

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.
(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF CHEMISTRY



CBCS SYLLABUS

BACHELOR OF SCIENCE

PROGRAMME CODE - K

COURSE STRUCTURE

(w.e.f. 2017 – 2018 onwards)



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CRITERION - I

1.2.2 Details of Programmes offered through Choice Based Credit System (CBCS) / Elective Course System

**Syllabus copies with highlights of contents focusing on
Elective Course System**



To be Noted:

HIGHLIGHTED	COURSE
<div data-bbox="467 1444 691 1520" style="border: 1px solid red; width: 138px; height: 36px;"></div>	Elective

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(w.e.f. 2017 – 2018 Batch onwards)

COURSE STRUCTURE-SEMESTER WISE

Sem	Part	Subject code	Title of the paper	Teaching hrs.(Per week)	Duration of exam (hrs)	Marks allotted			Credits
						C. A	S.E	Total	
1	I	171T1	Part –I Tamil	6	3	25	75	100	3
	II	172E1	Part-II English	6	3	25	75	100	3
	III	17K11	Core – Inorganic, Organic and Physical Chemistry-I	4	3	25	75	100	4
		17K2P	Core - Major Practical – I* Semi micro qualitative analysis and Organic preparations	2	-	-	-	-	-
		17AM1	Allied 1 – Maths -I	6	3	25	75	100	4
	IV	17SEK11	Laboratory Techniques	2	2	-	100	100	2
		17SEK12	Industrial Chemistry	2	2	-	100	100	2
		17NMK1	Dairy Science	2	2	-	100	100	2
2	I	171T2	Part –I Tamil	6	3	25	75	100	3
	II	172E2	Part-II English	6	3	25	75	100	3
	III	17K21	Core – Inorganic, Organic and Physical Chemistry-II	4	3	25	75	100	4
		17K2P	Core - Major Practical – I* Semi micro qualitative analysis and organic preparations	2	6	40	60	100	4
		17AM2	Allied 1- Maths – II	6	3	25	75	100	5

	IV	17SEK21	Medicinal Chemistry	2	2	-	100	100	2
		17SEK22	Forensic Chemistry	2	2	-	100	100	2
		17NMK2	Chemistry in Everyday Life	2	2	-	100	100	2
3		171T3	Part-I Tamil	6	3	25	75	100	3
	II	172E3	Part-II English	6	3	25	75	100	3
	III	17K31	Core – Organic and Inorganic Chemistry		3	25	75	100	4
17K4P		Core - Major Practical – II* Gravimetric & Volumetric analysis	2	-	-	-	-	-	
		17AM3	Allied 1 - Maths–III	6	3	25	75	100	4
		17AP1	Allied 2- Physics-Mechanics and Properties of Matter and Sound	4	3	25	75	100	4
		17AP2P	Allied 2- Physics Practical –I*	2	-	-	-	-	-
4	I	171T4	Part-I Tamil	6	3	25	75	100	3
	II	172E4	Part-II English	6	3	25	75	100	3
	III	17K41	Core – Organic & Physical Chemistry- National	4	3	25	75	100	4
		17K4P	Core - Major Practical – II* Gravimetric & Volumetric Analysis	2	6	40	60	100	5
		17AM4	Allied 1 - Maths – IV	6	3	25	75	100	5
		17AP2	Allied 2- Physics- Thermal Physics	4	3	25	75	100	4
		17AP2P	Allied 2-Physics Practical-I*	2	3	40	60	100	1
III		17K51	Core – Organic Chemistry	4	3	25	75	100	4
		17K52	Core – Physical Chemistry-I	4	3	25	75	100	4
			Core - Elective I	4	3	25	75	100	4

