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K. S. Ranagasamy College of Arts and Science (Autonomous),

Tiruchengode – 637 215

Department of Chemistry

List of New Courses Introduced

- Elective I: Bio-inorganic chemistry I
- Elective I:Principles and applications of drug design and discovery
- Elective II: Bio-inorganic chemistry II
- Elective II: Polymer Chemistry II

Encls:

1. Copy of Scheme of Examination
2. Syllabus Copy of New Courses
3. Mapping of Courses of New Courses

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HoD – Chemistry

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CoE

Mr. M. PRASAD, M.Sc., M.B.A., M.... Controller of Examinations K.S. Rangasamy College of Arts & Science (Autonomous) Tiruchengode - 637 215. Tamilnadu. India.

M.Sc., SCHEME OF EXAMINATION

Subject Code	Subject	Hours of Instruction	Exam Duration (Hours)	Max Marks			Credit Points
				CA	CE	Total	
FIRST SEMESTER							
Part A							
18PCHM101	Core I: Organic Chemistry I	5	3	25	75	100	5
18PCHM102	Core II: Inorganic Chemistry I	5	3	25	75	100	5
18PCHM103	Core III: Physical Chemistry I	5	3	25	75	100	4
18PCHM104	Core IV: Spectroscopy	4	3	25	75	100	4
18PCHMP101	Core Practical I: Organic Chemistry Practical I	5	6	40	60	100	3
18PCHMP102	Core Practical II: Inorganic Chemistry Practical I	5	6	40	60	100	3
Non Credit							
18PLS101	Career Competency Skills I	1	-	-	-	-	-
Total		**30**				**600**	**24**
SECOND SEMESTER							
Part A							
18PCHM201	Core V: Organic Chemistry II	5	3	25	75	100	5
18PCHM202	Core VI: Inorganic Chemistry II	5	3	25	75	100	5
18PCHM203	Core VII: Physical Chemistry II	4	3	25	75	100	4
	Elective I	4	3	25	75	100	4
18PCHMP201	Core Practical III: Organic Chemistry Practical II	5	6	40	60	100	3
18PCHMP202	Core Practical IV: Physical Chemistry Practical I	4	6	40	60	100	3

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Part B							
18PVE201	Value Education: Human Rights	2	3	25	75	100	2
Non-Credit							
18PLS201	Career Competency Skills II	1	-	-	-	-	-
	Total	**30**				**700**	**26**
THIRD SEMESTER							
PART - A							
18PCHM301	Core VIII: Organic Chemistry III	6	3	25	75	100	5
18PCHM302	Core IX: Inorganic Chemistry III	6	3	25	75	100	5
	Elective II	4	3	25	75	100	4
18PCHMP301	Core Practical V: Inorganic Chemistry Practical II	5	6	40	60	100	3
18PCHMP302	Core Practical VI: Physical Chemistry Practical II	5	6	40	60	100	3
18PPHCHI301	IDC I: Solid State Physics	4	3	25	75	100	4
	Total	**30**				**600**	**24**
FOURTH SEMESTER							
PART - A							
18PCHM401	Core X: Analytical Chemistry	5	3	25	75	100	5
18PCHM402	Core XI: Physical Chemistry III	5	3	25	75	100	5
18PCHPR401	Project & Viva -Voce	5	-	50	150	200	6
	Total	**15**				**400**	**16**
					Grand Total	**2300**	**90**

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18PCHEL202	ELECTIVE I:BIO-INORGANIC CHEMISTRY I	SEMESTER - II

COURSE OBJECTIVE:

The course aims

- To understand the role of various elements in the living systems.
- To acquire basic knowledge about the structure and functions of certain metallo-enzymes.
- To get an insight on the use of several spectroscopic and analytical techniques for structural investigation of bioinorganic compounds.
- To know about the mechanism of binding interactions of metal complexes with biomolecules and metal based drug action.

