AKKINENI NAGESWARA RAO COLLEGE:: GUDIVADA

DEPARTMENT OF CHEMISTRY(P.G)

PROPOSED COURSE STRUCTURE FOR PG PROGRAMS (SCIENCE SRTREAM)
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

W.E.F 2022-23 (R22 Regulations)

I SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/DSE/ SEC/OEC/ MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture	Practical	Tutorial				
	General Chemistry	4	0	0	Core	30	70	4
	Inorganic Chemistry	4	0	0	Core	30	70	4
	Organic Chemistry	4	0	0	Core	30	70	4
	Physical Chemistry	4	0	0	Core	30	70	4
COMPULSORY	**Personality Development through Life Enlightenment Skills**	2	2	0	Core	30	70	3
	Inorganic chemistry Practical	0	6	0	Core	30	70	3
	Organic chemistry Practical-I	0	6	0	Core	30	70	3
TOTAL FOR FIRST SEMESTER						**210**	**490**	**25**

II SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/DSE/ SEC/OEC/MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture	Practical	Tutorial				
	Advanced Inorganic Chemistry	4	0	0	Core	30	70	4
	Advanced Organic chemistry	4	0	0	Core	30	70	4
	Advanced Physical Chemistry	4	0	0	Core	30	70	4
COMPULSORY	**Research Methodology & IPR**	3	1	0	SEC	30	70	3
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
	Molecular Spectroscopy	4	0	0	DSE	30	70	4
	Instrumental methods of Analysis	4	0	0	DSE	30	70	4
	Analysis of foods & Drugs	4	0	0	DSE	30	70	4
LAB PRACTICALS								
	Physical chemistry Practical	0	6	0	Core	30	70	3
	Organic chemistry Practical-II	0	6	0	Core	30	70	3
TOTAL FOR SECOND SEMESTER						**210**	**490**	**25**

At the end of 2nd semester, every student must undergo summer Internship/ Apprenticeship/Project work/Industrial training/Research based Project work for Six weeks and must prepare a report concerned as per approved project guidelines, and submit the same to the University 14 days before the commencement of third semester end examinations.

III SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/DSE / SEC/OEC/MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture	Practical	Tutorial				
	Organic Spectroscopy	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
	Organic Reaction mechanism	4	0	0	DSE	30	70	4
	Organic Synthesis	4	0	0	DSE	30	70	4
	Natural Products	4	0	0	DSE	30	70	4
	Separation Techniques & Electro analytical techniques	4	0	0	DSE	30	70	4
	Marine Chemistry or Chemistry of Drugs	4	0	0	DSE	30	70	4
	Antibiotics, Drugs, Vitamins & Steroid harmones	4	0	0	DSE	30	70	4
LAB PRACTICALS								
	Organic Preparations	0	6	0	Core	30	70	3
	Organic Binary mixture Analysis.	0	6	0	Core	30	70	3
OPEN ELECTIVE (INTERDISCIPLINARY/MULTIDISCIPLINARY) COURSES (CHOOSE ANY ONE)								
	Polymer Chemistry	3	0	0	OEC	30	70	3
	Basic Bio Chemistry	3	0	0	OEC	30	70	3
	Basic Analytical Chemistry	3	0	0	OEC	30	70	3
		3	0	0	OEC	30	70	3
		3	0	0	OEC	30	70	3
TOTAL FOR III SEMESTER						**210**	**490**	**25**

IV SEMESTER

Course Code	Course Name	Teaching Hours/ week			CORE / IDC/DSE/ SEC/OEC/MOOCS	Internal Marks	External Marks	No. of Credits
		Lecture	Practical	Tutorial				
	Advanced Organic Spectroscopy	4	0	0	Core	30	70	4
DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY THREE)								
	Green Chemistry	4	0	0	DSE	30	70	4
	Techniques for Modern Industrial applications	4	0	0	DSE	30	70	4
	Nano Chemistry	4	0	0	DSE	30	70	4
	Bio-organic chemistry	4	0	0	DSE	30	70	4
	Bio-Inorganic Chemistry	4	0	0	DSE	30	70	4
	Environmental chemistry	4	0	0	DSE	30	70	4
LAB PRACTICALS								
	Organic Estimations	0	6	0	Core	30	70	3
ENTREPRENURAL & INNOVATION/IT SKILL RELATED TO DOMAIN SPECIFIC ELECTIVE COURSES (CHOOSE ANY ONE)								
	Asymmetric Synthesis	3	0	0	SEC	30	70	3
	Organo metallic Chemistry	3	0	0	SEC	30	70	3
	Heterocyclic chemistry	3	0	0	SEC	30	70	3
*** CHOOSE MOOCs FROM SWAYAM/NPTEL SOURCES**								
MOOCS								4
PROJECT WORK EVALUATION AND VIVA-VOCE							100	4
TOTAL FOR IV SEMESTER						**180**	**520**	**30**

