#### SCHOOL OF CHEMICAL SCIENCES

The School of Chemical Sciences consists of Departments of Analytical Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Polymer Science and Energy.

School of Chemical Sciences, University of Madras was established in 1973 when part-time M.Phil Course common to Organic, Inorganic and Physical Chemistry was introduced. The Master of Science programme was introduced in 1976 wherein the first year students undergo a common chemistry programme and the students specialize in one of the areas of Chemistry in the second year: Physical Chemistry, Organic Chemistry and Inorganic Chemistry. Since 1987, the department of Analytical Chemistry also joined the School of Chemical Sciences and the teaching programme is conducted by admitting the students in all the four branches based on the performance of the students in the entrance examination.

The School of Chemical Sciences consists of four departments, Viz., Analytical Chemistry, Inorganic Chemistry, Organic Chemistry and Physical Chemistry and these departments were established in 1960, 1975, 1952 and 1952 respectively. From the academic year 1975-76 the departments are conducting courses (M.Sc. & M.Phil) collectively. The Chairperson, School of Chemical Sciences is coordinating the academic activities. The students of School of Chemical Sciences have been performing very well in the competitive examinations and are working in prestigious institutions in India and abroad.

The Department of **Analytical Chemistry** specializes in spectrometry, separation techniques, electroanalytical methods, corrosion control and implants studies. The Department has the facilities of a workshop, air-conditioned room of equipments, telecommunication network, library and computation laboratory. The sophisticated instruments of the Department includes UV-Visible spectrophotometers, Polarographs, Cyclic Voltammeter, potentistate/Galvanostate, Gas chromatograph, Ion analyzer, corrosion monitoring system, microscope (Hot stage), refractometer, data acquisition system and computers. The Department offers consultancy in analytical problems relating to chemical industries, environment, material science, biomaterials, chelating resins, electroanalytical studies, chemically modified electrodes etc.

The Department of **Inorganic Chemistry** concentrates on research work in Photochemistry, Coordination Chemistry, Bioinorganic Chemistry, Catalysis and Laser Chemistry. The facilities in the Department include Spectrophotometers, Fluorimeters, photochemical, electrochemical systems, flash photolysis spectrometer, Nd-YAG pumped laser flash photolysis spectrometer, excimer laser, time-correlated Single Photon Counting spectrometer, IR, UV-Visible, esr, gas chromatograph, cyclic voltammeter and pulse polarograph.

The Department of **Organic Chemistry** specializes in the fields of synthesis of carbocyclics and their rearrangements, heterocyclic compounds of pharmacological interest, Macrocyclic compounds and molecules with spatial conjugation and laser dyes, asymmetric synthesis, Bio-organic chemistry and photochemistry. The facilities of the department include Jeol 90 MHz NMR and mass spectrometer, Schimadzu UV-vis spectrophotometer, FT IR, C,H,N elemental analyzer, GC, HPLC and Polarimeter. The staff of this department offer consultancy services in the synthesis of any type of industrially important organic compounds, application of any type of organics and solving structure through spectra.

The department of **Physical Chemistry** researches in Homo- and hetero - multisite catalysts, triphase catalysis, synthesis, characterization and kinetics of polymerization, model enzyme reactions, conducting polymers, defluridisation studies, electrocatalysis by metal complexes, electron transfer reactions, electrochemical studies on copper -halide interactions, ion-selective electrodes, SANS study of microemulsions, polymerization and oxidation reactions in microemulsion, synthesis, characterisation and catalytic activity of anionic clays, sorption studies of surfactants on polymeric surfaces electroanalytical oxygen evolution at oxide electrodes as in photo assisted splitting of water, Development of polymer-modified catalytic electrodes for detection of neurotransmitter enzymeless biosensors etc. The facilities of the Department include Gas Chromatography Varian 3700 with Data

The intense specialization of the Department on Polymers has resulted in the creation of Department of Polymer Science in 1983. Keen research of this department pertain to synthesis of dendritic and hyperbranched polymers, Ziegler-Natta Polymerization, polyurethanes, Polymer Chemistry, modification of Polymers, synthesis and characterization of new polymers and bio-polymers. The sophisticated instrumental facilities and equipments of the department are: UV-VIS spectrophotometer, FT-IR spectrophotometer, computers, electronic balance, tensile testing machine, rubber mixing mill, etc. The consultancy potential of the department exists in the areas of polyurethanes, polymer synthesis, polymer composites and metal containing polymers.