Credits: 4 **Total hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Metals and Non-metals in biological systems**-Essential and trace elements - Role of different metal ions in biological systems - Sodium - Potassium pump - Phorphyrin system - Structure and functions of Hemoglobin and Myoglobin -Dioxygen binding, transport and utilization-Structure and functions of Chlorophyll.	8	CO1
II	**Metallo enzymes** - Definition - Examples -Structure and functions of - Carboxy peptidase-A and Carbonic anhydrase - Superoxide dismutase (SOD) - Xanthine oxidase - Nitrogenase - VitaminB_{12} co-enzyme- Non-Hemeiron - sulphur proteins - Ferridoxins - Rubredoxins - Cytochrome *C* - Blue copper proteins-Plastocyanin.	8	CO2
III	**Applications of physical methods to bioinorganic chemistry:** (Exclusive of Instrumentation) - X-ray absorption spectroscopy (XAS) and Extended X-ray absorption fine structure (EXAFS) -Nuclear magnetic resonance spectroscopy(NMR) and Electron paramagnetic resonance method (EPR)-Mossbauer spectroscopy-Circular dichroism (CD) - Electronic spectroscopy(UV-visible and fluorescence emission)	8	CO3
IV	**Binding of metal ions and complexes to biomolecules:**	8	CO4

	Types of binding – Nucleic acid structures - Fundamental interactions with nucleic acids – Binding interactions of tris-phenanthroline metal complexes with DNA-Techniques to monitor binding. Chemotherapy-Radio diagnostic agents- MRI scanning – Chelating Agents (with special reference to EDTA) and therapy based on *in vivo* chelation of radio nucleotides-Dosage and toxicity.		
V	**Drug discovery and design** – Therapeutic index and chemotherapeutic index - Structure- activity relationship-Factors governing drug design – Computer aided drug design - Cancer chemotherapy - Bioinorganic chemistry of platinum and ruthenium anticancer drugs – Mechanism of action of cis-platin - Clinical trials and their significance - Applications of Coordination complexes in medicine and agriculture	8	CO5

Text Books:	
1	*Artherden, L.M.Bentley* and *Driver's*, 2003. **Textbook of Pharmaceutical Chemistry**, [Eighth edition]. Oxford University Press, New Delhi. 2003.
2	*Block, J.H.Roche, Soine, E.T.O.* and *Wilson, C.O.* 1986. **Inorganic Medicinal & Pharmaceutical Chemistry,** [First edition], Varghese publishing house, Mumbai.
3	*Rao, K.S.* and *Suresh, C.V.* 2011. **Pharmaceutical Inorganic Chemistry**, Pharma Med Press.
4	*Kasture, A.V. Wadodkar, S.G.* 2008. **Pharmaceutical Chemistry-I**, [Twenty Fifth edition]. Nirali Prkashan.
5	*Rajasekaran, V. N.* 2005. **Text Book of Pharmaceutical Inorganic Chemistry Theory and Practical**, [Second edition]. Sun Publication, Chennai.
Reference Books:	
1	I. Bertini, H.B. Gray, S.J. Lippard and J.S. Valentine, 1994.**Bioinorganic Chemistry**, University Science Books.
2	Dr Asim K Dass, 2015. **Bioinorganic Chemistry**, Books and Allied (P)Limited.

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3	Lawrence Que,Jr, 2000. **Physical Methods in Bioinorganic Chemistry-Spectroscopy and Magnetism**, University Science books.
4	J.E. Huheey, E.A. Kieter, R.L. Keiter, 1997. **Inorganic Chemistry** [Fourth Edition], Addision Wesely Publishing Company.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Recall the essential and trace elements in biological systems
CO2	Estimate the topical agents and its role in biological system
CO3	Demonstrate the chemical compounds as gastro intestinal agents
CO4	Predict the role of chemical compounds as electrolytes
CO5	Assess the utilization of inorganic Radio-Pharmaceuticals

MAPPING:

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	L	M
CO2	M	L	H	M	H
CO3	H	H	M	L	L
CO4	L	M	L	H	M
CO5	M	L	M	M	H

H-High M-Medium L-Low

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18PCHEL203	ELECTIVE I:PRINCIPLES AND APPLICATIONS OF DRUG DESIGN AND DISCOVERY	SEMESTER - II

