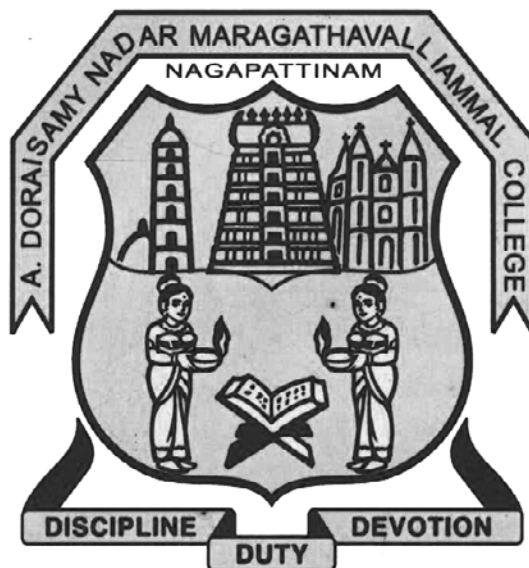


DEPARTMENT OF CHEMISTRY
U.G. PROGRAMME

SYLLABUS

2016 – 2019 BATCH

V SEMESTER



A. D. M. COLLEGE FOR WOMEN
NAGAPATTINAM

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM
III.B.Sc., CHEMISTRY
(For candidates admitted from the year 2016 – 2019 Batch)

SEMESTER V
CORE COURSE VII -
INORGANIC CHEMISTRY I

INT MARK : 25

Hours : 5

EXT MARK: 75

Credit : 5

Objectives :

1. To understand the basics of Nuclear chemistry
2. To learn the principles of bio inorganic chemistry

UNIT – I: NUCLEAR CHEMISTRY (15 Hrs.)

- 1.1 Introduction – composition of nucleus and nuclear forces.
- 1.2 Nuclear stability – n/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and drop models.
- 1.3 Isotopes – detection and separation. Isotopic constitution of elements and whole number rule. Deviation of atomic weights from whole numbers. Isobars, isotones and isomers.

UNIT – II : RADIOACTIVITY AND NUCLEAR TRANSFORMATIONS (15 Hrs.)

- 2.1 Radioactivity discovery, detection and measurements (Wilson cloud chamber). Radioactive emanations. Disintegration theory – modes of decay – Group displacement law – Rate of disintegration – Half life and average life – Radioactive series.
- 2.2 Nuclear transformations use of projectiles nuclear reactions fission and fusion. Nuclear reactors. Applications of radio isotopes – Carbon dating – Radioactive waste disposal

UNIT-III : BIO INORGANIC CHEMISTRY (15 Hrs.)

- 3.1 Chelates in Inorganic Chemistry
- 3.2 Essential and trace elements in biological processes metal porphyrins with special reference to hemoglobin and myoglobin.
- 3.3 Biological role of alkali and alkaline earth metal ion with special reference to Ca^{2+} , Nitrogen Fixation.

UNIT – IV : GRAVIMETRIC ANALYSIS (15 Hrs.)

- 4.1 Characteristics of precipitating agent choice of precipitants, specific and selective precipitant. Condition of precipitation. Types of precipitates. Purity of precipitates. Co-precipitation and post precipitation. Precipitation from homogeneous solution. Digestion and washing of precipitate. Ignition of the precipitate. Use of sequestering agents.

UNIT – V : CLATHRATES & SILICATES

(15 Hrs.)

- 5.1. Clathrates – examples and structures, interstitial compounds and non stoichiometric compounds.
5.2 Silicates – Classification into discrete an ions, one, Two and three dimensional structure with typical examples composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines.

TEXTBOOK:

1. P.L. Soni, “ Text Book of Inorganic Chemistry”, S. Chand & Co., New Delhi (1999).
2. R.D. Madan, G.D. Tuli and S.M. Malik, “Selected Topic in Inorganic Chemistry”, S.Chand & Co., New Delhi (1988)
3. B.R.Puri, L.R.Sharma, K.K.Kalia, “Principles of Inorganic Chemistry”, 23rd edition, New Delhi, Shoban Lal Nagin Chand & Co., (1993)

REFERENCE:

1. J.D. Lee: Concise Inorganic Chemistry, E.L.B.S., IV Edn, m (1991)
2. Jeffery et al: “Vogel Text Book of Inorganic Quantitative Analysis”, Longman (1984).
3. D.A. Skoog and D.M. West : “Fundamentals of Analytical Chemistry W.B. Saunders, New York(1983).