The Department of **Energy** was established (1983) to provide a knowledge base for the ever increasing energy needs and informations on conventional and non-conventional energy soruces and better utilization and conservation of the existing energy soruces. The Department of the energy is actively involved in research areas such as photocatalysis in presence of radiation matching the solar spectrum, fast reations, visible light-assisted

photoelectrochemistry, direct coversion of solar energy into photopotential and electricity, hydrogen fuel production from water and aqueous solutions, solid electrolytes and solid state batteries. The facilities of the department include UV and visible continous photolysis setup, stopped flow spectrophotometer, UV-visible spectrophotometer, photochemical reaction assembly, high temperature furnaces, pelletizer, four probe conductivity setup, BAS 100A electrochemical Analyser (USA), HP4284A Precision LCR meter.

#### **Faculty**

S.Rajeswari - Chairperson

#### Analytical Chemistry

S.Rajeswari, Ph.D. - Professor and Head

P.Riyazuddin, Ph.D. - Professor S.Sriman Narayanan, Ph.D. - Professor T.Raju, Ph.D. - Reader

## Inorganic Chemistry

M.Kandaswamy, Ph.D. - Professor and Head

P.Ramamurthy, Ph.D. - Professor V.Narayanan, Ph.D. - Lecturer S.Balasubramanian, Ph.D. - Lecturer K. Pandian - Lecturer

#### Organic Chemistry

R. Raghunathan. Ph.D. - Professor and Head

P. C. Śrinivasan, Ph.D.
Professor
P. Rajakumar, Ph.D.
Professor
M. Bakthadoss, Ph.D.
Lecturer
A. K. Mohanakrishnan, Ph.D.
Lecturer
T. Mohandas, Ph.D.
Lecturer

## Physical Chemistry

V.R.Vijayaraghavan, Ph.D. - Professor and Head T.Balakrishnan, Ph.D. - Professor (on lien)

J.Santhanalakshmi, Ph.D. - Professor K.Chandrasekara Pillai, Ph.D. - Professor E.Murugan, Ph.D. - Lecturer

E.J.Padma Malar, Ph.D. - Research Scientist (UGC)

## Polymer Science

A. Sultan Nasar, Ph.D. - Reader & Head-in-Charge

G. Harichandran, Ph.D. - Lecturer N.Rajendiran - Lecturer

# Energy [Chemistry-Interdisciplinary]

P. Maruthamuthu, Ph.D. -Professor (on lien)

S. Austin Suthanthiraraj, Ph.D. - Professor and Head-in-charge

## M.Sc., ANALYTICAL CHEMISTRY

Subject Code	Title of the Course	C/E	Credits			
			L	T	P	C
I SEMESTER						
CHE C001	Fundamental of Analytical Chemistry	C	3	0	0	3
CHE C101	Coordination and Nuclear Chemistry	C	3	0	0	3
CHE C201	Stereochemistry and Organic Reaction Mechanism	С	3	0	0	3
CHE C301	Thermodynamics and Chemical Kinetics	C	3	0	0	3
CHE C302	Physical Chemistry Practical – I	C	0	0	2	2
CHE C202	Organic Chemistry Practical – I	C	0	0	2	2
CHE E101	Inorganic Reaction Mechanism					
	OR	E	3	0	0	3
CHE E201	Name Reactions in Organic Chemistry					
II SEMESTER						
CHE C002	Analytical Instrumentation	C	3	0	0	3
CHE C102	Main Group Elements and Inorganic Polymers	C	3	0	0	3
CHE C203	Organic Reaction Mechanism	C	3	0	0	3
CHE C303	Quantum Chemistry and Group Theory	C	3	0	0	3
CHE C003	Analytical Chemistry Practical – I	C	0	0	2	2
CHE C101	Inorganic Chemistry Practical – I	C	0	0	2	2
CHE E301	Solid State Chemistry	E	3	0	0	3
III SEMESTER						
CHE C601	Physical Methods in Chemistry	C	4	0	0	4
CHE C602	Biological Chemistry	C	4	0	0	4
CHE C004	Practical – Analysis of Complex Materials and Separation	C	0	0	2	2
	Techniques					
CHE C005	Practical – Instrumental Methods	C	0	0	2	2
CHE E003	Classical Thermal and Radionalytical Methods of Analysis	E	3	0	0	3
CHE E004	Optical and Surface Ananytical Techniques	Е	3	0	0	3
IV SEMESTER						
CHE C006	Separation Techniques	С	4	0	0	4
CHE E603	Novel Reagents in Organic Synthesis	Е	3	0	0	3
CHE E304	Electrochemistry and Electroanlytical Chemistry	Е	3	0	0	3
CHE C007	Project	С	0	0	6	6

## ABSTRACT OF THE SYLLABUS

CHE C001	Fundamentals of Analytical Chemistry	C	3	S.Rajeswari
				P. Riyazuddin
				S.Sriman Narayanan

Treatment of analytical data and sampling, Chemical Equilibria, Neutralization Reactions, Redox, Precipitation and Complexometric titrations.

