

B.Sc. Chemistry Full Time 2017 Regulation - Curriculum & Syllabus SEMESTER 1

Subject Code	Subject Name	L	Т	Р	С
HBTA17001 /					
HBHI17001 /	Tamil –I / Hindi – I / French – I	3	0	0	3
HBFR17001					
HBEN17001	English – I	3	0	0	3
HBMA17A01	Allied – I : Mathematics – I/	3	1	0	4
HBBT17A01	* Allied – I : Biotechnology – I	4	0	0	4
HBCH17G01	General Chemistry – I	4	0	0	4
HBCH17G02	Applied Chemistry – I	4	0	0	4
	Practical				
HBCH17L01	Volumetric Analysis Lab	0	0	3	2
Total Credits 20					20

SEMESTER 2

Subject Code	Subject Name	L	Т	Р	С
HBTA17002 /					
HBHI17002 /	Tamil –II / Hindi – II / French – II	3	0	0	3
HBFR17002					
HBEN17002	English – II	3	0	0	3
HBMA17A02 /	Allied – I : Mathematics – II/	3	1	0	4
HBBT17A02	Allied – I : Biotechnology – II	4	0	0	4
HBCH17G03	General Chemistry – II	4	0	0	4
HBCH17G04	Inorganic Chemistry – I	4	0	0	4
	Practical				
HBCH17L02	Physical ChemistryLab - I	0	0	3	2
Total Credits 20					20

SEMESTER 3

Subject Code	Subject Name	L	Т	Р	С
HBCH17A01	Allied – II: Physics – I	4	0	0	4
HBCH17G05	General Chemistry – III	4	0	0	4
HBCH17G06	Analytical Chemistry – I	4	0	0	4
HBCH17G07	Organic Chemistry – I	4	0	0	4
HBCH17G08	Polymer Chemistry	4	0	0	4
	Practical				
HBCH17L03	Inorganic Chemistry Lab – I	0	0	3	2
HBMG17L01	Soft Skills – I	0	1	1	2
Total Credits 24					



Department of Chemistry

B.Sc. Chemistry

SEMESTER - 4

Subject Code	Subject Name	L	Т	Р	С
HBPH17A02	Allied - II : Physics - II	4	0	0	4
HBCH17G09	General Chemistry – IV	4	0	0	4
HBCH17G10	Analytical Chemistry – II	4	0	0	4
HBCH17G11	Physical Chemistry – I	4	0	0	4
	Practical				
HBCH17GL04	Organic Analysis Lab	0	0	3	2
HBCH17GL05	Inorganic Chemistry Lab – II	0	0	3	2
HBMG17L02	Soft Skills – II	0	1	1	2
Total Credits 22					

SEMESTER 5

Subject Code	Subject Name	L	Т	Р	С
HBCH17G12	Inorganic Chemistry – II	4	0	0	4
HBCH17G13	Organic Chemistry – II	4	0	0	4
HBCH17G14	Physical Chemistry – II	4	0	0	4
HBCH17G15	Nano Chemistry	4	0	0	4
HBMG17001	Environment Studies	3	0	0	3
	Practical				
HBCH17L06	Gravimetric Analysis Lab	0	0	3	2
HBCH17L07	Physical Chemistry Lab – II	0	0	3	2
	Project				
Total Credits 23					23

SEMESTER 6

Subject Code	Subject Name	L	Т	Р	С
HBCH17G16	Applied Chemistry II	4	0	0	4
HBCH17G17	Nuclear Chemistry	4	0	0	4
HBMG17G01	Entrepreneurship Development	3	0	0	3
	Practical				
HBCH17P01	Project				10
	Total Credits 21				

Credit Summary I Semester: 20 II Semester: 20 III Semester: 24 IV Semester: 22 V Semester: 23 VI Semester: 21 **Total Credits: 130**



SEMESTER 1

Subject Code	Subject Name	L	Т	Р	С
HBTA17001	Tamil –I	3	0	0	3

நோக்கம்:

- ≻ வாய்மொழிஇலக்கியத்தையும்செய்யுள்இலக்கியத்தையும்அறிந்துகொள்ளல்.
- ≻ சிறுகதைமரபினைப்புரிந்துகொள்ளல்.
- 🕨 பிழையின்றித்தமிழ்எழுதுவதற்குஅடிப்படைஇலக்கணத்தைப்பயிற்றுவித்தல்.
- 🕨 கவிதைமரபினையும்சிறுகதைமரபினையும்வரலாற்றுநிலையிலிருந்துவிளக்குதல்.

அலகு – I

செய்யுள்திரட்டுவாய்மொழிஇலக்கியம்: **நாட்டுப்புறப்பாடல்கள்**

- 1. தாலாட்டு
- 2. காதல்
- 3. ஒப்பாரி
- 4. காணிநிலம்வேண்டும்– பாரதியார்
- 5. நல்லதோர்வீணை பாரதியார்
- 6. தமிழ்க்காதல் பாரதிதாசன்
- 7. தமிழ்வளர்ச்சி பாரதிதாசன்
- 8. எந்நாளோ? பாரதிதாசன்
- 9. ஆறுதன்வரலாறுகூறுதல் கவிமணிதேசிகவிநாயகம்பிள்ளை

அலகு – II

- 1. வழித்துணை ந. பிச்சமூர்த்தி
- 2. குருடர்களின்யானை அப்துல்ரகுமான்
- 3. முள்முள்முள் சிற்பி

அலகு – III (புதுமைப்பித்தன்கதைகள்)

- 1. கடவுளும்கந்தசாமிப்பிள்ளையும்
- 2. செல்லம்மாள்
- 3. துன்பக்கேணி
- 4. ஆற்றங்கரைப்பிள்ளையார்
- 5. ஒருநாள்கழிந்தது



அலகு – IV

 பெயர், வினை, இடை, உரிச்சொற்களின்பொதுஇலக்கணம், வலிமிகும்இடங்கள், வலிமிகாஇடங்கள்

அலகு – V

- தமிழ்க்கவிதையின்தோற்றமும்வளர்ச்சியும் (மரபுக்கவிதை, புதுக்கவிதை)
- 2. தமிழ்ச்சிறுகதையின்தோற்றமும்வளர்ச்சியும்
- 3. மரபுத்தொடர்கள், பொருந்தியசொல்தருதல், கலைச்சொற்கள், நேர்காணல்

மேற்பார்வைநூல்கள்

- 1. சென்னைப்பல்கலைக்கழகவெளியீடு 2013
- 2. பொதுஇலக்கணம்



SEMESTER 1

Subject Code	Subject Name	L	Т	Р	С
HBHI17001	Hindi – I	3	0	0	3

Prose, Administrative Hindi and Grammar

Unit I

- 1. SabhayataKaarahasya-lesson and annotations, Questions& answers
- 2. Administrative terms(prayojanmulak Hindi)

Unit II

- 1. Mitrathakarahasya-lesson and annotations, Questions& answers
- 2. Patralekhan, definitions, correspondence in hindi

UnitIII

Paramanuoorjaevam and kadhyasanrakshan(lesson) annotations and answers,

1. Technical terms and words, letter writing

Unit IV

- 1. Yuvavon se(lesson), annotations, essay and question and answers
- 2. Types of official correspondence, technical terms
- 3. Grammar(change of voice, correcting the sentences)

Unit V

- 1. Yogyataaurvyavasaykachunav(lesson) essay and question and answers
- 2. Types of official correspondence, technical terms



Subject Code	Subject Name	L	Т	Р	С
HBFR17001 /	French – I	3	0	0	3

Unit I

Decouvrir la langue francaise

Se présenter, dire si on comprend, présenterunepersonne, nommerles choses, savoir vivre, comprendre la grammaire

Unit II

Faire connaissance

Donner des informationssurunepersonne, demander, exprimersespréférences, parler de son travail, parler de sesactivitiés, parler de son pays, de saville

Unit III

Organiser son temps

Dire la date, dire l'heure, donner des informationssur un emploi du temps, proposeraccepterrefuser, interroger-répondre, faire un programmed'activités

Unit IV

Decouvrir son environnement

S'orienter, Siturer, Se longer, Exprimer la possession, Connaître les rythmes de vie, Fixer des regles

Unit V

S'informer

Dire cequ'onfait, S'informersur un employ du temps passé, Expliquer, Exprimer la doouteou la certitude, Décoouvrir les relations entre les mots, Savoir s' informer

Recommended book:

Campus 1 - method de francaise by Jacky Girardet, Jacques Pecheur

B.Sc. Chemistry – Regulation 2017



SEMESTER 1

Subject Code	Subject Name	L	Т	Р	С
HBEN17001	English-I	3	0	0	3

OBJECTIVES

- To prepare students for attaining a comprehensive knowledge of the communication skills
- To make them understand the nuances of the language and use its vocabulary in appropriate contexts
- To develop in students a knowledge of the various techniques in language use
- To develop in them analytical and interpretative skills
- To train learners in organized academic and business writing

Unit IProse- For Detailed Study

1. On Running After One's Hat	G.K. Chesterton
2. The Unexpected	Robert Lynd
3. How to be a Doctor	Stephen Leacock
Unit IIPoetry- For Detailed Study	
1. Ulysses	Lord Tennyson
2. If	Rudyard Kipling
3. Leave this Chanting and Singing	Rabindranath Tagore
UnitIIIShort Story	
1.A Retrieved Reformation	O'Henry
2. Engine Trouble	R.K. Narayan
Unit IVGlimpse from Great Minds	
1. I lived with words	R.L. Stevenson
2. My Vision for India	Dr. APJ Abdul Kalam

Unit VFunctional English

Enhancing LSRW Skills through Tasks

Note: Each lesson to be followed by text-based Vocabulary, Grammar, and Usage Exercises

Synonyms, Antonyms- Affixes (prefixes & Suffixes)-Noun- Adjectives, Verb, Tense, Adverb, Preposition, 'if' clause, Articles, discourse markers, Reported and Direct speech-Voice, Degrees of comparison, Interrogatives, Comprehension, Précis writing.



Text Books, Reference Booksand Web Resources

- 1. Pushkala R, P.A.Sarada, El Dorado: A Textbook of Communication Skills, Orient Blackswan, 2014
- 2. PadmasaniKannan.S.,Pushkala.R. : Functional English
- 3. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
- 4. McCarthy, Michael et.al,, English Vocabulary in Use, Advanced, Cambridge Univ. Press, 2011
- 5. Wren and Martin: Grammar and Composition, Chand & Co, 2006
- 6. Part I& Part II from Spring Board by Orient Black Swan Pvt. Ltd.
- 7. http:// learenenglish. Britishcouncil.org
- 8. www.englishpage.com
- 9. www.writingcentre.uottawa.ca/hypergrammar/preposit.html
- 10. www.better-english.com/grammar/preposition.html
- 11. http://www.e-grammar.org/infinitive-gerund/
- 12. www.idiomsite.com/

Text Prescribed: Pushkala R, PadmasaniKannan, ChandrasenaRajeswaran, Anuradha V Literary Melodies, Orient Black Swan, 2017



Subject Code	Subject Name	L	Т	Р	С
HBMA17A01	Allied – I : Mathematics-I	3	1	0	4

OBJECTIVES

- Students understand mathematical concepts, symbols and procedures and are able to apply them.
- To understand the basics of differentiation and their applications.
- To introduce the notion of curvatures, Evolutes & Involutes and polar co-ordinates.
- To understand the basic concepts of Matrices.
- To understand the basic concepts of Differential Calculus.
- To understand the basic concepts of Trigonometry.
- To understand the basic concepts of Probability Statistics.
- To understand the mathematical concepts and skills to solve problems in both familiar and unfamiliar.
- Select and apply appropriate inquiry and mathematical problem-solving techniques in recognize patterns.
- To understand the students to successfully compete for current employment opportunities

Unit IMatrices

Elementary operations on Matrices – Rank of a Matrix – Solving simultaneous equations (atmost three equations with three unknowns).