COURSE OBJECTIVES:

The course aims

- To enable students to identify compounds in biological system
- To describe the various drug – receptor interactions
- To provide information the drug molecules and its chemistry
- To enumerate steps to synthesize a drug molecule by various methods
- To know about drug Identification and Validation Steps in drug discovery

Credits: 4 **Total hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Drug Design and Discovery:** Historical background - drug targets: lipids, carbohydrates, proteins, enzymes, and nucleic acids as drug targets and receptors. Receptor Pharmocology – Agonists and Antagonists (partial and full) - Allosteric Modulators – Pharmacokinetics and pharmacodynamics: administration, absorption, distribution, metabolism, elimination of drugs - bioavailability of drugs - side effects - Case study: serotonin and dopamine receptors and transferring drugs.	8	CO1
II	**Drug Identification and Validation Steps in drug discovery:** Leads identification – Hits - Drug validation - Natural products as drugs – molecular recognition in drug design – thermodynamic considerations – physical basis and inter molecular interactions between drugs and targets like electrostatic interactions – ionic bonds - hydrogen bonds – Inductive interactions – dispersive forces. Stereochemistry in drug designing – stereospecificity of drug targets – Eudesmic ratio – Examples of Eutomers and Distomers.	8	CO2
III	**Retrosynthetic strategies for Drug Synthesis:** Introduction to retrosynthetic analysis and disconnection approach – synthons acceptor and donor – synthetic equivalents- umpolungs – planning a synthesis – relay and convergent routes - Guidelines for disconnection – one group C-X and C-C disconnections – Chemoselectivity. Two group C-C disconnections in dicarbonyls – Case Study: Synthesis of	8	CO3

	Amelfolide.		
IV	**Computer Aided Drug Design:** Molecular modeling in drug design - Energy Minimization methods - both Molecular Mechanics and Quantum mechanical Methods - Energy minimization - Conformational analysis -Structure based and Ligand based Drug design - QSAR - parameters - Quantitative models of QSAR - Hansch methods - free Wilson model - 3D pharmacophore modeling - Docking - rigid and flexible methods of docking - Prediction of Binding modes - Protein Ligand binding free energies - Docking Score - validation.	8	CO4
V	**Quantum Mechanical Methods:** Electronic structure calculations - Geometry Optimization - Potential Energy Surface - Global and Local Minima - Identification of Transition states - Semiemperical and Density Functional Methods - Calculation of atomic Charges, Electrostatic Potential Maps.	8	CO5

Text Books:

1	Andrew, *R.Leach, Valerie J Gillet*, 2007. **An Introduction to Cheminformatics**, Revised Edition, Springer, Netherland.

Reference Books:

1	*Larsen* et al, 2004. **Text book of Drug design and Discovery**, [Fourth Edition]. London and New york, Taylor and Francis.
2	*Graham L. Patrick*, 2009. **An Introduction to Medicinal Chemistry**, [Fourth Edition]. Oxford University Press.

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COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Know the concepts of drug design and discovery
CO2	Assess the prediction of drug identification and validation steps in drug discovery
CO3	Recall the retrosynthetic strategies for drug synthesis
CO4	Predict the processes in computer aided drug design
CO5	Cognize the quantum mechanical methods in principles and applications of drug design and discovery

MAPPING:

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	M	L
CO2	H	M	L	H	H
CO3	M	L	H	L	M
CO4	L	M	H	L	M
CO5	L	H	L	M	H

H-High M-Medium L-Low

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18PCHEL302	ELECTIVE II:BIO-INORGANIC CHEMISTRY II	SEMESTER - III

COURSE OBJECTIVES:

The course aims

- To understand the importance of inorganic compounds in medicinal chemistry
- To gain knowledge about essential trace elements in biological systems
- To estimate the vitality of chemicals in gastro intestinal tracks
- To know about chemicals that are important as electrolytes
- To evaluate the chemistry of radioactive chemicals in dosimetry