CHE C101	Coordination and Nuclear Chemistry	С	3	M.Kandaswamy
				P.Ramamurthy
				V.Narayanan

Stability and Stereochemical aspects, Structural aspects and Crystal Field Theory, Molecular Orbital Theory.

CHE C20	1	Stereochemistry and organic reaction mechanism	С	3	P.C.Srinivasan
					R.Raghunathan
					M Bakthadoss

Elements of Stereochemistry, Confirmation analysis and Mechanism of substitution in aliphatic and aromatic compounds. Aromaticity.

CHE C301	Thermodynamics and Chemical Kinetics	C	3	J.Santhanalakshmi
				K.Chandrasekar Pillai

Second law of thermodynamics, Maxwell relation and thermodynamic equation of state-Partial molar properties-concept of fugacity and activity- activity coefficient, Phase rule and phase equilibria, Electrochemistry - Debye -Huckel theory, Conductivity of electrolytes, Onsagar equation. Electrochemical cells, electrode kinetics.

Chemica	l kinetics-co	omplex reaction	ns, transition	state theor	y and	collision	theory -	<ul> <li>reactions</li> </ul>	in solutio	n-effect of
solvent p	olarity and	ionic strength.	Heterogeneo	us catalysis-	vario	us isother	ms, fast	reactions.		

CHE C302	Physical Chemistry- Practical – I	С	2	J.Santhanalakshmi K.Chandrasekar Pillai
Exper and thermochen	iments in conductivity, EMF, kinetics, phase equilibnistry.	ria, solution e	equilibria, c	colligative properties
CHE C202	Organic Chemistry- Practical – I	С	2	A.K.Mohanakrishnan T.Mohandas M. Bakthadoss
Single	and double stages preparations.			
CHE E305	Electronics and Computers for Chemists	Е	3	P.Riyazuddin S.Sriman Narayanan
	Electronics, Computers in Chemistry Programs in BA ion, buffers, F and t tests, regression analysis.	ASIC – Calcula	ation pH, so	olubility product,
CHE E101	Inorganic Reaction Mechanism	Е	3	M.Kandaswamy V. Narayanan S.Balasubramanian
	and Labile Complexes, Stabilization of unusual oxidat actions, Reactions of organometallic compounds.	ion states, Ele	ectron trans	fer reactions,
CHE E201	Name Reactions in Organic Chemistry	Е	3	P.C.Srinivasan
Introd modification of				ynthesis and
CHE E306	Essentials of Statistical Thermodynamics	Е	3	
	on function, Thermodynamic parameters from st mi Dirac statistics – Applications of statistical method		nods, Bose	-Einstein, Maxwell-
CHE C002	Analytical Instrumentation	С	3	S.Rajeswari T.Raju S.Sriman Narayanan
Emission Specti	ption and Molecular Spectrometry, Atomic, Absorpt rometry, Chromatographic Techniques – General aspe Chromatography, GC and HPLC.			
CHE C102	Main Group Elements and Inorganic Polymers	С	3	M.Kandaswamy P.Ramamurthy V.Narayanan
	anic polymers-isopoly acids - heteropoly acids - s branes and metallo carboranes, nitrogen, phosphorous,			e polymers - boron
CHE C203	Organic Reaction Mechanism	С	3	A.K.Mohana Krishnan T.Mohandas P.Rajakumar
	•			
Mech	anism of various Organic reactions and rearrangement	ts.		

Foundations of quantum theory, Schrodinger equation, structure of the atom. Molecular structure - MO and VB methods, VSEPR theory; HMO METHOD, Group theory. Applications in Spectroscopy, and quantum chemistry, rotational and vibrational spectroscopy, Raman spectroscopy.