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III.B.Sc., CHEMISTRY

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SEMESTER – V

**CORE COURSE VIII –
ORGANIC CHEMISTRY I**

INT MARK : 25

Hours : 5

EXT MARK: 75

Credit : 5

Objectives :

1. To understand the arrangements of atoms.
2. To learn the reactions of Heterocyclic Compounds

UNIT – I : STEREOISOMERISM –I

(15 Hrs.)

1.1 Stereoisomerism Definition Classification into optical and Geometrical isomerism.

1.2 Optical isomerism – Optical activity – Optical and specific rotation – conditions for optical activity in solid, liquid and gaseous phases – criteria for optical activity. Asymmetric centre Chirality – Achiral molecule – Meaning of + and – , D and L notations – Elements of symmetry -Racemization –Methods of Racemization (by substitution and tautomerism) – Resolution – Methods of Resolution (Mechanical separation, seeding, biochemical and conversion to diastereoisomers) – Asymmetric synthesis partial and Absolute asymmetric synthesis – Walden inversion, Vant Hoff rule of superposition – Freudenberg’s rule of shift.

UNIT – II : STEREOISOMERISM II

(15 Hrs.)

2.1 Optical activity in compounds containing no asymmetric carbons Biphenyls, Allenes and Spirans.

Optical activity on symmetric & asymmetric system (Lactic acid) dissymmetric system (1,2 trans cyclopropanedicarboxylic acid) symmetric – system – (Meso tartaric acid)

2.2 Geometrical isomerism – cis-trans, Syn-Anti and E-Z notations – Geometrical isomerisms in Maleic and Fumaric acids and in unsymmetrical ketoximes – Methods of distinguishing geometrical isomers (Dipole moment, Dehydration, Heat of Hydrogenation, cyclization Melting points) – Methods of determining the configuration of geometrical isomers.

UNIT – III : STEREOISOMERISM III

(15 Hrs.)

3.1 Projection Formulas – Fischer, Flying wedge, Sawhorse and Newman Projection formula – Notations for optical isomers – Chan-Ingold-Prelog rules – R.S. notations for optical isomers with one asymmetric carbon – Erythro and Threo representations.

3.2 Conformational analysis – Introduction of terms (Conformers, Configuration, Dihedral angle, Torsional strain, Conformational analysis) – Conformational analyses of ethane and n-butane (including energy diagrams) – Conformers of cyclohexane (Boat, Chair and skew boat forms) – Axial and Equatorial bonds – Ring flipping showing Axial and equatorial bonds – Ring flipping showing axial – equatorial interconversions – Conformations of mono and disubstituted cyclohexanes.

UNIT-IV : HETEROCYCLIC COMPOUNDS

(15 Hrs.)

4.1 Aromatic characteristics of heterocyclic compounds - Preparation, properties and uses of Furan, Pyrrole & Thiophene.

4.2 Synthesis and reactions of pyridine and piperidine-comparative basic characters of pyrrole, pyridine and piperidine with amines.

4.3 Synthesis and reactions of Quinoline, Isoquinoline and Indole with special reference to Skraup, Bischler Napieralski and Fischer indole synthesis. Structural elucidation of Pyridine, Quinoline and isoquinoline.

UNIT – V :

(15 Hrs)

5.1 Vitamins - Thiamine, Riboflavin, Pyridoxine and Ascorbic acid occurrence, biological importance and structural elucidations.

5.2 Organic Estimations – Principles and methods to estimate glucose, ascorbic acid, phenol, aniline, ketone, oils and fats. Iodine value, saponification value R.M. value and acetyl value.