Note: Students may be allowed to register and appear for MOOCS from the third semester itself. However, students are to complete the MOOCS successfully and submit pass certificate of the same to the University through the Principal of the College concerned for approval and endorsement of the same on grade cards and PCs and ODs as per the regulations of the University.

Title of the Paper: GENERAL CHEMISTRY(22CHE101)

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1	Recollect the concepts of titrimetric analysis, statistical rules, visible spectro photmetry and group theory in chemistry	2
2	Identify the role of titrimetric analysis, statistical rules, visible spectro photmetry and group theory in chemistry.	1,7
3	Demonstrate knowledge of titrimetric analysis, statistical data analysis, visible spectro photometry and group theory in chosen job role.	1,4
4	Test the conceptual knowledge gained in titrimetric analysis, statistical rules / principles, visible spectrosphotometry and group theory in chemistry.	1,6

Syllabus

Course Details:-

Unit	Learning Units	Lecture Hours
I	**Treatment of analytical data** : Classification of errors – Determinate and indeterminate errors –Minimisation of errors – Accuracy and precision – Distribution of random errors – Gaussian distribution – Measures of central tendency – Measures of precision – Standard deviation – Standard error of mean – student's t test – Confidence interval of mean – Testing for significance – Comparison of two means – F – test – Criteria of rejection of an observation – propagation of errors – Significant figures and computation rules – Control charts – Regression analysis – Linear least squares analysis.	12
II	**Titrimetric Analysis:**Classification of reactions in titrimetric analysis- Primary and secondary standards-Neutralisation titrations-Theory of Neutralization indicators-Mixed indicators- Neutralisation curves-Displacement titrations-Precipitation titrations-Indicators for precipitation titrations-Volhard method-Mohr method- Theory of adsorption indicators-Oxidation reduction titrations-Change of electrode potentials during titration of Fe(II) with Ce(IV)- Detection of end point in redox titrations-Complexometric titrations- Metal ion indicators-Applications of EDTA titrations-Titration of cyanide with silver ion.	12
III	**Visible spectro photometry** – Theory of spectrophotometry and colorimetry, Beer-Lambert's law - Deviations from Beers law. Classification of methods of colour measurement or comparison (standard series method, Duplication method, Dilution method, photoelectric-photometer method, spectrophotometer method)-Instrumentation – Applications-determination of phosphates, chlorides, Iron, Manganese, chromium - Photometric titrations-Spectrophotometric	12

	determination of pK value of an indicator.	
IV	**Symmetry and Group theory in Chemistry I** Symmetry elements [Rotational axis of symmetry (C n), Plane of Symmetry(σ) amd Classification of planes of symmetry i.e., Vertical plane(σ v) Dihedral Plane(σ d) and Horizontal Plane(σ h), Improper rotational axis of symmetry(S n), Inversion centre or Centre of symmetry(i) and Identity element(E)]. Identification of possible symmetry elements in the molecules H_2O, NH_3 , BF_3 , CH_4 ,$[PtCl_4]^{-2}$, C_6H_6 , symmetry operation, Axioms of group theory- definition of group, sub group(Trivial and non-trivial sub groups), GMT tables- construction of GMT table Abelian(C_2v) and non abelian groups(C_3v), relation between order of a finite group and its sub group. Point symmetry group. Schoenflies symbols, Group generating elements, Classification of molecules- MLS, MHS,& amp; MSS. Procedure to Find out Point group of a molecule (yes or no Method),	12
V	**Symmetry and Group theory in Chemistry II** Representation of groups by Matrices (representation for the Cn, C_nv, C_nh, Dn etc. groups to be worked out explicitly). Definition of Class and importance of similarity transformation in identifying symmetry class with c_3v as example, Character of a representation. Reducible and Irreducible representations - Mulliken notations for Irreducible representations The great orthogonality theorem (without proof) and its importance. Character tables and their use. Construction of Character table (C_2v and C_3v only). Application of group theory in IR and Raman spectroscopy taking H_2O, NH_3, BF_3 examples. Mutual Exclusion principle with special reference to cis N_2F_2 and trans N_2F_2.	12

Reference Books:

1. Vogel's text book of quantitative analysis. (3^{rd} edition)Addition Wesley Longmann Inc.
2. Quantitative analysis R.A Day and A.L.Underwood. Prentice Hall Pvt.Ltd.
3. Fundamentals of Analytical Chemistry – Skoog and West
4. Instrumental Methods of analysis – B K Sharma.

