reddy AKN. MODERN ELECTROCHEMISTRY 2B: ELECTRODICS IN CHEMISTRY, Engineering, Biology and Environmental Science 2nd Ed. Springer (2001). 14. Bockris J O' M, Reddy AKN. & Gamboa-Aldeco ME: MODERN ELECTROCHEMISTRY 2A: FUNDAMENTALS OF ELECTRODICS 2nd Ed. Springer (2001). 15. Brett CMA & Brett AMO.	**New book is added in the list** 1. Atomic and Molecular Spectroscopy, Rita Kakkar, Cambridge University Press (2015)	In addition to the existing books, a new book is added

	ELECTROCHEMISTRY Oxford University Press (1993). 16. Koryta J, Dvorak J & Kavan L. PRINCIPLES OF ELECTROCHEMISTRY John Wiley & Sons: NY (1993). 17. Gaur DR:PRINCIPLES AND APPLICATIONS OF ELECTROCHEMISTRY, Chapmann and Hall 18.Reiger P H: ELECTROCHEMISTRY, Prentice hall (1994).		
CHM 806	**Inorganic Chemistry** 1. Semi-micro qualitative mixture analysis including less common metal ions, such as, TI, Mo, W, Ti, Zr, Th, V and U (two metal ions in cationic/anionic forms). 2. Spectrometric determination of fluoride/nitrite/phosphate. **Organic Chemistry** 1. Multistep synthesis of Organic compounds (any four of the given below). a. Acetanilide-->p-nitroacetanilide-->p-nitroaniline-->p-iodonitro aniline. b. Acetanilide-->aniline-->p-bromoacetanilide -->p-bromoaniline. c. Aniline-->2,4,6, tribromoaniline-->2,4,6, tribromo benzene. d. benzene -->nitrobenzene-->m-dinitrobenzene--> m-nitroaniline e. Synthesis of benzilic acid (Benzil-Benzilic-acid-rearrangement) f. Synthesis of Anthranilic acid (Hofmann's Rearrangement) g. Synthesis of 1,2,3,4 tetra hydrocarbazole (Fischer-Indole Synthesis). h. Synthesis of ortho and para derivatives of nitrophenols. i. Synthesis of methylsalicyclate starting from salicylic acid. 2. Isolation of ascorbic acid from fruit juices, its characterization and estimation volumetrically	**In addition to existing experiments, some more experiments based on Green Synthesis have been added** **Inorganic Chemistry** 1. Powder X-RAY Diffraction: Structural Determination Of Alkali Halide Salts (NaCl, KCl, NaF and CsCl) 2. Morphological analysis of metal oxides nano particles by Scanning Electron Microscopy. 3. Topological analysis of nanostructured metal oxides using Atomic Force Microscope **Organic Chemistry** **Green Synthesis** I. Green synthesis of nitro salicylic acid. II. Green synthesis of p-bromo acetanilide. III. Green photo reduction of benzo phenone to benzo-pinacol. IV. Green route to pinacol to pinacolone rearrangement (Benzo pinacolone). V. Green route to radical coupling reaction (1,1, bis 2-naphthol). VI. Green synthesis of dihydropyrimidinone.	Few more experiments have been added in the List covering hitherto untouched aspects of the subject and giving a wider choice for selection to the students and the teacher concerned. In addition to conventional grey synthesis are replaced by Green synthesis considering cost-effectiveness and environmental issues have been added.