TEXTBOOK:

1. B.S. Bahl and Arun Bahl, “Advanced Organic Chemistry”, 12th edition, New Delhi, Sultan chand and co., 2010.
2. R.T.Morrison and R.N.Boyd, S.K.Bhattacharjee, “ Organic Chemistry”, 7th edition, Pearson, India, 2011.
3. O.P. Agarwal : Chemistry of Natural Products, Volume 1 & 2.

REFERENCES:

1. Kalsi : Stereochemistry, conformation and mechanism.
2. S.H.Pine “ Organic Chemistry” 5th edition New Delhi, McGraw-Hill International Book Company, 1987.
3. D. Nasipuri, Stereochemistry of Organic Compounds.
4. I.L. Finar, Organic Chemistry Volume 1.

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM

III.B.Sc. CHEMISTRY

(For candidates admitted from the year 2016– 2019 onwards)

**SEMESTER V
CORE COURSE IX -
PHYSICAL CHEMISTRY I**

INT MARK : 25

Hours : 6

EXT MARK: 75

Credit : 5

Objectives :

1. To know the basic knowledge of thermodynamics.
2. To learn the second law of thermodynamics, Carnot cycle, Carnot theorem, entropy, free energy and Maxwell's relations.
3. To learn the third law of thermodynamics, Van't Hoff isotherm, Clausius-Clapeyron equation and Nernst heat theorem
4. To learn the fundamental concepts of phase rule and its applications to one, two and three component systems.

UNIT – I: CHEMICAL THERMODYNAMICS

(18 Hrs)

1.1 Definitions – System and Surrounding – isolated, closed and open system – State of the system – intensive and extensive variables. Thermodynamic processes reversible and irreversible, isothermal and adiabatic processes – State and path functions. Work of expansion at constant pressure and at constant volume.

1.2 First law of thermodynamics - statements, Definition of internal energy (U), enthalpy (H) and Heat capacity. U and H as thermodynamic properties. Relation between C_p and C_v . Calculation of W, Q, dU and dH for expansion of ideal and real gases under isothermal and adiabatic conditions for reversible and irreversible processes.

1.3. Joule – Thomson effect, Joule – Thomson experiment. Relationship between $\mu_{J,T}$ and other thermodynamic quantities. Calculation of $\mu_{J,T}$ for ideal and real gases. Joule Thomson coefficient and inversion temperature.

1.4 Thermochemistry – relationship between enthalpy of reaction at constant volume q_v and at constant pressure q_p - temperature dependence of heat of reaction- Kirchoff's equation – bond energy and its calculation from thermochemical data – integral and differential heats of solution and dilution.

UNIT – II : SECOND LAW OF THERMODYNAMICS

(18 Hrs.)

2.1 Need for the law. Different statements of the law. Heat engine – Carnot's cycle and its efficiency. Refrigeration cycle – Carnot's theorem – Thermodynamic scale of temperature.

2.2 **CONCEPT OF ENTROPY** - Entropy as a state function. Entropy as a function of P, V and T. Entropy changes in phase changes. Entropy of mixing of ideal gases – Clausius inequality – entropy as a criterion of spontaneous and equilibrium processes in isolated systems

2.3 **GIBBS AND HELMHOLTZ FUNCTIONS** - Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities - ΔA and ΔG as criteria of thermodynamic equilibrium and spontaneity – their advantage over entropy change. Variation of ΔA and ΔG with P, V and T Gibbs – Helmholtz equations and their applications. Thermodynamic equation of state. Maxwell's relations.

UNIT – III : APPLICATIONS OF II LAW OF THERMODYNAMICS AND III LAW OF THERMODYNAMICS (18 Hrs.)

3.1 Equilibrium constants and free energy change. Thermodynamic derivation of law of Mass Action. Thermodynamic interpretation of LeChatlier's principle. (Concentration, temperature, pressure and addition of inert gases.).

3.2 Equilibrium between different phases- System of variable composition – Partial molar quantities – Chemical Potential of component in an ideal mixture – Gibbs Duhem equation – Variation of chemical potential with T,P and X (mole fraction).

3.3 Reaction isotherm – van't Hoff's equation – van't Hoff's isochore. Clapeyron equation and Clausius Clapeyron equation – Applications.