Course Focus: Employability.

Title of the Paper: INORGANIC CHEMISTRY (22CHE102)

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1	Memorize the basic concepts of quantum chemistry, co-ordination chemistry and chemical Bonding.	2
2	Comprehend the role of basic and advanced concepts of quantum chemistry, co-ordination chemistry and chemical bonding.	1,7
3	Execute the conceptual knowledge gained in the concepts of quantum chemistry, co-ordination chemistry and chemical bonding in chosen job role**.**	1,4
4	Investigate the role and importance of concepts of quantum chemistry, co-ordination chemistry and chemical bonding in various allied fields of chemistry.	1,7

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Introduction to Exact Quantum Mechanical Results:** Schrodinger equation, importance of wave function, Operators, Eigen values and Eigen functions, derivation of wave equation using operator concept. Discussion of solutions of Schrodinger's equation to some model systems viz. particle in one dimensional box (applications), three-dimensional box, Rigid rotator system and the Hydrogen atom. Variation theorem, linear variation principle, perturbation theory (first order and non-degenerate), Application of variation method to the Hydrogen atom.	12
II	**Chemistry of non- transition elements:** Halogen oxides and oxy fluorides, Spectral and Magnetic properties of Lanthanides and Actinides. Analytical applications of Lanthanides and Actinides. Synthesis, properties and structure of B-N, S-N, P-N cyclic compounds. Intercalation compounds. **Metal π- complexes:** preparation, structure and bonding in Nitrosyl, Dinitrogen and Dioxygen complexes.	12
III	**Structure and Bonding:** pπ-dπ bonding, Bent's rule, Non-valence cohesive forces, VSEPR theory. Molecular Orbital theory, Molecular orbitals in triatomic (BeH_2) molecules and ions (NO_2^-) and energy level diagrams. Walsh diagrams for linear (BeH_2) and bent (H_2O) molecules.	12
IV	**Metal–ligand bonding:** Crystal Field Theory of bonding in transition metal complexes-Splitting of d-orbitals in octahedral, tetrahedral, square planar, Trigonal bipyramidal and Square pyramidal fields. Tetragonal distortions - Jahn-Teller effect. Applications and limitations of CFT. Experimental evidences for covalence in complexes. Molecular Orbital Theory of bonding for Octahedral, tetrahedral and square planar	12

	complexes. π-bonding and MOT - Effect of π - donor and π - acceptor ligands on Δo. Experimental evidence for π - bonding in complexes.	
V	**Metal – ligand Equilibria in solutions:** Step wise and over all formation constants. Trends in stepwise formation constants (statistical effect and statistical ratio). Determination of formation constants by Spectrophotometric method (Job's method) and pH metric method (Bjerrum's). Stability correlations - Irwing -William's series. Hard and soft acids and bases (HSAB).	12

Reference Books:

1. Inorganic Chemistry Huheey, Harper and Row.
2. Physical methods in inorganic chemistry, R.S. Drago. Affliated East-West Pvt. Ltd.
3. Concise inorganic chemistry, J. D. Lee, ELBS.
4. Modern Inorganic Chemistry, W. L. Jolly, McGrawHill.
5. Inorganic Chemistry , K. F. Purcell and J. C. Kotz Holt Saunders international.
6. Concepts and methods of inorganic chemistry, B. E. Douglas and D.H.M.C.
7. Daniel, oxford Press.
8. Introductory quantum mechanics , A. K. Chandra
9. Quantum Chemistry, R. K. Prasad.
10. Inorganic Chemistry ,Atkins, ELBS
11. Advanced Inorganic Chemistry ,Cotton and Wilkinson, Wiley Eastern
12. Quantum Chemistry, Levine.
13. Text book of Coordination chemistry ,K.SomaSekhar rao and K.N.K. Vani, Kalyani Publishers.
14. Theoretical Inorganic Chemistry by G.S.Manku, Tata Mc GrawHill, 2000, reprint.
15. Concise co-ordination chemistry, R.Gopal, Ramalingam, Vikas Publishing, House, 2014.
16. Inorganic Chemistry – Huheey, A.Keiter, L.Keiter, 4th edition, Pearson education, Asia.