5		17K61P	Core – Major Practical – III* Organic analysis & Estimation	4	-	-	-	-	-
		17K62P	Core - Major Practical – IV* Physical Chemistry	4	-	-	-	-	-
		17AP3	Allied 2 –Physics-Electricity & Electronics	4	3	25	75	100	4
		17AP4P	Allied 2-Physics Practical-II*	2	-	-	-	-	-
	IV	17SEK51	Chemistry of bio molecules- Global	2	2	-	100	100	2
		17EV5	Environmental Studies	2	2	-	100	100	2
6	III	17K61	Core – Organic Chemistry and Spectroscopy	4	3	25	75	100	4
	III	17K62	Core – Physical Chemistry-II	4	3	25	75	100	4
	III		Core - Elective II	4	3	25	75	100	4
		17K61P	Core – Major Practical – III* Organic analysis & Estimation	4	6	40	60	100	5
		17K62P	Core – Major Practical –IV* Physical Chemistry	4	6	40	60	100	5
		17AP4	Allied 2 – Physics - Optics	4	3	25	75	100	4
		17AP4P	Allied 2- Physics Practical-II*	2	3	40	60	100	1
	IV	17SEK61	Green and Nano Chemistry	2	2	-	100	100	2
		174VE6	Value Education	2	2	-	100	100	2
	V	175NS4/ 175PE4	Extension Activities NSS/ Phy. Education	-	2	-	-	100	1
		Total	180					140	

Electives**Semester V (Elective I- Choose any one)**

- | | |
|--------------------------------------|----------|
| 1 Inorganic and Analytical Chemistry | - 17KE5A |
| 2. Chemistry of materials | - 17KE5B |

Electives**Semester VI (Elective II- Choose any one)**

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| 1. Inorganic and applications of computer in chemistry | -17KE6A |
| 2. Diffraction Methods and Applications | -17KE6B |

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ALLIED CHEMISTRY (for B.Sc. Nutrition & Dietetics)**COURSE STRUCTURE - SEMESTER WISE**

Sem	Sub code	Title of the paper	Teach-ing hrs. (Per week)	Dura-tion of exam (hrs)	Marks allotted			Credits
					C.A	S.E	Tot al	
III	17AKN3	Bio Chemistry	4	3	25	75	100	4
		Allied Practical I* –Qualitative Analysis	2	-	-	-	-	
IV	17AKN4	Environmental and Organic Chemistry	4	3	25	75	100	4
	17AKN4P	Allied Practical I* –Qualitative Analysis	2	3	40	60	100	1
V	17AKN5	Applied Chemistry	4	3	25	75	100	4
		Allied Practical II* –Volumetric Analysis	2	-	-	-	-	-
VI	17AKN6	Applied and Medicinal Chemistry	4	3	25	75	100	4
	17AKN6P	Allied Practical II* –Volumetric Analysis	2	3	40	60	100	1

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ALLIED CHEMISTRY (for B.Sc. Physics)**COURSE STRUCTURE - SEMESTER WISE**

Sem	Sub code	Title of the paper	Teach- ing hrs. (Per week)	Dura- tion of exam (hrs)	Marks allotted			Credits
					C.A	S.E	Tot al	
III	17AKP3	Physical Chemistry	4	3	25	75	100	4
		Allied Practical I* –Qualitative Analysis	2	-	-	-	-	
IV	17AKP4	Organic and Physical Chemistry	4	3	25	75	100	4
	17AKP4P	Allied Practical I* –Qualitative Analysis	2	3	40	60	100	1
V	17AKP5	Inorganic, Physical and Medicinal Chemistry	4	3	25	75	100	4
		Allied Practical II* –Volumetric Analysis	2	-	-	-	-	-
VI	17AKP6	Analytical and Inorganic Chemistry	4	3	25	75	100	4
	17AKP6P	Allied Practical II* –Volumetric Analysis	2	3	40	60	100	1

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Core-Elective-I (Choice-A)

Title of the paper: Inorganic and Analytical Chemistry

Semester : V

Contact hours: 4

Sub code : 17KE5A

Credits : 4

Objectives:

1. To acquire knowledge and understanding of Halogen compounds.
2. To gain about fundamental concepts of d, f block elements, non-aqueous solvents, inorganic polymers and data analysis.