Unit II Trigonometry

Expansions of Sin n θ , Cos n θ in powers of Sin θ and Cos θ – Expansion of Tan n θ – Expansions of Sinⁿ θ and Cosⁿ θ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

Unit IIIIntegration

Basic concepts of Integration – Methods of Integration– Integration by substitution – Integration by parts – Definite Integrals – Properties of Definite Integrals – Problems on finding Area using single integrals (simple problems).

Unit IV Introduction to Probability

Axioms of Probability – Conditional probability – Total probability – Baye's Theorem – Random variable – Probability mass function – Probability density function – Properties (Definition and simple problems).

Unit V Standard Distributions

Binomial – Poisson – Exponential – Normal distributions.



Reference Books:

- 1) Vittal.P.R, Allied Mathematics, Margham Publications., Chennai, (2012).
- 2) Venkatachalapathy.S.G, Allied Mathematics, Margham Publications., Chennai, (2007).
- 3) Singaravelu, Allied Mathematics, Meenakshi Agency., Chennai, (2001).
- 4) Gupta S.C., Kapoor V.K., Fundamentals of Mathematical Statistics, S.Chand& Co., (2007).
- 5) Vittal.P.R, Malini, *Statistical & Numerical Methods*, Margham Publications., Chennai, (2012).



SEMESTER 1

Subject Code	Subject Name	L	Т	Р	С
HBBT17A01	Allied – I : Biotechnology-I	4	0	0	4

OBJECTIVES

- To understand about biological diversity
- Identifies the structure and function of macromolecules
- To understand the metabolism
- To gain knowledge about cell cycle and genetics
- To understand the application of biotechnology

Unit I

Introduction to Biological Diversity – Origin of Life, prokaryotes eukaryotes, viruses and their role in the biosphere.

Unit II

Structure and Function of Macromolecules-Carbohydrates, lipids, proteins, Nucleic acids

Unit III

Introduction to Metabolism –Law of Energy Transformation, free energy change, role of ATP, role of enzymes

Unit IV

Cell cycle and Genetics: Key roles of Cell Division, phases of the cell cycle, mitosis and meiosis, laws of Heredity, DNA as the genetic material, Concept of genes.

Unit V

Applications of Biotechnology: Biopharmaceuticals, Stem cells, Bioinformatics, Environmental remediation, Biosensors. Scientific Methods in making new discoveries.

References

- 1) Biology Edited by Campbell and Reece, Pearson-Benjamin Cummings
- 2) Nelson, L. D. and M. M Cox, (2002), Lehninger's Principle of Biochemistry: (3rd Ed)

Macmillan, Worth Publication Inc.

3) Lodish (2000) *Molecular cell biology* (4th Ed): W. H. Freeman New York



SEMESTER 1

Subject Code	Subject Name	L	Т	Р	С
HBCH17G01	General Chemistry – I	4	0	0	4

OBJECTIVES

- To understand the concepts of atomic structure, electronic configuration and wave mechanics.
- To familiarize the IUPAC nomenclature of organic compounds.
- To introduce the polar effects in organic compounds.
- To know the preparation, properties and reactions of aliphatic and aromatic hydrocarbons.
- To understand the concepts of gaseous state and liquid state.

Unit I Atomic Structure and Wave Mechanics

Structure of atom – Sub atomic particles – Rutherford's atomic model – Moseley's work on Atomic number – Mass number – Quantum theory and Bohr atom model. Wave Mechanical Approach – Wave mechanical concept of atom – de-Broglie equation – Distribution of electrons in orbitals – Representation of electronic configuration – Ground state electronic configuration of elements – Measurement of ionization energy.

Unit II Electronic Configuration

Bohr's Theory, dual nature (equation only), Heisenberg's principle, Schrodinger's equation, significance orbitals, Pauli's principle, Hund's rule, sequence of energy levels (Aufbau principle).

Unit III Classification and Nomenclature

Trivial, IUPAC nomenclature of organic compounds up to 10 carbon atoms, mono-functional compounds (alcohols, aldehydes, ketones, ethers, esters). Hybridization $(-sp^3, -sp^2 \text{ and } -sp)$ – Geometry of molecules – methane, ethane, ethylene, acetylene and benzene.

Unit IV Aliphatic and Aromatic Hydrocarbons

Alkanes – General methods of preparation – Reactions. Cycloalkanes – Baeyer's strain theory – Stability of cycloalkanes. Aromatic hydrocarbons – Benzene and its homologous – General methods of preparation – Reactions.

Unit V Gaseous State and Liquid State

Gas laws – Kinetic theory of gases – collision diameter – mean free path – collision number – Transport properties – diffusion – Maxwell distribution (no derivation) mean, rms & most probable velocity – equipartition of energy, real gases, Van der waals equation, significance of critical constants. Liquid state – Surface tension – effect of temperature, parachor – definition and applications. Viscosity – effect of temperature & pressure – Refractive Index and molar refraction.

- 1. Soni P.L., "Text Book of Inorganic Chemistry", Sultan Chand & Sons Publications.
- 2. Satyaprakash, Tuli G.D., Basu S.K., Madan R.D., "Advanced Inorganic Chemistry", S. Chand & Company.
- 3. Jain M.K. and Sharma S.C., "Modern Organic Chemistry", Vishal Publishing Company.
- 4. Bahl and ArunBahl, "Organic Chemistry", S. Chand & Company.
- 5. Puri& Sharma, Pathania, "Principles of Physical Chemistry", ShobanLalNagin Chand & Company.
- 6. Bahl and ArunBahl, "Physical Chemistry", S. Chand & Company.
- 7. Lee J.D., "Concise Inorganic Chemistry", Black Well Science Ltd.
- 8. Finar I.L., "Organic Chemistry", ELBS Edition.
- 9. Lewis and Glasstone, "Text Book of Physical Chemistry".



Subject Code	Subject Name	L	Т	Р	С
HBCH17G02	Applied Chemistry-I	4	0	0	4

OBJECTIVES

- To understand the chemistry of water treatment.
- To understand the types of corrosion and corrosion control.
- To know the various methods of protective coatings.
- To introduce the properties and applications of ceramics and glasses.
- To understand the principles and applications of adhesives.

Unit IWater Treatment

Water quality parameters – Definition and expression – Estimation of hardness – EDTA method – Boiler feed water – Water softening process – Internal & External conditioning – Desalination process – Domestic water treatment.

Unit II Corrosion and Its Control

Introduction – Types of corrosion – Mechanism of wet or electrochemical corrosion – Galvanic corrosion – Concentration cell corrosion – Passivity – Pitting corrosion – Waterline corrosion – Stress corrosion – Galvanic series – Factors influencing corrosion – Corrosion control.

Unit III Protective Coatings

Introduction – Metallic coatings – Electro plating – Electro plating methods – Electroless plating some other metallic coatings – Chemical conversion coatings – Organic coatings – Paints.

Unit IVCeramics& Glasses

Ceramics – Characteristics, properties, types, special ceramics – Plasticity of clays – White wares – Glazing – Earthen wares and stone wares. Glasses – Manufacture – Types of glasses – Special glasses.

Unit VAdhesives

Adhesives – Adhesive action – Development of adhesive strength – Physical and chemical factors – Influencing adhesive strength – Bonding process – Classification of adhesives and their uses.



- 1. Khanna G.B., "Material Science and Metallurgy", DhanpatRai Publications.
- 2. Sharma B.K., "Industrial Chemistry", Goel Publishing House.
- 3. Jain P.C. and Monika Jain, "Engineering Chemistry", DhanpatRai Publications.
- 4. Agarwal C.V., "Chemistry of Engineering Materials", Tata McGraw Hill Company.
- 5. Gupta R.B., "Material Science and Process", Tech India Publications.



Subject Code	Subject Name	L	Т	Р	С
HBCH17L01	Volumetric Analysis Lab	0	0	3	2

Acidimetry

- 1. Estimation of sodium hydroxide standard sodium carbonate.
- 2. Estimation of borax-std. Sodium carbonate
- 3. Estimation of bicarbonate and carbonate in a mixture

Permanganometry

- 1. Estimation of oxalic acid standard Mohrs salt or ferrous sulphate.
- 2. Estimation of calcium
- 3. Estimation of sodium nitrite-std. Oxalic acid.
- 4. Estimation of ferric ion.
- 5. Estimation of percentage of manganese in pyrolusite.

Iodometry

- 1. Estimation of copper Std. Potassium dichromate.
- 2. Estimation of potassium dichromate std. Copper sulphate.

Complexometry

- 1. Estimation of zinc or magnesium using EDTA.
- 2. Estimation of zinc using potassium ferrocyanide.
- 3. Estimation of temporary and permanent hardness of water.



SEMESTER 2

Subject Code	Subject Name	L	Т	Р	С
HBTA17002	Tamil-II	3	0	0	3

நோக்கம்:

- தமிழ் இலக்கிய வரலாற்றில் சிற்றிலக்கியங்கள் பெறும் இடத்தைப்பற்றி எடுத்துரைத்தல்.
- சைவ, வைணவ சமயங்களோடு தமிழ் இலக்கிய மரபு கொண்டுள்ள உறவினைப்போல பிற சமயங்களான கிறித்தவ , இஸ்லாம் சமயங்களோடும் தமிழ் இலக்கியம் உறவுகொண்டு விளங்குவதனை எடுத்துரைத்தல்.
- \succ காப்பிய மரபினை எடுத்துரைத்து ஒருசில காப்பியங்களைப் பயிற்றுவித்தல்.
- 🕨 அடிப்படை இலக்கணத்தைப் பயிற்றுவித்தல்.