Course Focus: Employability.

Title of the Paper: INTRODUCTORY ORGANIC CHEMISTRY (22CHE103)

Course Code		Course Delivery Method	Class Room / Blended Mode -
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction :2017-18	Year of Offering: 2022 - 23	Year of Revision: -----	

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1	Recollect the basic concepts of aromaticity, reactive intermediates, addition, elimination and Substitution reactions.	2
2	Explain the basic and advanced concepts of aromaticity, reactive intermediates, addition, elimination and substitution reactions.	2,7
3	Solve high level concepts in organic chemistry with conceptual knowledge gained in aromaticity, reactive intermediates, addition, elimination and substitution reactions.	1,7
4	Exercise the knowledge about aromaticity, reactive intermediates, addition, elimination and substitution reactions in understanding the properties of organic compounds.	1,5

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Nature of bonding:** Localised and Delocalized, Delocalised chemical bonding conjugation, cross conjugation, hyper conjugation, Tautomerism. **Aromaticity**: Concept of Aromaticity, Aromaticity of five membered, six membered rings - Non benzonoid aromatic compounds:-cyclopropenylcation, Cyclobutadienyldication, cyclopentadienyl anion-tropyllium cation and cyclooctatetraenyl dianion. Homoaromaticity, Anti aromaticity	12
II	**Reactive intermediates & Reactive Species:** **Reactive intermediates:**Generation, Structure, Stability, Detection and Reactivity of Carbocations, Carbanions, Free radicals, Carbenes, Nitrenes and Arynes. **Reactive Species:** Generation and reactivity of Electrophiles, Nucleophiles, Dienophiles, Ylids.	12

III	**Addition Reactions:** Additions: Addition to carbon – carbon multiple bonds, HX, X2, HOX, stereo chemistry of addition, formation and reaction of epoxides, syn and anti hydroxylation, hydrogenation(catalytic and Non catalytic), synthetic reactions of CO and CN and Cram's rule.	12
IV	**Eliminations Reactions**:Types of elimination (E1, E1cB, E2) reactions, mechanisms, stereochemistry and orientation, Hofmann and Saytzeff's rules, Syn elimination versus anti elimination. Competitions between elimination and substitution.Dehydration, dehydrogenation, dehalogenation, decarboxylative elimination, pyrolytic eliminations.	12
V	**Substitution Reactions:** **Aliphatic Nucleophilic substitutions:**The SN^2, SN^1, mixed SN^1 and SN^2 and SN^i reactions : Mechanism, effect of structure, nucleophile, leaving group on substitutions. The neighbouring group mechanism, participation by σ and π bonds, anchimeric assistance. **Aromatic Nucleophilic substitution:**The SN^{Ar} (Addition – Elimination), SN^1(Ar) mechanisms and benzyne mechanism (Elimination – Addition). Reactivity- effect of substrate structure, leaving group and attacking nucleophile. The Von-Richter, Sommelet – Hauser and Smiles rearrangements.	12

Reference Books:

1. Advanced organic chemistry- Reaction, mechanism and structure, Jerry March, John Wiley.
2. Advanced organic chemistry, F.A. Carey and R.J. Sundberg, Springer, New York.
3. A guide book to Mechanism in organic chemistry, Peter Sykes, Longman.
4. Organic chemistry, I.L. Finar, Vol. I & II, Fifth ed. ELBS.
5. Organic chemistry, Hendrickson, Cram and Hammond (McGraw – Hill).
6. Modern organic Reactions, H.O. House, Benjamin.
7. Structure and mechanism in organic chemistry, C.K. Ingold, Cornell University Press.
8. Principles of organic synthesis, R.O.C. Norman and J.M. Coxon, Blakie Academic & Professional.
9. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
10. Basic Principles of Organic Chemistry by J. B. Roberts and M. Caserio.

Course Focus: Employability & **E**ntrepreneurship.