Credits: 4 **Total hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Essential and trace Elements in Biological Systems**: Structure and functions, effect of metal deficiency. Toxicity: mercury, cadmium, lead, beryllium, selenium and arsenic. Chelation therapy: Metals used for diagnosis and chemotherapy. Crown ether complexes of Na+ and K+ - ATP and ADP. Platinum complexes as anticancer drugs.Pt-DNA binding, complexes of gold, copper, zinc, mercury, arsenic and antimony as drugs.	8	CO1
II	**Topical Agents:** Protectives - Calamine, Talc, Zinc Oxide, Zinc Stearate, Titanium dioxide, Silicon Polymers and Dimethicone. Astringents - Zinc sulphate, Alum. Anti-infectives - Boric acid, Hydrogen peroxide, Iodine, Potassium permanganate, Chlorinated Lime.Dental Products - Anti-caries Agents -Role of Fluorides as anti-caries agents, Sodium fluoride. Dentifrices - Calcium carbonate, dibasic calcium phosphate, Zinc chloride.	8	CO2
III	**Gastro-intestinal agents:** Acidifiers and Antacids - Dilute hydrochloric acid, sodium acid phosphate, sodium bicarbonate, aluminium hydroxide gel, dried aluminium hydroxide gel, magnesium oxide (Magnesia), magnesium hydroxide mixture, magnesium trisilicate. Adsorbents and related drugs - Light kaolin, heavy kaolin, and activated charcoal. Laxatives - Magnesium sulphate, sodium phosphate.	8	CO3
IV	**Electrolytes**: Major intra and extra cellular electrolytes -	8	CO4

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	Physiological role of Chloride, Phosphate, Bicarbonate, Sodium, Potassium, Calcium and Magnesium. Electrolytes used for replacement therapy - Sodium chloride, Potassium chloride, Calcium chloride, Calcium lactate, Tribasic calcium phosphate; Physiological acid-base balance: Sodium dihydrogen phosphate, Sodium acetate, Sodium bicarbonate and their importance; Dialysis fluids - Haemodialysis fluids.		
V	**Inorganic Radio-Pharmaceuticals:** Radioactivity, Units of radioactivity, radiation dosimetry, Measurement of radioactivity, Hazards and precautions in handling of radiopharmaceuticals, storage, radio pharmaceutical preparations and standards of radioactive material iodine-131 (I^{131}), Cobalt -58 (Co^{58}). Radio opaque contrast medium -barium sulphate.	8	CO5

Text Books:

1	*Artherden, L.M. Bentley* and *Driver's*, 2003. **Textbook of Pharmaceutical Chemistry**, [Eighth edition]. Oxford University Press, New Delhi. 2003.
2	*Block, J.H. Roche, Soine, E.T.O.* and *Wilson, C.O.* 1986. **Inorganic Medicinal & Pharmaceutical Chemistry,** [First edition], Varghese publishing house, Mumbai.
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4	*Kasture, A.V. Wadodkar, S.G.* 2008. **Pharmaceutical Chemistry-I,** [Twenty Fifth edition]. Nirali Prkashan.
5	*Rajasekaran, V. N.* 2005. **Text Book of Pharmaceutical Inorganic Chemistry Theory and Practical**, [Second edition]. Sun Publication, Chennai.

Reference Books:

1	*Chatwal*, 2007. **Pharmaceutical Chemistry Inorganic,** [Third edition]. Himalaya publishing house, Mumbai.
2	*Miessler, G.L.* and *Tarr, D.A.* 2005. Inorganic Chemistry, Pearson Education.
3	*Cowan, J. A.*1997. **Inorganic biochemistry,**Wiley-VCH, New York.
4	*Chenchu Lakshmi, N.V.*, 2012.**"Pharmaceutical Inorganic Chemistry: Theory and Practice"**[first edition]. Pearson Education, Dorling Kindersley (India) Pvt. Ltd.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Recall the essential and trace elements in biological systems
CO2	Estimate the topical agents and its role in biological system
CO3	Demonstrate the chemical compounds as gastro intestinal agents
CO4	Predict the role of chemical compounds as electrolytes
CO5	Assess the utilization of inorganic Radio-Pharmaceuticals