CHE C003	Analytical Chemistry – Practical – I	С	2	T.Raju S.Sriman Narayanan
Spectr	rophotometry, Potentiometry / pH metry, Polarography	and Gas Chi	romatog	raphy.
CHE C101	Inorganic Chemistry - Practical – I	С	2	P.Ramamurthy V.Narayanan
of water. Fe <sup>2+</sup> , M Qualit cation.	itative Analysis: Estimation of Mg <sup>2+</sup> , Zn <sup>2+</sup> ,Ca <sup>2+</sup> and NMn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method rative Analysis: Semimicro analysis of salts containing Te, Ce, Th, Ti, Zr, V, Be, U and Li.			
CHE E307	Analysis of Complex Materials	Е	3	P.Riyazuddin S.Sriman Narayanan T. Raju
Ore an	nd alloy analysis, Analysis of organic compounds, Fue	l analysis, sol	lid and li	iquid fuels.
CHE E104	Nuclear Chemistry	Е	3	M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian
CHE E204	Functional Group Transformation in Orga Chemistry		3	A.K.Mohana Krishnan
	onversion of various functional groups in Organic com			
CHE E301  Bondi nanochemistry.	Solid State Chemistry  ng in solids, band theory, properties of solids, defec	E ets and nonst	3 coichiom	V.R.Vijayaraghavn etry, solid electrolytes,
CHE C601	Physical Methods in Chemistry	С	4	V.R.Vijayaraghavan P.Rajakumar P.Ramamurthy V. Narayanan S.Sriman Narayanan T.Raju
Electr diatomic molect	onic spectroscopy, application of group theory, formules, Photoelectron Spectroscopy, esca	naldehyde bu	tadiene,	dissociation energy of
curve, J values, of phosphorous techniques, App transition metal groups, diffract	Principles, theory, chemical shift, spectra of organistic of the principles and Fluorine containing molecules - Mass spectra olication in determining structure of compounds. ESRs and coordination compounds - X-ray diffraction in methods. Mossbauer spectroscopy -theory and ysis - TGA, DTA and DSC - Principle and application	<ul> <li>Noe, and portion</li> <li>Molecularies</li> <li>Grades</li> <li>Bragg equipolities</li> <li>Bragg equipolities</li> </ul>	alse tech ar ion p otropy, s action, s	nniques, FTNMR, NMR eak, meta stable peak, simple organic radicals, pace groups and point

Origin of elements in biological systems, Corbohydrates, proteins, lipids, nucleic acids, DNA, RNA. - Essential and trace metal ions, metal ion transport in biological systems. Enzymes, nomenclature and classification, kinetics of enzyme catalyzed reaction, effect of pH and temperature.- Coenzymes, heme enzymes,

oxygen carriers, hemeproteins, nonhemeoxygen carriers, model compounds for oxygen carriers. Nitrogen fixations, biological redox reactions, cytochromes, iron-sulfur proteins, photosynthesis and chlorophyll, biological energy transfer and storage. Applications, medicinal, metal ion poisoning. –

CHE C004	Practical – Analysis of Complex Materials and Separation Techniques	С	2	S.Rajeswari
Analys	is of alloys, ores, and pharmaceuticals; separation techni	ques - chro	matographic	techniques.
CHE C005	Practical - Instrumental Methods	С	2	P.Riyazuddin
	ophotometry, potentiometry, Biamperometric titrati Flame photometry, Nephelometry and Fluorimetry.	ons ,cond	luctrometric	titrations, Gas
CHE C104	Inorganic Chemistry – Practical - II C	2	S.B	alasubramanian
Analys	is of ores and alloys - dolomite, galena, pyrites, solder be	ass stainles	ss stell, bronz	ze etc.
CHE C105	Inorganic Chemistry – Practical - III	С	2	V.Narayanan
	atographic separation of inorganic compounds and of cobalt, manganese, copper and nickel complexes. Solven			
CHE C204	Organic Chemistry – Practical – II	C	2	A.K.Mohankrishnan
Three s	tage preparations.			
CHE C205	Organic Chemistry – Practical - III	С	2	M.Bakthadoss T.Mohandas
Synthes CHE C304	sis of some oxygen and nitrogen containing heterocyclic  Physical Chemistry – Practical - II	C	2	V.R.Vijayaraghavan J.Santhanalakshmi
Experii kinetics - 15 expe	ments in chemical kinetics, thermodynamics, thermodynamics.	hemistry,	photochem	istry and enzyme
CHE C305	Physical Chemistry – Practical - III	С	2	V.R.Vijayaraghavan
				J.Santhanalakshmi
Experii equilibria - 15 ex	ments in conductivity, electrode equilibria, spectrophotoperiments.	ometry, par	tial molar v	olumes, acid base
CHE E003	Classical and Radioanalytical methods of Analysis.	Е	3	S.Rajeswari P.Riyazuddin
	is of complex materials - ore analysis, alloy analysis, a ioanalytical techniques	nalysis of o	organic Com	pounds - fuel and
CHE E004	Optical and Surface Analytical Techniques	Е	3	T.Raju S.Sriman Narayanan
Polarin electron spectron	netry, Refractometry, Chemical and Electron microscopnetry.	y, X-ray sp	pectroscopy,	ESCA and Auger
CHE E602	Photochemistry	Е	3	P.Maruthamuthu V.R.Vijayaraghavan