UNIT-I HALOGEN COMPOUNDS a) Halogen compounds: Electronic configuration, diatomic nature, oxidizing property, electronegativity and electron affinity –Difficulties in the discovery and isolation of fluorine – peculiarities of fluorine – electropositive character of Iodine b) Interhalogen Compounds: Interhalogen compounds: preparation, properties of ClF, ICl, ClF₃, BrF₃, ICl₃, ClF₅, BrF₅, IF₅, IF₇ – structure of ICl, ClF₃, IF₅, IF₇- poly halides and pseudo halogens.

UNIT-II TRANSITION ELEMENTS: a) Transition elements –position in the periodic table –general characteristics of d-block elements. b) Occurrence, extraction, properties and uses of titanium, vanadium, molybdenum and tungsten. c) Chemistry of titanium dioxide, titanium tetrachloride, vanadium pentoxide-ammonium vanadate, ammonium molybdate, molybdenum blue, tungsten oxide, tungsten bronze, zirconium halide.

UNIT-III LANTHANIDES AND ACTINIDES: Position of lanthanides, actinides in the periodic table –general characteristics of lanthanides and actinides –lanthanide contraction-actinide contraction. occurrence and general methods of extraction of lanthanides by reducing the trihalides, ion exchange and valence exchange

methods. Isolation of thorium from monazite –preparation ,properties and uses of oxides ,sulphates and halides of lanthanum and uranium .Applications of lanthanides and actinides.

UNIT-IV NON-AQUEOUS SOLVENTS & INORGANIC POLYMERS

a) Non-aqueous solvents: Classification of solvents-general properties of ionizing solvents-chemical reactions-liquid ammonia as solvents-liquid sulphur dioxide as solvents-liquid hydrogen fluoride as solvents. b) Inorganic polymers: Introduction-general properties of inorganic polymers -silicon based polymers-polysiloxane gums and silicon rubber.

UNIT-V DATA ANALYSIS AND THERMOANALYTICAL METHODS: a) Data analysis: Introduction-mean –median-precision-accuracy-confidence limits- definition – determinate errors- indeterminate errors-rules for types improving accuracy of data-significant figure-method of least squares. b) Thermoanalytical methods: Introduction-Thermogravimetric analysis (TGA) –principle –thermal analysis of silver nitrate - derivative thermogravimetry(DTA)-factors which influence the thermogram- application of thermogravimetry.

Text books:

1. Gopalan R. Subramanian P.S. & Rengarajan K., “*Elements of Analytical Chemistry*”, Sultanchand & Sons , NewDelhi, 2003.
2. Madan R.D, “*Modern Inorganic Chemistry*”, S.Chand and company Ltd., NewDelhi, 2011.
3. Puri B.R. Sharma L.R. Kalia K.C., “*Principles of Inorganic Chemistry*”, Milestone Publishers, Delhi, 2016.

Reference books:

1. Gurdeep R. Chatwal & Sham K. Anand.”Instrumental methods of chemical analysis”. Himalaya publishing house, Mumbai, 2002.
2. Lee J.D., “*Concise Inorganic Chemistry*”, Fifth Edition, Blackwell Science Ltd., New Delhi, 2003.
3. Malik U. Tuli G.D. & Madan R.L. “*Selected Topics in Inorganic Chemistry,*” S.Chand & Company, New Delhi, 2004

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Objectives: To introduce and give an insight into the fascinating area of solid state chemistry and material science. This will enable the students to pursue higher studies.

UNIT : I STRUCTURES OF SOLIDS: Introduction to solids – Crystalline and amorphous. Unit cell, Bravais lattices and X-ray structure determination (NaCl and KCl only) – powder and single crystal methods. Radius ratio rules – coordination number. Packing arrangement – different structure types in solids – rock salts, zinc blende, wurtzite, spinel and inverse – spinel and perovskite structures.

UNIT : II PREPARATIVE METHOD AND CHARACTERIZATION: Solid state reactions – ceramic method, sol-gel hydrothermal, high pressure, zone refining, CVD, Czochralski and Bridgman and Stockbarger methods. Physical methods – thermogravimetric and differential thermal analysis and scanning electron microscopy (only introduction and applications)

UNIT : III ELECTRICAL AND OPTICAL PROPERTIES: Defects in solid state – point defects – Frenkel and Schottky defects and non-stoichiometric defects. Conductors – variation of conductivity with temperature – semiconductors – p and n types, pn-junction, photoconduction, photo voltaic cell and photogalvanic cell – solar energy conversion, organic semiconductors. Piezoelectric, pyro-electric and ferroelectrics (introduction and applications) Photoluminescence.