3.4 Need for the law. Nernst heat theorem. III law of thermodynamics – statement and concept of residual entropy. Evaluation of absolute entropy from heat capacity data. Exception to third law. (Ortho & Para Hydrogen, CO, N₂O and Ice)

UNIT – IV: PHASE RULE (18 Hrs.)

4.1 Meaning of the terms – Phase, Component and Degree of Freedom. Derivation of Gibb's phase rule. Phase equilibria of one component systems – water, CO₂, and sulphur systems.

4.2 Phase equilibria of two component systems - Solid – Liquid equilibria – Simple Eutectic systems – Bi-Cd and Pb-Ag systems – Desilverisation of lead.

4.3 Compound formation with congruent melting points (Mg-Zn) and incongruent melting points (Na-K). NaCl – water and FeCl₃ – water systems – Freezing mixtures. Gas – Solid Equilibria – (CuSO₄ – water system). Efflorescence and Deliquescence.

UNIT – V: SOLUTIONS (18 Hrs.)

5.1 IDEAL BINARY LIQUID MIXTURES - Ideal liquid mixtures (Benzene and Toluene) – Raoult's law, Henry's Law . Deviation from Raoult's law, Henry's law. Activity and activity coefficient. Duhem – Margulus equation – its application to fractional distillation of binary miscible liquids – Non ideal systems – Azeotropes (Ethanol water systems).

5.2 Partially miscible liquid pairs – Phenol – Water, Triethanol amine – water and Nicotine – Water systems – Lower and Upper CSTs. Effect of impurities on CST. Nernst distribution law – derivation and application

5.3 Colligative Properties – Relating lowering of vapour pressure, Osmosis, law of osmotic pressure, derivation of elevation of boiling point and depression in freezing point.

TEXTBOOKS:

1. B.R. Puri , L.R. Sharma and M.S.Pathania “Principles of Physical Chemistry”, 35th edition, New Delhi, Shoban Lal Nagin chand and Co., 2013.
2. M.V.Sangaranarayanan and M.Mahadevan, “ Text Book of Physical Chemistry”, 2nd edition, Hyderabad, Universities Press, 2011.

REFERENCES:

1. P.W.Atkins, “Physical Chemistry”, 5th edition, Oxford University Press.
2. S.Glassstone and D.Lewis, “ Elements of Physical Chemistry”, London, Mac Millan and Co., Ltd.,

A.D.M. COLLEGE FOR WOMEN (AUTONOMOUS), NAGAPATTINAM

III.B.Sc. CHEMISTRY

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SEMESTER – V

CORE COURSE X

PHYSICAL CHEMISTRY - PRACTICAL

INT MARK :40

EXT MARK: 60

Hours : 3

Credit : 3

Objectives:

1. To learn the fundamentals of conductometric titration.
2. To understand the method of determination of molecular weight, CST, TT and rate constant.

LIST OF EXPERIMENTS:

1. Critical Solution Temperature
2. Effect of impurity on Critical solution Temperature
3. Transition Temperature
4. Rast Method
5. Phase Diagram (Simple eutectic system)
6. Kinetics of Ester Hydrolysis
7. Partition Co-efficient of iodine between water and carbon tetrachloride.
8. Conductometric Acid-Base Titration
9. Determination of cell constant

MARK DISTRIBUTION:

Internal: 40

External: 60

Record: 05

Procedure writing with formula: 10

Practical's: 45

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SEMESTER – V

MAJOR BASED ELECTIVE I

ANALYTICAL CHEMISTRY

INT MARK: 25

Hours : 5

EXT MARK: 75

Credit : 5

Objectives :

1. To know the storage and handling of various chemicals and first aid procedures.
2. To learn data analysis, various separation techniques.
3. To learn gravimetric analysis and various thermo analytical methods.
4. To learn Colorimetry and coulometry.

Unit – I

(15 hrs)

1.1 Laboratory Hygiene and safety: Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals.

1.2 Simple first aid procedure from accidents : Acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, poisoning, inhalation of gases, cut by glasses and heat burns.