Title of the Paper: PHYSICAL CHEMISTRY(22CHE104)

S.No	COURSE OUTCOMES	PO`S
	After the completion of the course, Students will be able to	
1	Recall the basic concepts of thermodynamics, surface chemistry, electrochemistry, chemical Kinetics and potentiometry in detail.	2
2	Apply the spontaneous and non spontaneous reaction and derive various thermodynamic and Chemical kinetic derivations.	1,7
3	Describe the physical significance of thermodynamics, chemical kinetics and electrochemistry in Explaining the chemical properties and reactivity of molecules.	1,6
4	Analyse the important techniques of surfaces with the help of ESCA, Auger electron spectroscopy and potentiometric techniques of complexometric, neutralization, oxidation and reduction Titrations.	1,7

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	**Thermodynamics – I** Classical thermodynamics - Brief review of first and second laws of thermodynamics - Entropy change in reversible and irreversible processes - Entropy of mixing of ideal gases - Entropy and disorder – Free energy functions - Gibbs-Helmholtz equation - Maxwell partial relations - Conditions of equilibrium and spontaneity - Free energy changes in chemical reactions: Van't Hoff reaction isotherm - Van't Hoff equation - Clausius Clapeyron equation - partial molar quantities - Chemical potential - Gibbs- Duhem equation - partial molar volume - determination of partial molar quantities - Fugacity - Determination of fugacity - Thermodynamic derivation of Raoult's law.	12
II	**Surface phenomena and phase equilibria** - Surface tension - capillary action - pressure difference - across curved surface (young - Laplace equation) - Vapour pressure of small droplets (Kelvin equation) - Gibbs-Adsorption equation - BET equation - Estimation of surface area - catalytic activity of surfaces – ESCA , X- ray fluorescence and Auger electron spectroscopy. **Surface active agents** - classification of surface active agents - Micellization - critical Micelle concentration (CMC) - factors affecting the CMC of surfactants, microemulsions - reverse micelles - Hydrophobic interaction.	12

III	**Electrochemistry – I -** Electrochemical cells - Measurement of EMF - Nernst equation – Equilibrium constant from EMF Data - pH and EMF data - concentration cells with and without transference – Liquid junction potential and its determination - Activity and activity coefficients - Determination by EMF Method - Determination of solubility product from EMF measurements. Debye Huckel limiting law and its verification.Effect of dilution on equivalent conductance of electrolytes - Anomalous behaviour of strong electrolytes. Debye Huckel-Onsagar equation - verification and limitations, conductometric titrations.	12
IV	**Chemical kinetics**- Methods of deriving rate laws - complex reactions - Rate expressions for opposing, parallel and consecutive reactions involving unimolecular steps. Theories of reaction rates -collision theory - Steric factor - Activated complex theory - Thermodynamic aspects – Unimolecular reactions - Lindemann's theory - Lindemann-Hinshelwood theory. Reactions in solutions - Influence of solvent - Primary and secondary salt effects - Elementary account of linear free energy relationships - Hammet - Taft equation - Chain reactions - Rate laws of H_2-Br_2, photochemical reaction of H_2 - Cl_2, Decomposition of acetaldehyde and ethane - Rice-Herzfeld mechanism.	12
V	**Radioactivity and Isotopes:** Introduction to radioactivity, properties of alpha rays, beta rays and gammarays, theory of radioactive disintegration, rate of disintegration, Geiger – Nuttal rule, radioactive equilibrium. Isotopes - radioactive and non-radioactive isotopes, group displacement law. Analysis ofisotopes – Aston's mass spectrograph, Dempster's method, Bainbridge's method. Separation methods of isotopes. Applications of Radio isotopes in Industry and medicine.	12

Reference Books:

1. Physical chemistry, G.K.Vemulapalli (Prentice Hall of India).
2. Physical chemistry, P.W.Atkins. ELBS
3. Chemical kinetics - K.J.Laidler, McGraw Hill Pub.
4. Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.
5. Polymer Sceince, Gowriker,Viswanadham, Sreedhar
7. Elements of Nuclear Science, H.J.Arniker, Wiley Eastern Limited.
8. Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.
9. Physical Chemistry-G.W.Castellan, Narosa Publishing House, Prentice Hall
10. Physical Chemistry, W.J.Moore, Prentice Hall
11. Polymer Chemistry – Billmayer

Course Focus: Employability.

Title of the Paper: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS(22PD101)

The Course will introduce the students to

1) Learn to achieve the highest goal happily.
2) Become a person with stable mind, pleasing personality and determination.
3) Learn to build positive attitude, self-motivation, enhancing self-esteem and emotional intelligence
4) Learn to develop coping mechanism to mange stress through Yoga and meditation techniques
5) Awaken wisdom among them.