அலகு –I

- 1. சிற்றிலக்கிய வரலாறு
- 2. கிறித்துவ இலக்கிய வரலாறு
- 3. இஸ்லாமிய இலக்கிய வரலாறு
- அலகு –II
 - 1. நந்திக்கலம்பகம்
 - 2. முத்தொள்ளாயிரம்
 - 3. தமிழ்விடு தூது (36 கண்ணிகள்)
- அலகு –III
 - 1. திருக்குற்றாலக்குறவஞ்சி (குறத்தி மலைவளம் கூறுதல்)
 - 2. முக்கூடற்பள்ளு (நாட்டுவளம்)
 - 3. இயேசுபிரான் பிள்ளைத்தமிழ் (செங்கீரைப்பருவம் முதல் 5 செய்யுட்கள்)
- அலகு –IV
 - 1. நளவெண்பா (கலிநீங்கு காண்டம்)
 - 2. சீறாப்புராணம் (மானுக்குப் பிணை நின்ற படலம்)

அலகு –V

- இலக்கணக்குறிப்பு: உவமைத்தொகை, பண்புத்தொகை, உம்மைத்தொகை, வேற்றுமைத் தொகை, வினைத்தொகை இருபெயரொட்டுப் பண்புத்தொகை, அன்மொழித்தொகை
- 2. ஒருபொருள் குறித்த பலசொல், பலபொருள் குறித்த ஒருசொல்
- 3. ஒருமை, பன்மை மயக்கம், பிறமொழிச்சொற்களை நீக்குதல், அகரவரிசைப்படுத்துதல்

மேற்பார்வை நூல்கள்

- 1. சென்னைப்பல்கலைக் கழக வெளியீடு 2013
- 2. பொதுஇலக்கணம்

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SEMESTER 2

Subject Code	Subject Name	L	Т	Р	С
HBHI17002	Hindi – II	3	0	0	3

Unit I

- 1. Poetry Virpooja, KaidiaurKokila- KaviParichay, Annotation, Summary MakhanlalChaturvedi
- 2. Poetry Kabirdass Sakhi Kantasth 01 -10 (Doha)
- 3. Alankar Aupras and Upma only.

Unit II

- 1. Poetry Aansu, Shradhakasaundarya Annotation, KaviParichay, Summary
- 2. Poetry Surdas Two Padhya

Unit III

- 1. Poetry SubramaniyaBharathi Nachenge Hum Annotation , KaviParichay , Summary
- 2. KaamKaji Hindi Concept of Official Language and Hindi computing theory

Unit IV

- 1. Poetry Galiv Chunin da ser Annotation , Summary , KaviParichay
- 2. Computer Internet in Hindi Latest tools and Packages

UnitV

- 1. Kaviparichay ,JaishanKar Prasad ,SubramaniyaBharathi and Mirzagalib ,Makhanlalchaturvedi
- 2. SleshaAlankar



Subject Code	Subject Name	L	Т	Р	С
HBFR17002 /	French – II	3	0	0	3

Unit I

Cultiverses relations

- Recevoir, Communiquer,Parler des personnes, Donner des informations, écrire, être a l'aise avec les autres

Unit II

Decouvrir le passé

- Parler du passé,raconter les moments d'unevie,parler de la famille,preciser le moment de la durée,parler des habitudes et des changements,connaîtrequelquesreperes de l'histoire

Unit III

ENTREPRENDRE

- Parlerd'uneenterprise,Exprimer un besoin,Parler du future,présenter less étapesd'unerealisation,Rapporter des paroles,Faire un project de réalisation

Unit IV

Prendre des decisions

- Comparer des qualités,Comparer des quantités et des actions,Exprimer la resemblance ou la différence,faire des suppositions,comparer des lieus,parler de la télévision

Unit V

Faire face aux problems

Poser un problém, caractériser une action, parler de la snte, interdire-autoriser, connaître la vie politique

Recommended book:

Campus 1 – method de francaise by Jacky Girardet, Jacques Pecheur

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SEMESTER 2

Subject Code	Subject Name	L	Т	Р	С
HBEN17002	English-II	3	0	0	3

OBJECTIVES

- To prepare students to attain a comprehensive knowledge of the communication skills
- To make them understand the nuances of the English language and use the vocabulary in appropriate contexts
- To develop in students a knowledge of the various techniques in language usage
- To develop in them analytical and interpretative skills
- To train learners in organized, academic and business writing

Unit I Prose- For Detailed Study

1. Spoon Feeding	W.R. Inge
2. Disaster Management	B.M. Hegde
3. If You are Wrong Admit it	Dale Carnegie

Unit II Poetry- For Detailed Study

1.	Psalm of Life	H.W. Longfellow
2.	Anthem for Doomed Youth	Wilfred Owen
3.	Street Cries	Sarojini Naidu

Unit III Short Story

1.	How Much Land does a Man Need?	Leo Tolstoy
2.	Uncle Podger Hangs the Picture	Jerome K. Jerome

Unit IV Drama

- 1. Excerpts from The Merchant of Venice
- 2. Monkey's Paw

Unit V Functional English

Enhancing LSRW Skills through Tasks

William Shakespeare

W.W. Jacob



Note: Each lesson to be followed by text-based Vocabulary, Grammar, and Usage Exercises

Synonym and Antonym, Phrasal Verb- Idioms and Phrases, Collocation.Gerund and infinitives, Auxiliaries: Primary and Modals, Use of 'as soon as', 'No soonerthan', 'Hardly had-when', 'Scarcely had-when', 'too....to', 'so...that'-Subject- Verb Agreement, Comprehension, note- making from an unknown passage, Expanding Hints into a meaningful paragraph,Essay writing.

Text Books, Reference Booksand Web Resources

- 1. Pushkala R, P.A.Sarada, El Dorado: A Textbook of Communication Skills, Orient Blackswan, 2014
- 2. PadmasaniKannan.S.,Pushkala.R. : Functional English
- 3. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
- 4. McCarthy, Michael et.al,, English Vocabulary in Use, Advanced, Cambridge Univ. Press, 2011
- 5. Wren and Martin: Grammar and Composition, Chand & Co, 2006
- 6. Part I& Part II from Spring Board by Orient Black Swan Pvt. Ltd.
- 7. http:// learenenglish. Britishcouncil.org
- 8. www.englishpage.com
- 9. www.writingcentre.uottawa.ca/hypergrammar/preposit.html
- 10. www.better-english.com/grammar/preposition.html
- 11. http://www.e-grammar.org/infinitive-gerund/
- 12. www.idiomsite.com/

Text Prescribed: Pushkala R, PadmasaniKannan, ChandrasenaRajeswaran, Anuradha V Literary Melodies, Orient Black Swan, 2017



Subject Code	Subject Name	L	Т	Р	С
HBMA17A02	Allied – I: Mathematics-II	3	1	0	4

OBJECTIVES

- To evaluate first and second order differential equations including Separable, Homogeneous, exact and linear.
- To understand the existence and uniqueness of solutions
- To understand the methods of solving linear systems of ordinary differential equations
- To understand the solving methods of partial derivatives using various methods
- To understand the meaning and basic application of Double and Triple Integrals
- To evaluate multiple integrals either by using iterated integrals or approximation methods.
- To understand the relationship between multiple and iterated integrals
- To impart knowledge in concepts of operations research and Linear Programming Problem
- To understand the variety of problems such as assignment, transportation, travel and salesman problem

Unit I OrdinaryDifferential Equations

First order differential equations – Second and higher order linear differential equations with constant coefficients and with RHS of the form: e^{ax} , x^n , Sin ax, Cos ax, $e^{ax}f(x)$, x f(x) where f(x) is Sin bx or Cos bx (simple problems).

Unit II Partial Differentiation

Partial derivatives – Jacobians – Maxima and Minima of functions of two variables – Lagrange's multipliers.

Unit IIIMultiple Integrals

Double integral in Cartesian and Polar Co-ordinates – Change of order of integration – Triple integral in Cartesian Co-ordinates (simple problems).

Unit IV Linear Programming

Formulation of LPP – Standard form of LPP – Graphical method – Simplex method – Big M method.

Unit V Transportation and Assignment

Formulation of Transportation problem – North West corner method – Least cost method – Vogel's approximation method – Optimality test – MODI method – Degeneracy – Assignment problem: Hungarian method.

Reference Books:

- 1) Vittal.P.R, Allied Mathematics, Margham Publications., Chennai, (2012).
- 2) Venkatachalapathy.S.G, Allied Mathematics, Margham Publications., Chennai, (2007).
- 3) Singaravelu, Allied Mathematics, Meenakshi Agency., Chennai, (2001).
- 4) Hamdy A. Taha, *Operations Research: An Introduction (10th ed.)*, Pearson, (2017).
- 5) Hira D.S., Gupta P.K., Operations Research, S.Chand& Co., (2014).

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Subject Code	Subject Name	L	Т	Р	С
HBBT17A02	Allied – I: Biotechnology-II	4	0	0	4

OBJECTIVES

- To understand about the products in biotechnology
- To identify the micro organism
- To understand the various parameters in bioprocess.
- To gain knowledge about the down streaming process
- To obtain ideas of process of beverages

UnitI

Introduction to biotechnology and products. Major classes of commercial products using micro organisms-enzymes, amino acids, vitamins, antibiotics, organic solvents, organic acids, food and beverages.

UnitII

Industrially important microorganisms: screening techniques - detection & assay of fermentation products-strain improvements - mutations, protoplast fusion and rDNA techniques for strain development.

UnitIII

Bioreactors/Fermentor: Types, features, operation: sterilization (Batch and Continuous), inoculation and sampling. Control of bioprocess parameters. Microbial growth and media formulation. Microbial culture - batch, fed batch, semi-continuous, continuous. Growth kinetics of microorganisms.

UnitIV

Downstream processing: Solid-liquid separation, flotation, flocculation, filtration, centrifugation, cell disruption, concentration, evaporation, liquid-liquid extraction, membrane filtration, precipitation, adsorption, product purification by chromatography.

UnitV

Industrial process of beverages - enzymes - amino acid - organic acids - organic solvents - antibiotics.Introduction to nanotechnology - history and recent developments - sources of nanoparticles - microbial production of nanoparticles - advantages of microbial nanoparticles - applications.



Reference

1. Manual of industrial microbiology and Biotechnology, Demain A.L. Solomon, J.J., 1986. ASM press.

- 2. Industrial Microbiology, Reed C., Prescott and Dann's, 1982. Macmillan publishers.
- 3. Fundamentals of Biotechnology, Prave. P. Faust, V. Sitih. W., Sukatsh, DA, 1987. ASM press.
- 4. Biotechnology, Satyanarayana, U., 2006. Books and Allied (P) Ltd.
- 5. AN introduction to Genetic Engineering, Desmond, S.T., Nicholl, 1994. Cambridge press.
- 6. Principles of Gene Manipulation. 4th edition, Old R.W. and S.B. Primrose, 1994. Blackwell scientific publication London.



Subject Code	Subject Name	L	Т	Р	С
HBCH17G03	General Chemistry – II	4	0	0	4

OBJECTIVES

- To know the periodicity and arrangement of elements.
- To understand the VB, VSEPR and MO theories.
- To know the preparation, properties and reactions of alkyl and aryl halides.
- To familiarize the preparation, properties and reactions of alcohols and phenols.
- Enable the students to understand elementary principles of thermodynamics.

Unit I Periodic Properties

Size of atoms and Ions – Atomic radius, ionic radius – Variation of ionic radii of iso-electronic ions – Ionization energy of iso-electronic species – Electron affinity – Electro-negativity – Pauling's approach – Mulliken's approach – Applications of electro-negativity – Atomic volume of elements – Oxidizing and reducing properties of elements in aqueous solutions – Oxidation states of elements.