	3. Isolation of caffeine from tea leaves and its characterization 4. Synthesis of Polymer (Synthetic rubber) 5. Synthesis of conducting polymer (Poly aniline) 6. Synthesis of polymeric laminating agents 7. **PHYSICAL CHEMISTRY:** **Any four of the following:** 1. Determination of pKa of an indicator (methyl red) in aqueous media 2. Determination of rate constant for hydrolysis/inversion of sugar using polarimeter 3. Determination of thermodynamic constants by e.m.f. method 4. Determination of activity coefficients of an electrolyte by e.m.f Determination 5. Determination of number of quanta absorbed using chemical actinometers 6. Determination of quantum yield of photochemical dimerisation of Anthracence 7. Determination of transport number of ions by e.m.f method 8. Determination of decomposition voltage of aqueous solutions **ENVIRONMENTAL CHEMISTRY:** 1. Analysis of air pollutants 2. Analysis of water quality parameters 3. Analysis of N, P and K in soil samples	**PHYSICAL CHEMISTRY: (Below given list of Experiments will replace the previous list)** **Any five of the following** 1. Determination of pKa of an indicator (methyl red) in aqueous media 2. Determination of rate constant for hydrolysis/inversion of sugar using polarimeter 3. Determination of thermodynamic constants by e.m.f. method 4. Determine the activity coefficient of Ag^+ ions in $AgNO_3$ solution, potentiometrically, using a concentration cell with a salt bridge. 5. Study the effect of ionic strength (varied by the addition of KNO_3 in the solution) on the activity coefficient of Ag^+ ions in 0.01 M $AgNO_3$ solution, potentiometrically. 6. Determine the transport number of Ag^+ and NO_3^- ions in solution using 0.1 M and 0.01 M $AgNO_3$ solutions (Given: Mean ionic activity coefficients of $AgNO_3$ in 0.01 M and 0.1 M solutions are 0.89 and 0.73, respectively). 7. Determine the composition of binary mixture (solution) containing $K_2Cr_2O_7$ and $KMnO_4$ using spectrophotometer. 8. Determination of decomposition voltage of aqueous solutions 9. Determination of number of quanta absorbed using chemical actinometers 10. Determination of quantum yield of photochemical dimerisation of Anthracence **ENVIRONMENTAL CHEMISTRY:** 1. Analysis of major anions (F, Cl, NO_3, SO_4) and major cations (Na, Ca, K, Mg, NH_4) in water by ion-	Few more experiments have been added in the previous list covering hitherto untouched aspects of the subject and giving a wider choice for selection to the students and the teacher concerned. In lieu of the Department possessing several important analytical instruments, it is proposed to introduce the air and water analyzing using sophisticated instruments.

		exchange chromatography. 2. Analysis of SO_2 , NH_3, NO_2 and O_3 with real time value from online analyzers. 3. Determination of PM 2.5 mass concentration and calculation of Air Quality Index. 4. Analysis of N, P, K in Soil. 5. Analysis of water quality parameters: PH, conductance, dissolved oxygen, hardness, chloride and fluoride. 6. Determination of Pesticides by Gas chromatography in drinking water samples. **7.** Determination of Cu/ Cd/Fe in water samples by Atomic Absorption Spectrophotometer.	
CHM 902	**SUGGESTED READINGS:** 1. Barrow GM: INTRODUCTION TO MOLECULAR SPECTROSCOPY McGraw-Hill (1962). 2. Banwell CN and McCash EM: FUNDAMENTALS OF MOLECULAR SPECTROSCOPY, McGraw-Hill, 4th Ed. (1994). 3. Brand JCD and Speakman JC: MOLECULAR STRUCTURE: THE PHYSICAL APPROACH, Edward Arnold: London, 2nd Ed. (1975). 4. Chang R: BASIC PRINCIPLES OF SPECTROSCOPY McGraw-Hill: New York, (1970). 5. Harris DC and Bertolucci MD: SYMMETRY AND SPECTROSCOPY: AN INTRODUCTION TO VIBRATIONAL AND ELECTRONIC SPECTROSCOPY Dover Publications: New York (1990). 6. Hollas JM: MODERN SPECTROSCOPY, JOHN WILEY & SONS, 4th Ed. (2004). 7. Parish RV: NMR, NQR, EPR AND MOSSBAUER SPECTROSCOPY IN INORGANIC CHEMISTRY, Ellis Harwood, (2003). 8. Drago RS: PHYSICAL METHODS IN CHEMISTRY, Saunders College. (1992). 9. Ebsworth EAV, Rankin DWH and Cradock S: STRUCTURAL METHODS IN INORGANIC CHEMISTRY, ELBS (1988).	**New book is added in the list** 1. Atomic and Molecular Spectroscopy, Rita Kakkar, Cambridge University Press (2015)	In addition to the existing books, a new book is added