Course Learning Outcomes:

At the end of this course the students should be able to:

- Develop their personality and achieve their highest goals of life.
- Lead the nation and mankind to peace and prosperity
- Practice emotional self regulation.
- Develop a positive approach to work and duties
- Develop a versatile personality

Syllabus

Course Details:-

Unit	Learning Units	Lecture Hours
I	**Introduction to Personality Development:-**The concept of personality - Dimensions of Personality – Theories of Personality development (Freud & Erickson) – The concept of Success and Failure – Factors responsible for Success – Hurdles in achieving Success and Overcoming Hurdles — Causes of failure – Conducting SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis.	12
II	**Attitude, Motivation and Self-esteem**:-Conceptual overview of Attitude – Types of Attitudes – Attitude Formation – Advantages/Disadvantages of Positive/Negative Attitude - Ways to Develop Positive Attitude. **Concept of motivation:** Definition and Nature of Motivation/Motive – Internal and external motives – Theories of Motivation – Importance of self-motivation- Factors leading to de- motivation. **Self-esteem**: - Definition and Nature of self-esteem – Do's and Don‟ts to develop positive self- esteem – Low self esteem - Personality having low self esteem - Positive and negative self esteem.	12

III	**Other Aspects of Personality Development:-** Body language - Problem-solving - Conflict Management and Negation skills - Decision-making skills - Leadership and qualities of a successful leader – Character building - Team-work – Time management - Work ethics – Good manners and etiquette – Emotional Ability/Intelligence – Dimensions of Emotional Intelligence – Building Emotional Intelligence.	12
IV	**Neetisatakam-Holistic Development of Personality:** Verses- 19,20,21,22 (wisdom) – Verses- 29,31,32 (pride and heroism) – Verses- 26,28,63,65 (virtue) **Personality of Role Model – Shrimad Bhagwadgeeta** Chapter2-Verses 17 – Chapter 3-Verses 36,37,42 – Chapter 4-Verses 18, 38,39 – Chapter18 – Verses 37,38,63.	12
V	**Yoga & Stress Management :**Meaning and definition of Yoga - Historical Perspective of Yoga - Principles of Astanga Yoga by Patanjali – Meaning and Definition of Stress - Types of Stress - Eustress and Distress –Stress Management – Pranayama- Pranayama: Anulom and Vilom Pranayama - Nadishudhi Pranayama - Kapalabhati-Pranayama - Bhramari Pranayama - Nadanusandhana Pranayama – Meditation techniques: Om Meditation - Cyclic meditation : Instant Relaxation technique (QRT), Quick Relaxation Technique (QRT), Deep Relaxation Technique (DRT) (Theory & Practical).	12

PRACTICAL COMPONENTS:

- Students should identify different types of personality to know their own personality. Students are to describe the characteristics of their personalities and submit the same for assessment.
- Students are to form in groups (a group consists of 4-6 students) to identify and write a brief note on famous personalities of India and World.
- Students are required to identify different types of attitudes and give any five examples of each.
- Students are expected to check their attitudes and develop ways to improve their attitudes at work place and home.
- Students are required to identify keys to self-motivation to achieve their goals.
- Students are expected to identify at least seven types of body language and conduct activities with the following:

S. No.	Pose	Possible Interpretations
1	Standing with your hands on your hips	Aggressive, disgusted
2	Standing upright	Confidence
3	Arms crossed on your chest	Defensive
4	Resting your hand on your cheek	Thinking
5	Touching or rubbing your nose	Doubt, lying
6	Resting your head in your hands	Boredom, tired

7	Tapping your fingers	Impatience
8	Biting your nails	Nervous, insecure
9	Playing with your hair	Insecure
10	Rubbing your eyes	Disbelief, doubt

- **Conduct the following exercise to develop communication skills – Negotiation Skills and Empathy**

Exercise: Card Pieces

In this activity, team members trade pieces of playing cards to put together complete cards.
Uses -This exercise is useful for showing team members others' perspectives. It builds communication and negotiation skills **, and helps people to develop** empathy **.**

People and Materials

- Enough people for at least three teams of two.
- Playing cards – use between four and six for each person.
- A private room.

Time - 15minutes.

Instructions:

1. Cut each playing card into half diagonally, then in half diagonally again, so you have four triangular pieces for each card.
2. Mix all the pieces together and put equal numbers of cards into as many envelopes as you have teams.
3. Divide people up into teams of three or four. You need at least three teams. If you're short of people, teams of two will work just as well.
4. Give each team an envelope of playing card pieces.
5. Each team has three minutes to sort its pieces, determine which ones it needs to make complete cards, and develop a bargaining strategy.
6. After three minutes, allow the teams to start bartering for pieces. People can barter on their own or collectively with their team. Give the teams eight minutes to barter.
7. When the time is up, count each team's completed cards. Whichever team has the most cards wins the round.