Unit IIChemical Bonds - I

Stable electronic configuration, Ionic bond - Lattice energy, Born - Haber cycle, characteristics of ionic compounds, Inert pair effect, covalent bond, polarity of bonds, characteristics of covalent bonds, Fajan's rule, deviation from octet rule, coordinate bond, hydrogen bond, Metallic bond - theories.

Unit IIIAlkyl and Aryl Halides

Alkyl halides – Nomenclature – Preparation - Properties – Isomerism Aryl halides – Mono and Di- halides – Preparation – Properties – Isomerism – DDT – BHC.

Unit IVAlcohols and Phenols

Hydroxy derivatives –Aliphatic alcohols- reactions of C-OH group- Dihydroxy and Trihydroxy compounds, preparations, properties and uses. Phenols- monohydric phenols-preparations, H-bonding, acidity of phenols-chemical properties - tests for phenols, Reimer Tiemer, Kolbes, LedererMannese reactions and mechanisms. α,β - naphthol- properties.

Unit V Thermodynamics – I

Thermodynamics - Terminology in thermodynamics - First law- internal energy-enthalpy and heat capacities- relation between C_p and C_v . Application of Laws of thermodynamics to real gases (Vanderwaals), isothermal process, work done, change in internal energy, adiabatic process- work done- Joule-Thomson effect, Joule Thomson coefficient and significance.



- 1. Soni P.L., "Text Book of Inorganic Chemistry", Sultan Chand & Sons Publications.
- 2. Satyaprakash, Tuli G.D., Basu S.K., Madan R.D., "Advanced Inorganic Chemistry", S. Chand & Company.
- 3. Jain M.K. and Sharma S.C., "Modern Organic Chemistry", Vishal Publishing Company.
- 4. Bahl and ArunBahl, "Organic Chemistry", S. Chand & Company.
- 5. Puri& Sharma, Pathania, "Principles of Physical Chemistry", ShobanLalNagin Chand & Company.
- 6. Bahl and ArunBahl, "Physical Chemistry", S. Chand & Company.
- 7. Lee J.D., "Concise Inorganic Chemistry", Black Well Science Ltd.
- 8. Finar I.L., "Organic Chemistry", ELBS Edition.
- 9. Lewis and Glasstone, "Text Book of Physical Chemistry".



SEMESTER 2

Subject Code	Subject Name	L	Т	Р	С
HBCH17G04	Inorganic Chemistry- I	4	0	0	4

OBJECTIVES

- To understand the comparison of VB and MO theories including hybridization.
- To know the alikali and alkaline group elements.
- To understand the nitrogen, oxygen and halogen family.
- To familiarize the properties of transition elements.
- To enable the students to understand the metallurgical operations of Ti, V, Cr and Mn.

Unit I Chemical Bonds - II

Valence bond theory - principles of hybridization, VSEPR theory, shapes of simple molecules, BeCl₂, BF₃, NH₃, XeF₄, BrF₅, PCl₅, SF₆, H₂O, IF₇. Concepts of sigma and pi bonds. Molecular orbital theory - applications to H₂, He₂, N₂, O-₂, HF and CO. Comparison of VB and MO theories.

Unit IIs – Block Elements

Alkali and alkaline earth metals – General discussion – Similarities in physical and chemical properties – Anamolousbehavior of Lithium and Berilium – Diagonal relationship of Lithium with Magnesium, Berilium with Aluminium – Compounds.

Unit IIIp –Block Elements

Nitrogen family – General characteristics of VA group – Unique feature of nitrogen. Preparation, properties, structures and uses of hydrazine, hydroxylamine and hydrozoic acid – General characteristics of Oxygen group elements – Classification of oxides – Ozone – Compounds of Sulphur.

Halogens – Anamolousbehavior of Fluorine – Inter halogen compounds.

Unit IVTransition Elements – I

Position of transition elements in the periodic table – General properties – Electronic configuration, oxidation states, spectral and magnetic properties, colour, tendencies to form complexes, catalytic properties, tendency to form alloy – Group study of Ti, V, Cr and Mn.

Unit VMetallurgy – I

General methods of extraction / isolation and uses of Titanium, Vanadium, Chromium and Manganese.



- 1. Malik V.W., Tuli G.D. and Madan R.D., "Selected Topics in Inorganic Chemistry", S. Chand & Company
- 2. Cotton F.A., Wilkinson G. and Gaus Paul C., "Basic Inorganic Chemistry", Wiley Student Edition
- 3. Banerjee D., "Fundamental Principles of Inorganic Chemistry", Sultan Chand & Sons
- 4. Soni P.L., "Text Book of Inorganic Chemistry", Sultan Chand & Sons Publications.
- 5. Satyaprakash, Tuli G.D., Basu S.K., Madan R.D., "Advanced Inorganic Chemistry", S. Chand & Company.



Subject Code	Subject Name	L	Т	Р	С
HBCH17L02	Physical ChemistryLab - I	0	0	3	2

1. Distribution Law

a) Determination of partition coefficient of iodine between carbon tetra chloride and water.

- b) Degree of association of benzoic acid between water and benzene.
- c) Equilibrium constant of the reaction $KI + I_2 = KI_3$

2. Kinetics

Determination of the orders of the following reactions.

- a) Acid catalysed hydrolysis of an ester (methyl or ethyl acetate).
- b) Saponification of an ester (methyl or ethyl acetate).
- c) Jodination of acetone.

3. Molecular weight of a solute

Rasts method using naphthalene, meta dinitrobenzene and diphenyl as solvents.



Department of Chemistry

B.Sc. Chemistry

SEMESTER 3

Subject Code	Subject Name	L	Т	Р	С
HBCH17A01	Allied – II: Physics – I	4	0	0	4

OBJECTIVES

- To explain thermal properties of heat and application of ultrasonic
- To familiarize and understand the characteristics, working principle laser and fibre optics.
- To provide knowledge on magnetism
- To provide knowledge on DC and AC effects
- To study the properties of nanomaterials and different methods for non- destructive testing

Unit I Heat and Sound

Conduction of Heat – Thermal Conductivity- Thermal Conductivity of bad Conductor- Lee's Disc Method- Radial Flow of Heat- Thermal Conductivity of glass and rubber.

Ultrasonics-Production of Ultrasonics- Piezo electric method-Magnetostriction Method-Properties-Applications.

Unit II Fibre Optics and Laser

Fibre Optics- Introduction- Total internal reflection – Acceptance Angle and Numerical Apertureclassification of Optical Fibres- Step index and Graded index Fibre- Optical Fibre communication.

Laser: Spontaneous and Stimulated Emission-Population Inversion- He-Ne Laser, CO₂Laser-Semiconductor Laser- Applications.

Unit IIIMagnetism

Basic concepts of magnetic materials – magnetic properties of Dia, para and Ferro magnetic materials – Area of (B-H) loop – electric and magnetic circuits – Curie temperature – applications of Ferrites in computer memory.

Unit IVD.C and A.C Circuits

DC Circuits: Introduction to electrical circuits, ohm's law, Kirchhoff's law, method of solving a circuits by Kirchhoff's laws, series and parallel connections- problems.

AC Circuits: Peak, Average and RMS values of ac current and voltage – LR circuits, CR circuits, LCR circuits, Resonance frequency- Power factor and Current values in an ac circuit.



Unit V Nanomaterials and NDT

Nanomaterials: Definition- Classification- Properties- Types of synthesis method- Sol-gel method-Gas condensation Method- Chemical method- their Applications.

Non-Destructive Method: Definition-Liquid Penetrant Method-Ultrasonic Flaw detection Method-Applications.

Books for study:

1. Allied Physics- Dr.K. Thangaraj and Dr.D.Jeyaraman- Popular Book Depot.

2. Applied Physics for Engineering- Dr. V. Rajendran&Dr.A. Marikani- TATA McGRAM HILL 3.Electricity and Magnetism by N.S.Khare and S.S. Srivastava,AtmaRaam& Sons, 10th Edition, New Delhi(1983).

Books for Reference:

1.Fundamentals of Physics by Resnick & Halliday 2.Engineering Physics-1 by Dr.D. Jayaraman

3. Materials Science by Dr.M. Arumugam- Anuratha Publications



Subject Code	Subject Name	L	Т	Р	С
HBCH17G05	General Chemistry – III	4	0	0	4

OBJECTIVES

- To understand the properties of inner transition elements.
- To enable the students to understand the separation and isolation of rare gases.
- To know the preparation, properties and isomerism of ethers.
- To understand the preparation, properties and reactions of aldehydes and ketones.
- To understand the principles of thermochemistry and its calculations.

Unit IInner Transition Elements

General discussion – Lanthanides – Electronic configuration – Lanthanide contraction – Effects of Lanthanide contraction. Actinides - General discussion - Electronic configuration - Oxidation states and general properties – Actinide contraction and its effects.

Unit II Rare Gases & Inter Halogen Compounds

Electronic configuration – group study, position in the periodic table – Isolation of inert gases. Xenon compounds – XeF_2 , XeF_4 , XeF_6 , $XeOF_4$ – preparation, structure & properties. Inter-halogen compounds: Preparation, structure & geometry of ICl, ICl₃, IF₅, IF₇.

Unit III Ethers

Introduction – Structure – Nomenclature – Isomerism – Preparation – Properties – Comparison of Ethers and Alcohols, Anisol and Phenetole.

Thioalcohols& thioethers - preparation and properties - DMSO and mustard gas.

Unit IVAldehydes and Ketones

Aliphatic aldehydes and ketones – Structure – Nomenclature – Isomerism – Preparation – Properties – Test for aliphatic aldehydes and ketones – Name reactions.

Aromatic aldehydes and ketones - Structure - Nomenclature - Isomerism - Preparation - Properties - Test for aromatic aldehydes and ketones - Name reactions.

Unit V Thermochemistry

Thermochemistry – Measurement of thermal changes – Heat of reaction – Calculation of change in Internal energy from enthalpy change – Heat of formation, combustion, neutralisation, hydration, transition, solution, dilution – Hess's law of constant heat summation – Applications of Hess's law – Simple problems. Bond energy and heat of reaction – Born Haber's cycle – Kirchoff equation.



- 1. Soni P.L., "Text Book of Inorganic Chemistry", Sultan Chand & Sons Publications.
- 2. Satyaprakash, Tuli G.D., Basu S.K. and Madan R.D., "Advanced Inorganic Chemistry", S. Chand & Company.
- 3. Jain M.K. and Sharma S.C., "Modern Organic Chemistry", Vishal Publishing Company.
- 4. Bahl and ArunBahl, "Organic Chemistry", S. Chand & Company.
- 5. Puri& Sharma, Pathania, "Principles of Physical Chemistry", ShobanLalNagin Chand & Company.
- 6. Bahl and ArunBahl, "Physical Chemistry", S. Chand & Company.
- 7. Lee J.D., "Concise Inorganic Chemistry", Black Well Science Ltd.
- 8. Finar I.L., "Organic Chemistry", ELBS Edition.
- 9. Lewis and Glasstone, "Text Book of Physical Chemistry".