UNIT : IV MAGNETIC PROPERTIES: Magnetic properties – classification – diamagnetic, paramagnetic, antiferro magnetic, ferro and ferri magnetic – magnetic susceptibility – variation with temperature Curie-Wiess law, Curie temperature and Neel temperature. Permanent and temporary magnets.

UNIT : V SPECIAL MATERIALS: Super conductivity – introduction, Meissner effect – mention of Bardeen, Cooper and Schrieffer theory and Cooper pairs – examples of superconducting oxides, Chevrel phases – applications of superconducting materials. Ionic conductors – sodium-b alumina, sodium-sulphur battery. Intercalation-layered compounds – graphitic compounds. Special applications of solid state materials. High energy battery, lithium cells.

Text Books:

1. Meyers H.P., *“Introductory Solid State Physics”*, Viva Books Private Limited, New Delhi, 1998.
2. West A.R., *“Solid State Chemistry and its Applications”*, John-Wiley and Sons Singapore, 1989.

Reference Books:

1. Emelius H.J. & Sharpe A.G., *“Modern aspects of Inorganic Chemistry”*, Universal Book stall, 1989.
2. Greenwood N.N., *“Ionic crystals, Lattice defects and Nonstoichiometry”*, Butterworths, London, 1968.
3. Jolly W.L., *“Modern Inorganic Chemistry”*, Mc Graw Hill Book Company New York, 1996.
4. Shriver D.F & Atkins P.W., *“Inorganic Chemistry”*, Oxford University, Longford, 1990.

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Core-Elective Paper II (Choice A)

Title of the paper: Inorganic and Applications of Computer in Chemistry		
Semester	: VI	Contact hours: 4
Subject code	: 17KE6A	Credits : 4

Objectives:

Students undergoing this course acquire knowledge and understanding of fundamental concepts of coordination compounds, metal carbonyls, nitrosyls and bio-inorganic chemistry. The students also acquire knowledge about programming in C language and introduction to chem informatics.

UNIT :I COORDINATION COMPOUNDS-I: Double salts and coordination compounds – terminology: coordination sphere, coordination number, ligand and its types – nomenclature – EAN rule - **Isomerism:** structural isomerism and stereoisomerism **Chelates:** classification – chelate effect and application of the formation of chelated complexes in analytical chemistry.

UNIT :II COORDINATION COMPOUNDS-II: Werner's coordination theory: postulates and experimental evidence - Sidgwick's concept: EAN rule – applications and limitations - Valence Bond Theory: assumptions and illustration to 4 - and 6-coordination ions - hybridization and geometry - limitations - Crystal Field Theory: salient features - orbital splitting as applied to octahedral, tetrahedral and square planar complexes - CFSE and its calculation –factors influencing the magnitude of CF splitting: nature of central cation, spectrochemical series- magnetic moments and color of transition metal complexes- Comparison of VBT and CFT - Molecular orbital theory :

σ bonding in octa hedral complexes $[\text{Co}(\text{NH}_3)_6]^{3+}$ & $[\text{CoF}_6]^{3-}$ π bonding system introduction only.

UNIT : III METAL CARBONYLS, INORGANIC POLYMERS AND BIO-

INORGANIC CHEMISTRY : a) Metal Carbonyls: Definition-classification-general methods of preparation and properties of carbonyls-structure and bonding in $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, $\text{Mn}_2(\text{CO})_9$, and $\text{Co}_2(\text{CO})_8$ -EAN rule as applied to carbonyls.b) Metal nitrosyls:Nitrosyls-types-nitrosyls compounds.preparation, properties and struc ture – sodiumnitroprusside-nitroferrous sulphate-EAN as applied to nitrosyls.

c) Bio-Inorganic Chemistry: Role of metal ions (Fe, Co, Zn, Mg, Na, Ca &K) in biological systems- structure of metallo porphyrins- structure and f unctions of heamoglobin, myoglobin, chlorophyll.