Advice for the Teacher/Facilitator

After the activity, ask your team members to think about the strategies they used. Discuss these questions:

1) Which negotiation strategies worked? Which didn't?
2) What could they have done better?
3) What other skills, such as **active listening** or **empathy** , did they need to use?

- **Conduct following Time management activity - Ribbon of Life**

Take a colored ribbon length of approximately 1 meter/100 cm. and scissors. Start with the following questions:

1. If the life span of an individual is say, 100 years. Consider that each cm represents one year. The response will be that few live that long. Assuming a life of 75 to 90 years,

cut 10 to 25 cm off the ribbon, accordingly.

2. What is the average age of the participants sitting here, the response would be 25 to 30 depending on the group, in that case, cut another 25 cms of the ribbon and say that is gone you cannot do anything.
3. What is left is 50 years? People will say, "Yes," but the answer is NO.
4. Every year we have 52 weeks, that is 52 Sundays. If we multiply that by 50 years, it comes to 7.14 years. Reduce the ribbon by another 7.14 cm.
5. We also usually have Saturdays off, so reduce another 7. cms.
6. Public/National holidays are 10 multiple with 50 years. That comes to another 1.5 years. Reduce ribbon by another 1.5 cms.
7. Your casual leave, sick leave, and annual holidays approx. 40 days a year, multiplied by 50. Cut off another 5 cms. Now you are left with about 29.5 years. But, the calculation is not over yet.
8. You sleep an average of 8 hours daily; multiply that by 365 days and again by 50 years (i.e. 122 days X 50 = almost 17 years). Cut off another 17 cm.
9. You spend time eating lunch, breakfast, snacks, and dinner total 2 hours daily (i.e. 30 days a year X 50 years= 4 years or so). Cut off another 4 cm.
10. Last, let‟s figure we spend about 1 hour a day travelling from place to place for activities and such. (that‟s about 2 more years). We‟re down to 6 (SIX) years oflife to make it or break it.

Exercise Decision making skills - Create Your Own

In this exercise, teams must create their own, brand new, problem-solving activity.

Uses

This game encourages participants to think about the problem-solving process. It builds skills such as creativity, negotiation and decision making, as well as communication and time management. After the activity, teams should be better equipped to work together, and to think on their feet.

What You'll Need

- Ideally four or five people in each team.
- A large, private room.

Paper, pens and flip charts

Time -Around one hour.

Instructions:

1. As the participants arrive, you announce that, rather than spending an hour on a problem-solving team building activity, they must design an original one of their own.
2. Divide participants into teams and tell them that they have to create a new problem- solving team building activity that will work well in their organization. The activity must not be one that they have already participated in or heard of.
3. After an hour, each team must present their new activity to everyone else, and outline its key benefits.
4. **Advice for the Teacher/Facilitator:**

There are four basic steps in problem solving: defining the problem, generating solutions, evaluating and selecting solutions, and implementing solutions. Help your team to think creatively at each stage by getting them to consider a wide range of options. If ideas run dry, introduce an alternative brainstorming technique, such as brain writing . This allows your people to develop one others' ideas, while everyone has an equal chance to contribute.

After the presentations, encourage teams to discuss the different decision-making processes they followed. You might ask them how they communicated and managed their time . Another question could be about how they kept their discussion focused. And to round up, you might ask them whether they would have changed their approach after hearing the other teams' presentations.
Students are asked to recite verses: 26,28,63,65 (virtue) of Neetisatakam-Holistic development of personality.

Students are asked to identify personality of role Mmodels from Shrimad Bhagwadgee ta and portray the roles of the same.
Students are asked to practice Yoga and meditation techniques

REFERENCE BOOKS:

1. Hurlock, E.B. Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill, 2006.
2. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari"s ThreeSatakam, Niti-sringar-vairagya, New Delhi, 2010
3. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata, 2016.
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B. Body Language. Delhi: Rohan Book Company. 2004
8. Yogic Asanas for Group Training - Part-I: Janardhan Swami Yogabhyasi Mandal, Nagpur.
9. Rajayoga or Conquering the Internal Nature by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata.
10. Nagendra H.R nad Nagaratna R, Yoga Perspective in Stress Management, Bangalore, Swami Vivekananda Yoga Prakashan.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc16_ge04/preview
2. https://freevideolectures.com/course/3539/indian-philosophy/11