SEMESTER 3

Subject Code	Subject Name	L	Т	Р	С
HBCH17G06	Analytical Chemistry – I	4	0	0	4

OBJECTIVES

- To understand the principles and techniques of separation and purification.
- Enable the students to know about the chromatography.
- To know the principles of thermogravimetric and Differential thermal analysis.
- To understand the colorimetric analysis including UV-Vis spectroscopy.
- To know the advantages of IR and Raman spectroscopy.

Unit I Separation and Purification Techniques

Purification of solid organic compounds, recrystallisation, use of miscible solvents, use of drying agents and their properties, sublimation. Purification of liquids - Experimental techniques of distillation, fractional distillation, distillation under reduced pressure. Extraction - use of immiscible solvents - solvent extraction - Chemical methods of purification and test of purity.

Unit II Chromatography

Principle of adsorption and partition chromatography. Column chromatography: adsorbents, classification of adsorbents, solvents, preparation of column, adsorption and applications. Thin layer chromatography: choice of adsorbent, choice of solvent, preparation of chromatogram, sample, R_f value and its applications. Paper chromatography - solvent, R_f value, factors which affect R_f value. Ion exchange chromatography - resins used, experimental techniques, applications. Gas chromatography - Principle, detector (FID, TCD, ECD) and applications.

Unit IIIThermo Analytical Methods Thermo gravimetric analysis – principles, Derivative thermo gravimetry, TGA Instrumentation - applications of TGA. Differential thermal analysis – principle, instrumentation, DTA of calcium oxalate monohydrate and calcium acetate monohydrate.

Unit IVColorimetric Analysis & Absorption Spectroscopy

Absorption – Beer Lamberts law – Photo electric colorimeter – Colorimetric estimation – UV-Vis., Spectroscopy – Instrumentation – Block diagram – Types of electronic transitions – Chromophores – Auxochromes – Applications in organic and inorganic compounds.

Unit V IRand Raman Spectroscopy

Instrumentation, Radiation sources, monochromators, detectors, sampling techniques, applications, finger print region, frequencies of functional groups, mutual exclusives of IR and Raman spectra. Born-open heimer approximation – selection rules, vibrational modes of simple molecules.



- 1. Gopalan, Subramanian and Rangarajan, "*Elements of Analytical chemistry*", Sultan Chand & Company.
- 2. Dash U.N., "Analytical Chemistry Theory & Practice", Sultan Chand & Company.
- 3. Srivastava A.K. and Jain P.C., "Chemical Analysis", S. Chand & Company.
- 4. Khopkar S.M., "Analytical Chemistry", Narosa Publications.
- 5. Willard H.H., MerritJr L.J., Dean J.A., "Instrumental Methods of Analysis", Affiliated East West Press.
- 6. Skoog D.A. and West D.M., *"Fundamentals of Analytical Chemistry"*, Old Reinhold &Winston Publications.



SEMESTER 3

Subject Code	Subject Name	L	Т	Р	С
HBCH17G07	Organic Chemistry – I	4	0	0	4

OBJECTIVES

- To know the preparation, properties, reactions and uses of organometallic compounds.
- To understand the preparation, properties, reactions and structures of heterocyclic compounds.
- Enable the student to learn about the polar effects and reaction mechanism.
- To understand the concepts of aromaticity and its mechanism.

Unit I Organometallic Compounds

Grignard reagents – Preparation, properties and synthetic applications – Organo lithium, Organo zinc and Organo Tin compounds – preparation and properties – Lead tetra ethyl – Preparation and uses.

Unit II Heterocyclic Compounds

Nomenclature, five membered rings – Pyrrole, furan, thiophene – Structure, preparation and properties – Furfural and tetrahydrofuran.

Six membered rings – Pyridine and piperidine.

Fused ring systems – Indole, Quinoline, Isoquinoline – Preparation and properties.

Unit IIIPolar Effects

Inductive, inductomeric, electromeric, mesomeric, resonance, hyperconjugative steric effects – explanation with examples – Addition of H₂, HX, HOX, H₂SO4 & H₂O to alkenes – Markownikoff and antimarkownikoff's rule, hydroboration, ozonolysis, allylic substitution of alkenes by NBS.

Unit IVOrganic Reaction Mechanisms

Nucleophilic substitution & elimination. Nucleophiles, leaving groups, mechanism & stereochemistry of SN^1 , $SN^2 \& SN^i$ reactions. Comparison of SN^1 , SN^2 reactions. Elimination reactions, mechanism, Hoffmann & Saytzeff rule.

Unit VCarbohydrates

Classification – chemistry and structure of glucose, fructose, sucrose and maltose. Interconversion of glucose, fructose. Ascending and descending the series. Osazone formation, epimerization and mutarotation- starch and cellulose- elementary treatment- derivative of cellulose- artificial silks - cellulose nitrate.



- Bahl and ArunBahl, "Organic Chemistry", S. Chand & Sons.
- Ahluwalia G.K. and MadhuaiGoyal, "Text Book of Organic Chemistry".
- Soni P.L. and Chawla H.M., "Text Book of Organic Chemistry", Sultan Chand & Sons.
- Jerry March, "Advanced Organic Chemistry", John Wiley & Sons.
- Hendrickson, Cram and Hammond, "Organic Chemistry", MccGraw Hill Kogakusha.
- C.N. Pillai, "Organic Chemistry", University Press.
- P.S. Kalsi, "Stereochemistry and Mechanism", Wiley Eastern.



Subject Code	Subject Name	L	Т	Р	С
HBCH17G08	Polymer Chemistry	4	0	0	4

OBJECTIVES:

- To introduce the various types, structure, strength of polymer & its processing techniques.
- To understand the kinetics & mechanism of polymerization.
- To enable the students to classify the different types of polymers.

Unit I Introduction

Classification of polymers: Natural synthetic, linear, cross linked and network; plastics, elastomers, fibres, Homopolymers and Co-polymers. Bonding in polymers: Primary and secondary bond forces in polymers structure and strength: cohesive energy and decomposition of polymers. Determination of Molecular mass of polymers: Number Average molecular mass (M_n) and Weight average molecular mass (M_w) of polymers and determination by: (i) viscosity (ii)Light scattering method (iii) Gel Permeation Chromatography (iv) Osmometryandultracentrifuging.

Unit II Kinetics and Mechanism of Polymerization

Addition and Condensation polymers – distinction

Mechanism of polymerization: Cationic, anionic, free radical polymerization, Stereo regular polymers: Ziegler Natta polymers.

Polycondensation-non catalysed, acid catalysed polymerization, molecular weight distribution step growth polymers

Unit III Industrial Polymers

Bulk, Solution, Emulsion, Suspension, Melt polycondensation, solution Polycondensation interfacial and gas phase polymerization. Raw material, preparation, fibre forming polymers

Plastics – Thermosetting and thermo plastics differences.

Thermoplastics: Polyethylene, Polypropylene, Polystyrene, Polyacrylonitrile, Polyvinylchloride, Polytetrafluoroethylene, Nylon and Polyester - Preparation, uses - Cellulosics

Thermosetting Plastics: Phenol formaldehyde and epoxide resin.

Unit IVElastomers

Natural rubber – Latex, coagulation of rubber, compounding, vulcanisation, structure, Reclamation of rubber.

Synthetic rubber - Buna - N, Buna-S and Neoprene, Butyl rubber, Thiakol – Preparation and uses.

Unit VIntroduction to Polymer Processing

Compounding: Polymer Additives: Fillers, Plasticizers antioxidants and thermal stabilizers fire retardants and colorants.

Processing Techniques: Calendaring, die casting, compression moulding, injection moulding, blow moulding, extrusion moulding and reinforcing.

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- 1. Speciality Polymers Faiz Mohamed, International Publishing House
- 2. Polymer Chemistry B.K. Sharma, Goel Publishing House
- 3. Polymer Chemistry M.G. Arora, Anonol Publications (P) Ltd
- 4. Textbook of Polymer Science F. N. Billmeyer, Wiley Interscience
- 5. Polymer Science V.R. Gowariker and Viswanathan, Wiley Eastern
- 6. Introductory Polymer Chemistry G.S. Misra, New Age International (Pvt) Limited.



SEMESTER 3

Subject Code	Subject Name	L	Т	Р	С
HBCH17L03	Inorganic Chemistry Lab – I	0	0	3	2

Analysis of a mixture containing two cations and two anions, one of which will be an interfering ion. Semimicro methods using the conventional scheme may be adopted.

Reactions of the following anions to be studied: carbonate, sulphide, sulphate, fluoride, chloride, bromide, nitrate, oxalate, phosphate, borate, iodide, arsenite, chromate, sulphite, thiosulphate nitrite, acetate, arsenate and tartrate

Reactions of the following cations to be studied: lead, silver, mercury, copper, tin, antimony, cadmium, bismuth, aluminium, iron, manganese, zinc, cobalt, nickel, calcium, strontium, barium, magnesium and ammonium.



SEMESTER 3

Subject Code	Subject Name	L	Т	Р	С
HBMG17L01	SOFT SKILL-I	0	1	1	2

OBJECTIVES

- To diagnose the strength and weakness of the student in Functional English.
- To develop the functional grammar.
- To prepare them to use Functional English through LSRW.
- To make them learn through practice and activity.
- To use English Language as a life skill.

Prelude

Diagnostic Test- Articles, Forms of 'be'verbs, Tense, Preposition, Gerund& Infinitives, Reported Speech, Active&Passive Voice, Letter Writing

Unit I

Job and Career-three types-Govt., pvt and public sector-Bank, govt.offices, navy, defence, govt.institutions-IT and,BPO and corporate-semi govt like ISRO etc- requirements-adv.-skills needed(download the details)

Delivery Audio and Video cassettes

Unit II

Technical skill-Communication skill especially in English-strengthening communicative English-Listening, Reading, Speaking and Writing-Listening-sounds of vowels and consonants and writing them-functional English-difference between functional and theoretical English

Unit III

Listening and Writing Activity based exercise on articles, modals, preposition and infinitives. The above topics are chosen as we don't find equivalents' in L1

Unit IV

Reading and Writing

Vocabulary-synonyms, antonyms, collocations, confused words, homonym, odd man out, words with correct spelling, avoid redundancy-Inferential comprehension (based on BEC and Blog on Soft Skills BY me)



Unit V

Speaking

Introducing yourself (giving questions)-collecting information in pairs and presenting it for 2 minutestory telling through picture- interpretation of psychometric pictures through question and answer-PPT preparation and presentation- developing the story in pairs as game

Text Book and Reference Books:

- 1. Soft Skill for Everyone-Jeff Butterfield, Part-1; Unit-D&E
- 2.EFA (English For All)- Dr.PadmasanniKannan, Libin Roy Thomas
- 3. English for Competitive Exam- R.P. Bhatnagar, RajulBhargava
- 4. Soft Skill Blog
- 5. Jobsearch.about.com
- 6. www.exsearch.in/interview.html



Subject Code	Subject Name	L	Т	Р	С
HBPH17A02	Allied - II : Physics - II	4	0	0	4

OBJECTIVES

- To make the students understand photoelectric effect and matter waves
- To enable them to familiarize about semiconductor diodes and transistors
- To help the students study about the Electronic devices
- To familiarize and understand the digital electronics
- To provide knowledge on operational amplifiers

Unit I Photoelectric effect & Matter waves

Photo electric effect – Einstein's photo electric equation – verification of Einstein's photo electric equation by Millikan's experiment – photo electriccells – applications - de Broglie matter waves – calculations of de Broglie wave length – Experimental study of de Broglie matter wave by G.P.Thomson experiment.