UNIT: IV PROGRAMMING IN C LANGUAGE: a) Advantages- types of the language- keywords- variables and parameters- arrays- data types-structures- funning of C program constants- operators-expressions- input and output - control statements- looping- functions. b) Applying C programme to Calculation of Inversion temperature- C_{rms} , C_{av} and C_{mp} velocity- degrees of freedom on the basis of phase rule- efficiency of a heat engine - half-life period of a reaction - critical constants-ionic strength of any electrolytic solutions .

UNIT : V CHEM INFORMATICS: a)Representation and manipulation of 2d molecular structure: Introduction- computer representation of chemical structure- Graph Theoretic Representations of Chemical Structures– connection tables and linear notations- structure searching – substructure searching (screening methods) –reaction databases.b)Representation and manipulation of 3d molecular structure:Introduction- theoretical 3D databases (structure generation programmes – conformational search & analysis – systematic conformational search – random conformational search).

Text Books

1. Andrew R. Leach Valerie J. & Gillet, "*An Introduction to Chemoinformatics*", Springer International Edition, 2007.
2. James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, "*Inorganic chemistry principles of structure and reactivity*", IVth Edition, Pearson Education, New Delhi, 2016.
3. Madan R.D., "*Modern Inorganic Chemistry*", S.Chand and Company Ltd., New Delhi, 2008.
4. Puri B.R., Sharma L.R. & Kalia K.C., "*Principles of Inorganic Chemistry*", Milestone Publishers, Delhi, 2008.
5. Raman K.V., "*Computers in Chemistry*", Tata McGraw-Hill Publishing Company, New Delhi, 1996.

Reference Books:

1. Balagurusamy, "*Programming in ANSI C*", Third Edition, Tata McGraw-Hill Publishing Company, 2004.
2. Chatwal G.R. & Bhagi A.K., "*Bio-Inorganic Chemistry*," First Edition, Himalaya Publishing House, Mumbai, 1996.
3. Kettle S.F., "*Coordination Chemistry*", ELBS and Nelson, 1986.
4. Lee J.D., "*Concise Inorganic Chemistry*," Fifth Edition, Blackwell Science Ltd., New Delhi, 2003.
5. Malik U., Tuli G.D. & Madan R.L. "*Selected Topics in Inorganic Chemistry*," S.Chand & Company, New Delhi, 2004.

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Core- Elective Paper II (Choice -B)

Title of the paper: Diffraction methods and applications

Semester : VI

Contact hours: 4

Subject code : 17KE6B

Credits : 4

Course Objectives:

This paper aims at enriching the knowledge of the students in the area of diffraction methods and their applications.

UNIT : I

Diffraction phenomenon – introduction – principles of Diffraction X-rays and crystal-diffraction of particle beams. Single crystal X-rays: X-ray crystallography – single crystals – diffraction from lattices – atoms in lattices – extension of phasing-refinement.

UNIT : II

Particle structure determination – Production of X rays – determining the unit cell and space group – intensity data – data reduction – elucidating the structure – crystallographic results.

UNIT : III

Structure analysis – Growth of X-ray crystallography – inorganic chemistry and mineralogy – metal complexes and covalent molecule – organometallic compounds – metal and semiconductors – organic compounds – biological structures – single crystals work in perspective.

UNIT : IV

Specialized applications of X-ray diffraction – Powder method X-ray diffraction and high polymers degree of crystallinity – orientation – micro and macro structure in polymers – other applications of X-ray diffraction.

UNIT : V

Neutron Diffraction – Diffraction of thermal neutron – elastically scattered neutrons – magnetic scattering of neutrons – inelastic neutron scattering – Electron diffraction – Diffraction from gases and vapours – high energy electron diffraction from solids – low energy diffraction.

Text book:

1. Wormald J., “*Diffraction Methods*”, Oxford series, U.K., 1973.

Reference Book:

1. Ebsworth E.A.V., David W.H. & Rankin Stephen Cradock, “*Structural Methods in Inorganic Chemistry*”, ELBS, Oxford, U.K., 1987.