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Title of the Paper: Practical – I – Inorganic Chemistry (22CHE105P)

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1	Memorize the basic principles involved in quantitative and qualitative inorganic analysis.	1,7
2	Understand the importance of inorganic qualitative and quantitative analysis and their use in research and industry.	2,6
3	Apply the procedures of quantitative analysis and tests for identification of cations and anions in chosen field.	1,5
4	Evaluate how far these methods are accurate in quantitative determination.	1,4

List of experiments:

1. Preparation of Potassium trisoxalato ferrate (III).
2. Preparation of Tris thiourea copper (1) sulphate.
3. Preparation of Cis and trans potassium diaquodioxalato chromate (III).
4. Preparation of Hexa ammine cobalt (III) chloride.
5. Determination of Zn^{2+} with potassium ferro cyanide.
6. Determination of Mg^{2+} using EDTA.
7. Determination of Ni^{2+} using EDTA.
8. Determination of hardness of water using EDTA.
9. Gravimetric determination of nickel using dimethyl glyoxime.
10. Gravimetric determination of Zn using diammonium hydrogen phosphate.
11. Semi micro qualitative analysis of six radical mixtures
    (One interfering anion and one less familiar cation for each mixture)
    (minimum three mixtures).

Anions: S^{2-} , SO_3^{2-} , Cl^-, Br^-, I^- , NO_3^- , SO_4^{2-}, CH_3COO^-, $C_2O_4^{-2}$, $C_4H_4O_6^{-2}$, PO_4^{3-}, CrO_4^{2-}, BO_3^{3-}

Cations: Ammonium (NH_4^+)

1st group: Ag^+, Pb^{+2}, W^{+6}

2nd group: Pb^{+2}, Bi^{+3}, Cu^{+2}, Cd^{+2}, Sn^{+2}, Sn^{+4} , Mo^{+6}.

3rd group: Fe^{+2}, Fe^{+3}, Al^{+3}, Cr^{+3}, Ce^{+4}, Th^{+4}, Zr^{+4}, VO^{+2}, Be^{+2}.

4th group: Zn^{+2}, Mn^{+2}, Co^{+2}, Ni^{+2}.

5th group: Ca^{+2}, Ba^{+2}, Sr^{+2}.

6th group: Mg^{+2}, K^+, Li^+.

Title of the Paper: Organic Practical-I (22CHE106P)

S.No	COURSE OUTCOMES	PO`S
	After completion of the course, the student will be able to :	
1	Understand the importance of organic compound synthesis and separation and their research and industry.	2,5,6
2	Understand the mechanisms for the synthesis of organic compounds in different steps.	1,7
3	Apply the procedure of synthesis and separation of organic compounds in required field.	1,5,7
4	Interpret the role of separation of organic compounds and synthesis in the core areas of research.	1,5,6

List of experiments:

1. Separation of Binary mixtures of Carboxylic acid + Neutral organic compounds (Solvent extraction method).
2. Separation of Binary mixtures of Basic nature + Neutral organic compounds (Solvent Extraction method).
3. Separation of Binary mixtures of Phenolic compounds + Neutral organic compounds (Solvent extraction method).
4. Preparation of Phthalimide from Phthalic anhydride – High Temperature.
5. Preparation of p-nitro acetanilide – Low temperature.
6. Preparation of Iodoform – Room temperature.
7. Paper chromatography - separate the given mixture of sugars.
8. Paper chromatography - separate the given mixture of amino acids.
9. Thin layer chromatography - separate the given mixture of phenols
10. Thin layer chromatography - separate the given mixture of 2,4-DNP derivatives of carbonyls compounds.

Text books/ Reference books:

1. A.I. Vogel, “A Text Book of Practical Organic Chemistry”, Longman
2. A.I. Vogel, “Elementary Practical Organic Chemistry”, Longman
3. F.G. Mann and B.C. Saunders, “Practical Organic Chemistry”, Longman
4. Reaction and Synthesis in Organic Laboratory, B.S. Furniss, A.J. Hannaford, Tatchell, University Science Books mills valley.
5. Purification of Laboratory chemicals, manual, W.L.F. Armarego EDD Perrin
6. Reaction and Synthesis in Organic Chemistry Laboratory, Lutz-Friedjan- Tietze, Theophil Eicher,University Science Book.