1.3 Waste Disposal- Fume disposal – Precautions for avoiding accidents.

Unit – II

(15 Hrs)

2.1 Data Analysis: Errors in chemical analysis, classification of errors, determinate errors, instrumental errors, personal errors, constant errors, and proportional errors – correction of determinate errors, random errors . Precision, accuracy and rejection of data questioned. Significant figures. Mean and standard deviation. Curve fitting.

Unit – III

(15 hrs)

3.1 Separation and purification techniques: General principles involved in the separation of precipitates. Solvent extraction.

3.2 Chromatography: Principles involved in adsorption, partition and ion exchange, paper, thin layer, column, gas chromatography, Electrophoresis applications.

Unit – IV

(15 Hrs)

4.1 Thermo analytical Methods - Principals involved in TGA and DTA – instrumentation.

Characteristics of TGA ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and DTA curve ($\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$). Factors affecting TGA and DTA curves.

4.2 Thermometric titration of HCl Vs NaOH

4.3 Analytical Electrochemistry -Redox potential – measurement and applications. Interpretation of chemical behaviour. Electrolytic separations. Principles of Electrodeposition. Electro gravimetric (estimation of Cu and Ag) .

Unit – V

(15 hrs)

5.1 Colorimetric analysis :Laws of colorimetry – instrumentation. Nessler’s and photoelectric colorimetric method- operation and application. Estimation of Ni, Cu and Fe.

5.2 Coulometry – Principle of coulometric analysis – coulometry at controlled potential – apparatus and technique – separation of nickel and cobalt. Amperometry titrations- Principle – Instruments – Types and applications.

Text Book :

1. R.Gopalan, P.S. Subramanian, and K. Rengarajan – “Elements of Analytical Chemistry” Second Revised edition, Sultan Chand 1993.
2. B.K. Sharma – “Instrumental methods of chemical analysis” Goel Publishing House, Merrut, 1997.
3. Gurdeep Chatwal and Sham Anand – “Instrumental methods of chemical analysis” Himalaya publishing house 2005.

Reference:

1. D.A. Skoog and D.M. West- “Fundamentals of analytical chemistry” 7th edition, Harcourt College Publishers .
2. J.Mendham, R.C.Denny, J.D.Barnes, M.Thomas “Vogel’s text book of quantitative chemical analysis” 6th edition, Pearson education.

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III.B.Sc., CHEMISTRY

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SEMESTER V
SKILL BASED ELECTIVE II –
POLYMER CHEMISTRY

INT MARK : 25

Hours : 2

EXT MARK: 75

Credit : 2

Objectives :

1. To know about Polymers
2. To learn the properties and detection methods of Polymers
3. To study about the Natural and synthetic rubbers

UNIT - I**(6 hrs.)**

INTRODUCTION TO POLYMERS- Introduction to polymers and Macro molecules. Molecular forces and Chemical bonding in polymers. General methods of preparation of polymers. Polymerisation techniques.

UNIT- II**(6hrs.)**

2.1 Polymer structure - Linear, branched and cross linked polymers Stereo chemistry of polymers – Isotactic, syndiotactic and Atactic. Properties of Polymers.

2.2 Molecular weight of Polymers - Number average molecular weight and weight average molecular weight. Viscosity and molecular weight. Osmometry.

UNIT- III**(6hrs.)**

3.1 Chain growth Polymerisation- Introduction, mechanism of polymerisation.

3.2 Co polymerization - Definitions –homo and copolymers, Block copolymers and graft copolymers.

3.3 Kinetics of polymerization - Kinetics of free radical polymerization kinetics of cationic polymerization. Mean kinetic chain length. Degree of polymerization. Inhibition and retardation.

UNIT - IV**(6 hrs.)**

4.1 Natural and synthetic rubbers, constitution of natural rubber. Thiocol, Polyurethane and silicone rubbers. Thermocole polymers related to natural rubber – Chlorinated rubber, oxidized rubber, cyclised rubber and ebonite..