	10. Nakamoto K: INFRARED AND RAMEN SPECTRA: INORGANIC AND COORDINATION COMPOUNDS. Wiley (1986). 11. Cotton FA: Vol. 15PROGRESS IN INORGANIC CHEMISTRY, S. J. Lippard, Wiley (1997). 12. Carlin RL: TRANSITION METAL CHEMISTRY, Vol. 3, Dekker (1966). 13. Lever APB: INORGANIC ELECTRONIC SPECTROSCOPY, Elsevier (1984). 14. Martin ML, Delpeuch JJ and Martin GJ: PRACTICAL NMR SPECTROSCOPY, Heyden (1980). 15. Silverstein RM, Bassler GC and Morill TC: SPECTROMETRIC IDENTIFICATION OF ORGANIC COMPOUNDS. John Wiley (2000). 16. Abraham RJ, Fisher J and Loftus P: INTRODUCTION TO NMR SPECTROSCOPY, Wiley (1988). 17. Dyer JR: APPLICATION OF SPECTROSCOPY OF ORGANIC COMPOUNDS, Prentice Hall (2004). 18. Williams DH and Fleming I: SPECTROSCOPIC METHODS IN ORGANIC CHEMISTRY, Tata McGraw-Hill (1988). 19. Kalsi PS: SPECTROSCOPY OF ORGANIC COMPOUNDS (1996).		
CHM 955	**SUGGESTED READINGS:** 1. David Lay, Linear Algebra and its Applications, Pearson. 2. Holmes, D., Moody, P. & Dine, D., 2010. Research Methods for the Biosciences (2nd edition), Oxford University Press, Oxford. 3. Bajpai, N., 2010, Business Statistics, Pearson Press. 4. Russell C. Eberhart and Yuhui Shi, 2011, Computational Intelligence: Concepts to Implementations, Elsevier/Morgan Kaufmann Publishers. 5. S. Rajsekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, Prentice Hall of India.	**Few new books have been added** 1. Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) Practical skills in chemistry. 2nd Ed. Prentice-Hall, Harlow. 2. Hibbert, D. B. & Gooding, J. J. (2006) Data analysis for chemistry. Oxford University Press. 3. Topping, J. (1984) Errors of observation and their treatment. Fourth Ed., Chapman Hall, London. 4. Harris, D. C. Quantitative chemical analysis. 6th Ed., Freeman (2007) Chapters 3-5.	In addition to the existing books, few new books have been added.

	6. Robert R. Sokal and F. James Rohlf, Biometry: The Principles and Practices of Statistics in Biological Research. 7. Gerald Peter Quinn, Michael J. Keough, Experimental Design and Data Analysis for Biologists.	5. Levie, R. de, How to use Excel in analytical chemistry and in general scientific data analysis. Cambridge Univ. Press (2001) 487 pages.	
CHM 001	**SUGGESTED READINGS:** 1. Karlinger FN: Foundations of Behavioural Research 2. Sheltz & Others: Research Methods in Social Relations 3. Kothari CR: Research Methodology-Methods and Techniques 4. Sharma VM: Shodh Pravidhi 5. Singhal Baijnath: Shodh Swaroop aur Manav Vyavaharic Karyavidhi 6. Chandra Suresh: Anusandhan Swaroop aur Prakiya	**New book is added in the list** 1. Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) Practical skills in chemistry. 2nd Ed. Prentice-Hall, Harlow	In addition to the existing books, a new book is added