Unit II Semiconductor Diodes and Transistors

Semiconductors- P-type and N-type semiconductors- Junction diode and Zener Diode- Junction Diode & Zener Diode Characteristics- Junction Diode as a rectifier- Zener diode as a voltage regulator - Transistor- characteristics- Transistor as an amplifier.

Unit III Electronic Devices

Rectifiers: Half Wave and Full Wave rectifier- Efficiency-Capacitive Filter- Ripple Factor

Field Effect Transistor: Types- Junction Field Effect Transistor, Metal Oxide Semiconductor Field Effect Transistor-Characteristics- Silicon Control Rectifier- Characteristics.

Unit IV Digital Electronics

Number system: Binary System, Decimal to Binary, Octal system, Hexadecimal system, Binary – Addition, Subtraction, Multiplication and Division.

Logic Gates: OR, AND, NOT, Exclusive-OR, NOR, NAND gates, Simple combinational logic circuits- Half adder, Full adder, BCD Adder.



Unit V Operational Amplifier

Operational amplifier – OP-Amp – Inverting and non inverting amplifiers- Voltage amplifier., OP-Amp- Adder, Subtractor., OP- Amp comparator., OP-Amp Integrators.

Books for Study and Reference:

- 1. V.K. Metha- Principles of Electronics, S. Chand & Co.
- 2. R.S. Sedha- A Text book of Applied Electronics, S. Chand & Co.
- 3. B.L. Theraja- fundamentals of Electrical Engineering & Electronics, S. Chand & Co.
- 4. Applied Physics for Engineers- Dr.V.Rajendran&Dr.A. Marikani- TATA McGRAM HILL.



SEMESTER 4

Subject Code	Subject Name	L	Т	Р	С
HBCH17G09	General Chemistry - IV	4	0	0	4

OBJECTIVES

- To understand the principles, theories and structures of coordination compounds.
- To know the preparation, properties and reactions of aliphatic and aromatic carboxylic acids.
- Enable the students to learn the preparation, properties of aliphatic and aromatic nitrogen compounds.
- To know the principles and applications of II & III laws of thermodynamics.

Unit I Coordination Chemistry – I

Coordinate bond - double salts and coordinate complexes - IUPAC nomenclature.

Isomerism in coordination complexes: structural isomerism – Ionic linkage and coordination isomerism – stereoisomerism – Geometrical and optical isomerism – square planar & octahedral coordination complexes (Co, Ni, Cr, Pd&Pt complexes). Applications of coordination compounds in qualitative & quantitative analysis- chlorophyll &haemoglobin (elementary ideas)

Unit II Coordination Chemistry – Ii

Theories of coordination compounds – Werner's theory, Sedgwick's, EAN theory (precipitation & conductivity studies), Pauling's theory – interpretation geometry & magnetic properties of coordination compounds. Crystal field theory – Postulates, splitting of d- orbitals in octahedral &tetrahedral fields. High spin & low spin complexes. Interpretation of colour& magnetic properties.Comparison of VB & Crystal field theories.

Unit III Carboxylic Acids and Derivatives

Aliphatic Carboxylic Acids – Methods of preparation – Properties – Strengths of carboxylic acids – Reactions of Formic acid and Acetic acid.

Dicarboxylic acids – Oxalic acid – Properties – Reactions.

Tricarboxylic acids – Citric acid

Aromatic Carboxylic Acids – Benzoic acid, Cinnamic acid, Salicylic acid – Preparation, properties and uses.

Dicarboxylic acids - Phthalic acids - Preparation, properties and uses.

Unit IV Aliphatic and Aromatic Nitrogen Compounds

Nitro compounds - General methods of preparation and properties of aliphatic nitro compounds.

Aliphatic amines – General methods of preparation and properties of aliphatic amines.

Aromatic nitro compounds - Methods of preparation – Reactions of benzene ring and nitro group with special reference to reduction of nitro group.

Aromatic amines - General methods of preparation and reactions. Benzene diazonium chloride and its synthetic applications



Unit V Thermodynamics II & III

Need For Ii Law, Statements, Thermodynamic scale of temperature, concept of entropy, definition and physical significance of entropy. Entropy as a function of P, V& T. Entropy changes during phase changes – entropy of mixing – entropy criterion for spontaneous & equilibrium processes in isolated systems – Gibbs free energy & Helmholtz free energy variation of G & A with P,V& T. Gibbs – Helmholtz equation & its application. Third law of thermodynamics & concept of residual entropy, Nernst heat theorem, exceptions to third law. (ortho¶-H, CO, NO & ice)

- 1. Soni P.L., "Text Book of Inorganic Chemistry", Sultan Chand & Sons Publications.
- 2. Satyaprakash, Tuli G.D., Basu S.K. and Madan R.D., "Advanced Inorganic Chemistry", S. Chand & Company.
- 3. Jain M.K. and Sharma S.C., "Modern Organic Chemistry", Vishal Publishing Company.
- 4. Bahl and ArunBahl, "Organic Chemistry", S. Chand & Company.
- 5. Puri& Sharma, Pathania, "Principles of Physical Chemistry", ShobanLalNagin Chand & Company.
- 6. Bahl and ArunBahl, "Physical Chemistry", S. Chand & Company.
- 7. Lee J.D., "Concise Inorganic Chemistry", Black Well Science Ltd.
- 8. Finar I.L., "Organic Chemistry", ELBS Edition.
- 9. Lewis and Glasstone, "Text Book of Physical Chemistry".



SEMESTER 4

Subject Code	Subject Name	L	Т	Р	С
HBCH17G10	Analytical Chemistry - II	4	0	0	4

OBJECTIVES

- To understand the principles, instrumentation and applications of NMR and MASS spectroscopy.
- To learn the principles of polarography and its application in qualitative and quantitative analysis.
- To introduce the use of flame photometry and ESR spectroscopy.
- To understand the techniques of reaction kinetics.

Unit I NMR Spectroscopy

Principles of proton NMR - NMR active nuclei and percentage of abundance, energy level and basic NMR equations. Instrumentation – block diagram – solvents, use of TMS. Chemical shift, deshielding and shielding, up field and downfield, calculation of spin – spin couplings. Pascal's triangles – spectrum of ethanol, acetone, acetaldehyde and cinnamic acid.

Unit II Mass Spectroscopy

Principles of mass spectrum – Instrumentation and block diagram, molecular ion peak, base peak, meta stable peak, isotopic peak, fragmentation, N-rule, ring rule, mass spectrum of aldehydes, alcohols, alkenes, aromatic hydrocarbons - determination of molecular formula. Mcclafferty rearrangement.

Unit III Polarography

Unit IV Flame Photometry and ESR

Flame photometry – Introduction, principles, instrumentation – block diagram – Determination of Calcium and Magnesium in water – Determination of vanadium in lubricating oil. Electron spin resonance spectroscopy – Principles, instrumentation and applications – Hyper fine splitting.

Unit V Experimental Techniques In Reaction Kinetics

General principles of kinetics of reactions – Titration method – Optical rotation method – Electrical conductivity method – Spectrophotometric method – Fast reactions – Photochemical reactions, flash photolysis.



- 1. Gopalan, Subramanian and Rangarajan, "*Elements of Analytical chemistry*", Sultan Chand & Company.
- 2. Dash U.N., "Analytical Chemistry Theory & Practice", Sultan Chand & Company.
- 3. Srivastava A.K. and Jain P.C., "Chemical Analysis", S. Chand & Company.
- 4. Khopkar S.M., "Analytical Chemistry", Narosa Publications.
- 5. Willard H.H., MerritJr L.J., Dean J.A., "Instrumental Methods of Analysis", Affiliated East West Press.
- 6. Skoog D.A. and West D.M., "Fundamentals of Analytical Chemistry", Old Reinhold & Winston Publications.



Subject Code	Subject Name	L	Т	Р	С
HBCH17G11	Physical Chemistry - I	4	0	0	4

OBJECTIVES

- To know the concepts and theories of chemical kinetics.
- To understand the principles of surface phenomena and theory of catalysis.
- Enable the students to know about the reactions and factors influencing chemical equilibrium.
- To familiarize the different properties of solutions.

Unit I Chemical Kinetics - I

Rate, rate law, order, molecularity, measurement of rate constant – zero, first, second & third order reactions – derivation – pseudo first order – examples – Collision theory of reaction rates.

Unit II Chemical Kinetics - II

Effect of temperature on reaction rates. Temperature coefficient. Arrhenius equation – Activation energy concepts, collision theory – Derivation of rate constant for bimolecular gaseous reactions. Theory of absolute reaction rates – derivation for a bimolecular reaction, comparison of collision & ARR theory

Unit III Surface Phenomena And Catalysis

Types or classification of adsorption – Adsorption of gases on solids – Adsorbent of solute from solutions – Adsorption isotherms – Freundlich's and Langmuir's adsorption isotherm – Applications. Catalysis – Types – Characteristics of catalytic reactions – Promoters – Catalytic poisoning – Auto catalysis – Negative catalysis – Enzyme catalysis - theories of catalysis.

Unit IVChemical Equilibrium

Reversible reactions - Dynamic equilibrium, law of mass action, Le Chatilier principle, equilibrium constant (K_c , K_p) – relation between $K_c \& K_p$. thermodynamic derivation of equilibrium constant. Temperature dependence of equilibrium constants.Vant Hoff isotherm, Vant Hoff isochore – integral form.

Unit V Solutions

Expression of concentration – Molarity – Molality – Normality – Solutions of gases in gases – Henry's law – Solutions of liquids in liquids – Solubility of partially miscible liquids – Phenol-Water system – Trimethylamine - Water system – Nicotine - Water system – Azeotropes – Theory of fractional distillation – Steam distillation – Solutions of solids in liquids - Solubility of solids in solids.



- 1. Soni P.L., Dharmarha O.P., "Text Book of Physical Chemistry", Sultan Chand & Sons.
- 2. Puri& Sharma, "Basic Principles of Physical Chemistry", Vishal Publishing
- 3. ArunBahl, Bahl B.S. and Tuli G.D., "Physical Chemistry", S. Chand & Company.
- 4. Glasstone S. and Lewis D., "*Elements of physical chemistry*", Maccmillan& Company Ltd.
- 5. Maron and Lando, "Fundamentals of Physical Chemistry", Maccmillan& Company Ltd.
- 6. Khaterpal, "Physical Chemistry (Volume I&II)", Pradeep Publications.
- 7. Maron and Prutton, "Fundamentals of Physical Chemistry", Maccmillan& Company Ltd.
- 8. P.W. Atkins, "Physical Chemistry", Oxford University Press.