MAPPING:

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	L	M
CO2	M	L	H	M	L
CO3	L	M	M	H	L
CO4	M	H	H	H	H
CO5	H	L	M	L	M

H-High M-Medium L-Low

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18PCHEL303	ELECTIVE II: POLYMER CHEMISTRY II	SEMESTER - II

COURSE OBJECTIVES:

The course aims

- To know the basic concepts of polymer, coordination in polymer, properties of commercial polymers and polymer processing
- To gain knowledge about Coordination polymerization and the catalysts that enhances
- To recognize the properties of polymer and its measurements
- To understand the processing of polymers and its types
- To cognize the properties and chemistry behind commercial polymers

Credits: 4 **Total hours: 40**

UNIT	CONTENTS	Hrs	CO
I	**Dendrimers and hyper branched polymers:** Properties of Dendrimers and Hyper branched Polymers and their Blends: Dendrimers and their structure, synthesis of Dendrimers, Hyper branched Polymers and their structure. Synthesis of hyper branched polymers, branching and polydispersity, conformation, general concepts of polymer blends. Blends of Dendritic polymers with thermoplastics.	8	CO1
II	Polymer nano composites Polyamide/clay nano composites- Synthesis, characterization and properties of Nylon 6-clayhybrid. Polystyrene/clay nano composites- Surface initiated polymerization, syndiotactic polystyrene/ clay nano composites, properties. Poly(butylenes terephthalate) (PBT) based nano composites, Epoxynano composites on layered silicates. Polypropyelene layered silicate nano composites.	8	CO2
III	Synthesis of Biomedical polymers for drug delivery Polymers as biomaterials, biomedical applications of synthetic polymers, synthetic polymers for biomedical applications, poly(α-hydroxyesters), poly(lactic acid), poly(anhydrides), poly(phosphazenes), controlled drug delivery, methods of drug delivery	8	CO3

IV	Conducting polymers Correlation of chemical structure and electrical conductivity. Structure of conducting polymers Polyacetylene, polypyrrole, polythiophene, polyanilines, p-phenylene sulphide, polyphenylene vinylene. Different methods of synthesis of polyaniline. solution polymerization, interfacial polymerization, electrochemical systhesis, enzyme synthesis and photo induced polymerization of aniline. Applications of conducting polymers: Membranes and ion exchanger, corrosion protection, gas sensors, biosensors, electrocatalysis.	8	CO4
V	**Engineering plastics** Acrylonitrile butadiene styrene (ABS), Polycarbonates (PC), Polyamides (PA), Polybutylene terephthalate (PBT), Polyethylene terephthalate (PET), Polyphenylene oxide (PPO), Polysulphone (PSU), Polyetherether ketone (PEEK). Polyimides, Polyphenylene Sulphide (PPS), Syntheticroute, structure, properties and uses.	8	CO5

Text Book:

1	Gabriel, O. Shonaike & Suresh G. Advani, 2003.**Advanced polymeric materials**, CRC press.

Reference Books:

1	*Allcock, H. R* and*Lamber, F.W. 2004.* **Contemporary Polymer Chemistry.** [Third Edition]**.** Prentice Hall, New Delhi.
2	*Flory, P. J.* 1995. **Principles of Polymer Chemistry**. [First edition-16th reprint].Cornell University press, NewYork.
3	*Odian, G. 2007.* **Principles of Polymerization**. [Fourth Edition]. John Wiley & Sons, New York.

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COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Recall the basic concepts and types of polymers
CO2	Understand the role of catalyst and techniques of polymerization
CO3	Know about the properties and measurement of molecular weights
CO4	Estimate the processing techniques of polymer
CO5	Demonstrate the properties of commercial polymers

MAPPING:

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	L	M	H	L
CO2	L	M	H	M	L
CO3	L	H	M	L	M
CO4	M	L	H	H	L
CO5	M	H	L	M	L

H-High M-Medium L-Low

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