4.2 Acrylic polymers - Polymers of acrylic acid, methacrylic acid, and poly acrylates.

UNIT- V**(6 hrs.)**

PLASTICS AND RESINS - Plastics and Resins - Definitions, Thermoplastic and thermo setting resins. Constituents of plastics fillers, dyes, pigments, plasticizers, lubricants and catalysts. Important thermoplastic resins acrylics, polyvinyl and cellulose derivatives. Important thermo setting resins – Phenolic resins, amino resins, epoxy resins, alkyd resins and silicone resins.

Text Book:

1. V.R.Gowarikar, N.V.Viswanathan “Polymer science”, Wiley Eastern Ltd., New Delhi, 1978.
2. M.G.Arora, M.Singh and M.S.Yadav “ Polymer Chemistry” 2nd Revised edition, Anmol Publications Private Ltd., New Delhi, 1989.
3. B.K.Sharma “ Polymer Chemistry”, Goel Publishing House, Meerut, 1989.

REFERENCES:

1. F.W.Bilmeyer, “Text book of Polymer Science”, Jr.John Wiley and Sons, 1984.

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III.B.Sc., CHEMISTRY

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**SEMESTER V
SKILL BASED ELECTIVE III –
APPLIED CHEMISTRY**

INT MARK : 25

Hours : 2

EXT MARK: 75

Credit : 2

Objectives:

To know the scientific and principles underlying in Water chemistry, leather chemistry and diary chemistry

UNIT – I

WATER CHEMISTRY I - Water – types of water - soft and hard water – hardness, degree of hardness - Reverse osmosis and ion exchange methods – principles and techniques.

UNIT – II

WATER CHEMISTRY II- Water Analysis - Determination of TDS, Total hardness by EDTA, BOD and COD

UNIT – III

LEATHER CHEMISTRY - Introduction, chief process used in leather manufacture, structure of hide and skin, leather processing – process before tannage – tanning process – vegetables tanning and chrome tanning.

UNIT – IV

DAIRY CHEMISTRY I -Milk – Definition, physiochemical properties of milk, constituents of milk, chemical change taking place in milk - boiling, pasteurization, sterilization and homogenization.

UNIT – V

DAIRY CHEMISTRY II-Definition of creams, butter, ghee and ice creams. Milk powder – definition, need for making Powder. Principles involved in drying process.

TEXT BOOKS:

1. B.K.Sharma, Industrial Chemistry, 13th e dition, Goel Publishing House, Reprint 2008.
2. Dilip Kumar Das, Introductory Soil Science, 1st Edition, Kalyani Publishers, Reprint 2002.

V Semester
PART – IV
SOFT SKILL DEVELOPMENT

Internal Marks : 25

Instruction Hrs : 2

External Marks : 75

Credit : 2

Total Marks : 100

Exam Hrs : 3

Objective : To impart knowledge Self development through inter personal relation, Communication and self presentation.

UNIT I: Know Thyself / Understanding Self

Introduction to Self Skills – Self discovery – Developing positive attitude -
Improving perception – Forming values.

6 Hrs.

UNIT II: Interpersonal Skills \ Working with Others

Developing interpersonal relationship – Team building – group dynamics -
Net working – improving work relationship.

6 Hrs.

UNIT III: Communication Skills \ Working with Others

Art of listening – Art of reading – Art of Speaking – Art of Writing –
Art of Writing E – mails –E mail etiquette.

6 Hrs.

UNIT IV: Corporate Skills \ Working with Others

Developing body language – Practising etiquette and mannerism – Time
Management – Stress Management.

6 Hrs.

UNIT V: Selling Self \ Job Hunting

Writing resume \ cv – interview skills – discussed – Mock interview –
Mock GD – Goal setting – Career planning.

6 Hrs.

(Theory only)

Text Book

Dr.K.Meena & Dr.V.Ayothi - A book on development of Soft Skills.

Dr.K.Alex - Soft Skills. S.Chand & Company Ltd. Ram Nagar, New Delhi -110055

Books for Reference

1. Developing the leader within you John C Maxwell
2. Good to Great by jim Collins
3. The seven habit of highly effective people Stephen Covey
4. Emotional Intelligence Daniel Goleman
5. You can win shive Khera
6. Principal centred leadership Stephen