Subject Code	Subject Name	L	Т	Р	С			
HBCH17L04	Organic Analysis Lab	0	0	3	2			

Organic analysis

Reaction of the following functional groups: Aldehyde, ketone, carboxylic acid (mono and di), ester, carbohydrate (reducing and non-reducing), phenol, aromatic primary amine, amide, nitro compound, diamide and anilide. Analysis of organic compounds containing one functional group and characterization with a derivative.

Determination of boiling point and melting point-demonstration experiments.

Organic preparation

- 1) Oxidation (benzaldehyde to benzoic acid).
- 2) Hydrolysis (methyl salicylate or ethyl benzoate to the acid).
- 3) Nitration (metadinitrobenzene or picric acid).
- 4) Halogenation (parabromoacetanilide from acetanilide).
- 5) Diazotisation (methyl orange).
- 6) Acylation (Benzoylation of beta naphthol)



SEMESTER 4

Subject Code	Subject Name	L	Т	Р	С
HBCH17L05	Inorganic Chemistry Lab-II	0	0	3	2

Preparation of the following inorganic compounds:

 Ferrous ammonium sulphate 2. Manganous sulphate 3. Microcosmic salt 4. Tetraminecopper(II) sulphate. 5. Sodium thiosulphate and 6. Potassiumtrioxalatochromate (III)



Department of Chemistry

B.Sc. Chemistry SEMESTER 4

Subject Code	Subject Name	L	Т	Р	С			
HBMG17L02	SOFT SKILL-II	0	1	1	2			

OBJECTIVES

- To strengthen the students with the needed vocabulary
- To infer information from the given passage through reasoning.
- To train them in attending Group Discussion.
- To face the Technical and HR interview of the corporate.
- To raise communication proficiency to global standards

Unit I

Preparation of resume- functional resume with objective according to different advts- how to have interview file- how to send it by email- concept of writing email- practise through BEC method (questions and answer)

Unit II

Writing secretarial letters like intra-mail and inter-mail, agenda, memo and business reports-introducing

GD through video-conduct of GD on a topic and also case studies

Unit III

Body language-grooming- Interview skill- Dos and Donts- mock interview- exchange of interview practical session

Unit IV

Number system- H.C.F & L.C.M- Problems on ages – Percentage- Profit & Loss- Ratio & Proportion- Partnership.

Unit V

Time& work-Time& Distance- Clocks – Permutation & Combibnations- Heights & Distancea- Odd man out and Series.



Text Book and Reference Books:

1. Soft Skill for Everyone-Jeff Butterfield, Part-1; Unit-D&E

2. EFA (English For All)- Dr.PadmasanniKannan, Libin Roy Thomas

3. English for Competitive Exam- R.P. Bhatnagar, RajulBhargava

4. Placement Interview- S.Anandamurugan, Chapter-2&3

5. Alex K, Soft Skills; S. Chand& Company Pvt Ltd, 2009

6.Rizvi Ashraf M, Effective Technical Communication; Tata McGraw-Hill; 2005

7. Thorpe, Edgar, Course in Mental Ability and Quantitative Aptitude Tata McGraw-Hill,2003

8.Agarwal, R.S, A Modern Approach to Verbal and Non-Verbal Reasoning, S. Chand& Co;2004

9. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S. Chand& Co., (2017)

10. Jobsearch.about.com

11. www.exsearch.in/interview.html



SEMESTER 5

Subject Code	Subject Name	L	Т	Р	С
HBCH17G12	Inorganic Chemistry – II	4	0	0	4

OBJECTIVES

- To enable the students to learn about the crystal structure.
- To familiarize the properties of transition elements.
- Enable the students to understand the metallurgy of Iron, Cobalt, Nickel and Copper.
- To know the preparation, properties and uses of carbides and nitrides.
- To understand the properties and uses of special class of compounds.

Unit ISolid State

Isotropic & anisotropic crystals.Laws of crystallography. Elements of symmetry. Unit cell & space lattice, Miller indices – simple cubic, fcc, bcc, diffraction of X – rays by crystals – Bragg's equation, X ray – analysis of NaCl, KCl, CsCl – determination of Avogadro number.

Unit II Transition Elements – II

Transition elements II – Group study of – Iron, Cobalt, Nickel and Copper.

Unit III Metallurgy – II

Methods of extraction and uses of Iron, Cobalt, Nickel and Copper.

Unit IV Carbides and Nitrides

Carbides: Classification – ionic, covalent and interstitial carbides – calcium carbide, boron carbide, silicon carbides.

Nitrides: Classification - ionic, covalent and interstitial nitrides - Boron nitride.

Unit V Special Class of Compounds

Clathrates – Interstitial compounds and non-stoichiometric compounds – Structures and uses. Inorganic polymers – metal alkyls – Phosphonitrilic polymers – Borazine – Hydrides and borides – Preparation, structure and properties.

- 1. Malik V.W., Tuli G.D. and Madan R.D., "Selected Topics in Inorganic Chemistry", S. Chand & Company
- 2. Cotton F.A., Wilkinson G. and Gaus Paul C., "Basic Inorganic Chemistry", Wiley Student Edition
- 3. Banerjee D., "Fundamental Principles of Inorganic Chemistry", Sultan Chand & Sons
- 4. Soni P.L., "Text Book of Inorganic Chemistry", Sultan Chand & Sons Publications.
- 5. Satyaprakash, Tuli G.D., Basu S.K., Madan R.D., "Advanced Inorganic Chemistry", S. Chand & Company.



SEMESTER 5

Subject Code	Subject Name	L	Т	Р	С
HBCH17G13	Organic Chemistry – II	4	0	0	4

OBJECTIVES

- To know about the function and structural elucidation of alkaloids.
- To understand the structure and synthesis of terpenes and carotenoids.
- Enable the students to know about the isomerism of organic compounds including conformation and configuration.
- To learn about the various name reactions and their mechanisms.

Unit I Alkaloids

Introduction & functions of alkaloids, classification.Structural elucidation of conine, nicotine, piperine&papavarine.

Unit II Terpenes and Carotenoids

Terpenoids: Introduction, classification, isoprene rule. General methods of determining structure. Structure & synthesis of citral, menthol, α – terpineol and camphor

Unit IIIStereochemistry – I

Stereoisomerism, types, optical isomers, geometrical isomers, symmetry, asymmetry, dissymmetry, optical activity, conditions & its measurement, projections, enantiomerism, dia-stereomerismD,L and R,S notations. Erythreo&threo - d,l - and meso forms. Stereo selectivity & stereo specificity in organic reactions with examples.

Unit IV Stereochemistry – II

Racemisation, resolution of racemic mixture, Walden inversion asymmetric synthesis.Biphenyls, spiranes.Conformation analysis, definition, difference between configuration & conformation. Conformation analysis of ethane, propane, butane, staggered, eclipsed, Gauche forms. Conformers of cyclo-hexane, chair & boat forms substituted cyclohexane's.

Unit VMolecular Rearrangements

Classification, general mechanistic treatments of nucleophilic, electrophilic & free radical rearrangements – pinacol-pinacolone, Wagner-Meerwin, Beckmann, Benzidine, Hoffmann, curtius, Lossen, Schmidt, benzilic acid, Cope and Fries.



- 1. Bahl and ArunBahl, "Organic Chemistry", S. Chand & Sons.
- 2. Ahluwalia G.K. and MadhuaiGoyal, "Text Book of Organic Chemistry".
- 3. Soni P.L. and Chawla H.M., "Text Book of Organic Chemistry", Sultan Chand & Sons.
- 4. Jerry March, "Advanced Organic Chemistry", John Wiley & Sons.
- 5. Hendrickson, Cram and Hammond, "Organic Chemistry", MccGraw Hill Kogakusha.
- 6. C.N. Pillai, "Organic Chemistry", University Press.
- 7. P.S. Kalsi, "Stereochemistry and Mechanism", Wiley Eastern.



SEMESTER 5

Subject Code	Subject Name	L	Т	Р	С
HBCH17G14	Physical Chemistry – II	4	0	0	4

OBJECTIVES

- Enable the students to understand the concept of one and two component systems.
- To understand the fundamental principles of electrochemistry.
- To know about the concepts of acids and bases.
- To understand the different types of electrodes and their applications.
- To familiarize the physical properties with reference to chemical constitution.

Unit I Phase Rule

Concepts of phase, component & degree of freedom with examples. Gibbs phase rule – derivation. Clausius – Clapeyron equation & its applications to equilibrium in phase transitions.

One component system, phase diagrams – water & sulphur systems

Two component system – simple eutectic, lead-silver system, formation of compound with congruent melting point.Ferric chloride – water system – Cooling curves & thermal analysis.

Unit II Electrochemistry – I

Faraday's laws – conduction – specific, equivalent & molar conductance, measurement – variation of equivalent conductance with dilution, Kohlraush law & its applications, solubility of sparingly soluble salts. Ostwald dilution law, determination of ionization constants of weak electrolytes.

Migration ions, transport number, Hittorf& moving boundary methods, theory of strong electrolytes – Debye-Huckel's theory & its verification. Conductometric titrations.

Unit III Ionic Equilibria

Acids and bases, Arrhenius concept, Lewis concept, ionic product of water, pH &pOH, common ion effect, buffer solutions, calculation of pH of buffer, Henderson equation. Salt hydrolysis of different types of salts, degree of hydrolysis. Theory of acid – base indicators, solubility product – principle – applications.

Unit IV Electrochemistry – II

Reversible and irreversible cells, measurement of emf, thermodynamics of cell reaction, Nernst equation. Reversible electrodes – types – single electrode potential – reference electrodes – primary & secondary – standard electrode potential, sign conventions, electrochemical series & its significance. Nernst equation for emf and electrode potential.Determination of pH.Glass electrode, potentiometric titrations.

Concentration cells – with & without transference, liquid junction potential. Application of concentration cells.Decomposition potential, over voltage & polarization.

Unit V Physical Properties and Chemical Constitution

Dipole moment – determination – bond moment – dipole moment & molecular structure.Surface tension – uses of parachor in elucidating structure.

Viscosity and molecular structure, molar refraction and constitution.Magnetic properties – para magnetic & diamagnetic substances.

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- 1. Soni P.L., Dharmurta O.P., "Text Book of Physical Chemistry", Sultan Chand & Sons.
- 2. Puri& Sharma, "Basic Principles of Physical Chemistry", Vishal Publishing
- 3. ArunBahl, Bahl B.S. and Tuli G.D., "*Physical Chemistry*", S. Chand & Company.
- 4. Glasstone S. and Lewis D., "Elements of physical chemistry", Maccmillan & Company Ltd.
- 5. Maron and Lando, "Fundamentals of Physical Chemistry", Maccmillan& Company Ltd.
- 6. Khaterpal, "Physical Chemistry (Volume I&II)", Pradeep Publications.
- 7. Maron and Prutton, "Fundamentals of Physical Chemistry", Maccmillan& Company Ltd.
- 8. P.W. Atkins, "Physical Chemistry", Oxford University Press.



Subject Code	Subject Name	L	Т	Р	С
HBCH17G15	Nano Chemistry	4	0	0	4

OBJECTIVES

- To introduce nano materials and describe the synthetic methods for preparing them.
- Enable students to understand the techniques used for characterization.
- To give an idea of physico-chemical properties and applications of nano materials.

Unit I Introduction to Nanoscience

Definition – Nanochemistry basics – classical nanostructures, distinction between nanomaterials & bulk materials. Nanomaterials - definition crystals, quasi-crystals & amorphous phase. CNT & fullerenes, metal and metal oxide nanoparticles, core-shell structures and nano composites.

Unit II Synthetic Methodologies

Top-down and Bottom-up approaches: laser ablation, chemical & physical vapour deposition, chemical reduction, arc discharge method, co-precipitation and thermolysis.

Unit III Characterization Techniques

Electron microscopes: Scanning electron microscope & Transmission electron microscope, instrumentation and applications

Absorption spectra: UV-Visible & diffuse reflectance spectroscopy

Emission spectra: Fourier Transform Raman spectroscopy

Unit IV Physio-Chemical Properties of Nanomaterials

Novel properties: size and shape dependent properties – optical, catalytic and photo-catalytic properties. Magnetism in nanomaterials – Para magnetism, Diamagnetism, Ferromagnetism and Antiferromagnetism - Electronic, electrical and dielectric properties

Unit V Applications of Nanomaterials

Nanomaterials in catalysis – Gold, palladium, titanium dioxide, choice of catalyst – bio catalyst, polymer supported catalyst. Nanomaterials in water purification – Nano filtration, choice of filter.Nanoparticles for cleaning ground water.



- 1. The Nano Scope Vol. I VI Edn. Dr. ParagDiwan and AshishBharadwaj, Pentagon Press
- 2. Nano Materials A.K. BandyoPadhyan, New Age Internationa Publishers
- 3. Principles of Nano Science and Nano Technology M.A. Shah and Takeer Ahmad, Narosa Publishing House



SEMESTER 5

Subject Code	Subject Name	L	Т	Р	С
HBMG17001	Environment Studies	3	0	0	3

Unit I Environmental and Eco Systems

Definition, scope and importance of environment- need for public awareness- concept, structure and function of an ecosystem-producers, consumers and decomposers-energy flow in the ecosystem.Biodiversity at National and local levels

Unit II Environmental Pollution

Definition-causes, effects and control measures of(a) Air pollution (b) Water pollution (c)Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards (g)E-Wastes and causes, effects and control measures.

Unit IIINatural Resources

Forest resources: Use and Over-exploitation, deforestation.Water resources: Use and over-utilization of surface and ground Water, Floods, drought, and conflicts over Water, dams-benefits and problems. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer –pesticide problems.

Unit IV Social Issues and the Environment

From unsustainable to sustainable development-urban problems related to energy-water conservation. Rain water harvesting, watershed management-resettlement and rehabilitation of people; its problems and concerns climate change, global warming, acid rain, ozone layer depletion, nuclear and state pollution control boards-Public awareness.

UnitVHuman Population and the Environment

Population growth, variation among nation –population explosion, environment and human healthhuman rights-value education-HIV/AIDS –women and child welfare –role of information technology in environment and human health.

Text books:

- 1. Gilbert M.Masters ,"Introduction to Environmnetal Engineering and Science",2ndEdition,Pearson Education (2004)
- 2. Benny Joseph , "Envionmental Science and Engineering", TataMcGrawHill , NewDelhi, (2006)

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SEMESTER 5

Subject Code	Subject Name	L	Т	Р	С
HBCH17L06	Gravimetric Analysis Lab	0	0	3	2

- 1. Estimation of sulphate as barium sulphate.
- 2. Estimation of barium as barium sulphate.
- 3. Estimation of barium as barium chromate.
- 4 Estimation of lead as lead chromate.
- 5. Estimation of silver as silver chloride.
- 6. Estimation of calcium as calcium oxalate monohydrate.
- 7. Estimation of nickel as DMG complex.
- 8. Estimation of zinc and magnesium as oxinate.



Subject Code	Subject Name	L	Т	Р	С
HBCH17L07	Physical Chemistry Lab - II	0	0	3	2

Heterogeneous equilibria:

a) Effect of impurity - 2% NaCl or succinic acid solutions on phenol determination of the concentration of the given solution.

b) Determination of the transition temperature of the given salt hydrate. Na $_2$ S $_2$ O $_3.5$ H $_2$ O, CH $_3$ COONa. 3H $_2$ O, SrCl $_2$. 6H $_2$ O, MnCl $_2$. 4H2O

Electrochemistry

Conductivity

a) Determination of cell constant and equivalent conductivities of solutions of two different concentrations.

b) Conductometric titration of a strong acid against a strong base.Potentiometric titration of a strong acid against a strong base.



SEMESTER 6

Subject Code	Subject Name	L	Т	Р	С
HBCH17G16	Applied Chemistry II	4	0	0	4

OBJECTIVES:

- To understand the chemistry of Lime & Cement.
- To understand the classification & manufacturing process of fuels.
- To introduce the classification of Lubricants & properties of Refractories.
- To understand the manufacture and applications of soaps & detergents.

Unit I Lime and Cement

Lime – Classification – Manufacture – Properties – Plaster of Paris. Cement – Types of Cement – Manufacture of Portland Cement – Hydraulic property – Mechanism of setting and hardening of Cement – Special Cements.

Unit II Fuels

Classification – Calorific value – HCV and LCV – Spontaneous Ignition Temperature – Explosive range – Solid fuels – Coal and its varieties – Analysis of coal – Proximate and Ultimate analysis – Manufacture of Coke – Beehive oven method – Otto Hofmann method – Liquid fuels – Petroleum – Refining – Production of petrol by Cracking and by synthesis – Knocking property of gasoline – Octane number – Leaded petrol – Cetane number.

Unit III Lubricants

Classification – Mechanism of lubrication – Types of lubricants – Properties of lubricants – Viscosity index – Flash point, fire point, cloud point, pour point – oiliness – aniline point – Saponification value – Blended oils – Semi solid and solid lubricants.

Unit IV Refractories

Definition – Refractoriness – Properties of Refractories – Natural and artificial abrasives – Manufacture of Abrasives – Silicon carbide – Refractory bricks – Cermets.

Unit V Soaps and Detergents

Soaps – Saponification of oils and fats – manufacture of soaps – mechanism of action of soap – classification of soap – soft soap, medicated soap, herbal soap, shaving soap and creams.

Detergents – Anionic detergents – manufacture and applications – mechanism of action of detergents. Comparison of soaps and detergents.

- 1. Material Science and Metallurgy, G.B. Khanna, DhanpatRai Publications.
- 2. Industrial Chemistry, B.K. Sharma, Goel Publishing House.
- 3. Engineering Chemistry, P.C. Jain and Monika Jain, DhanpatRai Publications.
- 4. Chemistry of Engineering Materials, C.V. Agarwal, Tata McGraw Hill Company.
- 5. Material Science and Process, R.B. Gupta, Tech India Publications.



Subject Code	Subject Name	L	Т	Р	С
HBCH17G17	Nuclear Chemistry	4	0	0	4

OBJECTIVES

- To introduce the phenomena of natural and artificial radioactivity and emphasize the theoretical basis.
- To comprehend nuclear fission and fusion and their constructive and destructive uses.
- To give the preliminary ideas behind the preparation and uses of explosives and propellants.
- To create awareness on chemical and nuclear disarmament, chemical weapons convention and test ban and non-proliferation treaties.
- To impart knowledge on the varied uses of nuclear technology.

Unit I Radioactive Chemistry

Natural radioactivity – types and properties of radiation – detection and measurement of radioactivity – radioactive decay – half-life period – group displacement law – radioactive series – stability of nuclei – p/n ratio – packing fraction – binding energy- mass defect – magic numbers – theories of radio activity.

Unit II Nuclear Chemistry

Isotopes, Isotones, Isotones, separation of isotopes – Nuclear fission and fusion – Nuclear energy, reactions – Atom bomb – Hydrogen bomb – Induced radio activity – Artificial transmutation – Applications of radio activity – Carbon dating – Age of earth and medical applications. Nuclear Reactors.

Unit III Rocket Propellants and Explosives

Introduction, characteristics, classification, Oxygen balance – preparation properties and uses of detonators, low explosives and high explosives, Dynamites, Gun cotton, Cordites, Rocket propellants – characteristics – solid and liquid propellants – examples.

Unit IV Concept of CWC

Chemical weapons of mass destruction – examples – hazards – chemical weapon convention – key points – controlled substance. Disarmament – danger of nuclear weapons – treaties – nuclear non-proliferation treaty – comprehensive test ban treaty – nuclear weapon free zones – Ban of fissile material production.

Unit V Chemistry for Peace

Uses of nuclear technology – in agriculture – food preservation – fertilizers – genetic variability – insect control – water resources – isotope hydrology technique – medicine – diaganosis, therapy, sterilization, smoke detectors – Industry – environmental pollution detectors and analysis – radiography – check welds and cracks in pipe lines.



- 1. U.N.Dash, Nuclear Chemistry, Sultan Chand & Sons.
- 2. H.J. Arnikar, Essentials of Nuclear Chemistry, New Age International.
- 3. B.R. Puri, L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, ShobanlalNagin Chand & Co.
- 4. Irving Kaplan, Nuclear Physics, Narosa Publishing House.
- 5. Walter Krutzsch, Eric Myjer and Ralf Trapp, The Chemical Weapons convention, Oxford University Press.



SEMESTER 6

Subject Code	Subject Name	L	Т	Р	С
HBMG17G01	Entrepreneurship Development	3	0	0	3

Unit I

Concept of Entrepreneurship – Meaning – Types – Qualities of an Entrepreneur – Classification of Entrepreneurs – Factors influencing Entrepreneurship – Functions of Entrepreneurs

Unit II

Entrepreneurial Development – Agencies – Commercial Banks – District Industries Centre – National Small Industries Corporation – Small Industries Development Organisation – Small Industries Service Institute. All India Financial Institutions – IDBI –IFCI – ICICI – IRDBI.

Unit III

Project Management - Business idea generation techniques – identification of Business Opportunities – Feasibility study – Marketing, Finance, Technology & Legal Formalities-Preparation of Project Report Tools of Appraisal.

Unit IV

Entrepreneurial Development programmes (EDP) – their role, relevance, and achievements – Role of Government in organizing EDPs – critical evaluation

Unit V

Economic development and entrepreneurial growth

Role of Entrepreneur in economic growth – Strategic approaches in the changing economic scenario for small scale Entrepreneurs – Networking – Niche play, Geographic Concentration, Franchising/dealership – Development of Women Entrepreneurship.

Reference books:

- 1. Srinivasan N.P. Entrepreneurial Development
- 2. Saravanavel Entrepreneurial Development
- 3. Vasant Desai Project Management
- 4. Jayashree Suresh Entrepreneurial Development
- 5. Holt Entrepreneurship New Venture Creation.