Fundamentals of photochemistry - absorption - emission of radiation - lifetimes - photochemical laws - quantum yield - intersystem crossing — Stern-Volmer equation - electron transfer - energy transfer; - Photochemical techniques-flash photolysis - lasers in photochemistry; radiation chemistry - primary processestrack effects-dosimetry - pulse radiolysis - Inorganic photochemistry-photoredox reactions-substitution reactions -

T. Mohandas P.Ramamurthy V.Narayanan photosensitisation reactions; organometallic photochemistry - metal carbonyls - photochemistry in energy conversion - formation of fuels - hydrogen production - semiconductor electrodes - chemically modified electrodes - photogalvanic cells. - Organic Photochemistry: Norrish reactions. photochemistry of cyclohexadieneones. Reactions of olefines. Oxidation reduction reactions. Reaction of oxygen with olefines. Reduction of ketones. singlet oxygen - selected reactions - Photo Fries reaction. Barton reaction and Di-pi-methane rearrangement.

CHE E105	Organometallic Chemistry	Е	3	M.Kandaswamy
				P.Ramamurhty
				S.Balasubramanian

Types of ligands in organometallic compounds, 18 electron rule, general methods of preparations, carbon sigma donors, carbon pi donors, chain and cyclic pi donors, multidecker sandwitch complexes, metallocenes, bis pi-arene metal complexes. Complexes of pi acceptor ligands, mono and poly metal carbonyls, preparation, structure and reactivity, reaction pathways, substitution, addition elimination and rearrangemnt, ligand protonation, fluxinal isomerism, catalysis, hydrogenation, hydroformylationn, oxidation, polymerisation, cyclooligomerisation and isomerisation.

CHE E203	Chemistry of Heterocycles, Organo-lithiums and	Е	3	P.C.Srinivasan
	Assymmetric synthesis			R.Raghunathan

Synthesis of heterocycles with N, O and S – five and six membered rings. Preparation of Organolithiums, Assymmetric synthesis.

CHE E302	Advanced Chemical Thermodynamics and Kinetics	E	3	K.Chandrasekarapillai/E.Murugan

Statistical thermodynamics, Irreversible thermodynamics, Chemical kinetics - Gas and solution reactions

CHE E502	Solar Energy Materials and Energy Conversions.	Е	3	S.Austin Suthanthiraraj
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Nature of solar radiation, materials used for absorption of solar radiation, solar heating, Energy systems, energy storage and energy transport. Frontier energy conversions; entropy reduction.

CHE C006	Separation Techniques	C	4	S.Rajeswari
				S.Sriman Narayanan /T.Raju

Distillation, Solvent extraction, Floatation and dialysis. Theory and applications. Chromatographic techniques – Column, TLC, Paper and ion-exchange chromatorgraphy, GC, GC-MS, GCIR, HPLC, HPTLC, GPC, SFC theory and applications.

CHE E603	Transition Metal Chemistry	С	4	M.Kandaswamy / P.Ramamurhty
				V.Narayanan / S.Balasubramanian

Inert and labile complexes - substitution reactions-dissociative and associative processes-hydrolysis, isomerisation and racemisation reactions-trans effect - redox reactions - inner sphere and outer sphere - complimentary and non-complimentary reactions; nitrosyls - phosphine, arsine and cyanide complexes-stabilisation of unusal oxidation states - ligand design - template methods - macrocyclic effect - synthesis of macrocyclic ligands; magentic moments - Van Vleck equation- magenetic properties of A,E,T terms -spin orbit coupling - antiferromagnetic interactions - magnetic behaviour of lanthanides and actinides.

CHE E304	Orbital	symmetry	and	Modern	Synthetic	C	4	R.Raghunathan / P.Rajakumar
	Methodo	logy						

Introduction to Woodward Hoffmann rules to concerted reactions, Aromatic, nonaromatic and anitiaromatic systems. Mechanism of photochemical reactions. Synthon, formation of C-C, C=C bonds, disconnection approach, protective groups, sulphur, retero synthetic analysis.

CHE C007	Quantum Chemistry and Macromolecules	C	4	V.R.Vijayaraghavan
				E.J.Padma Malar / E.Murugan

Schrodinger equation - solutions to particle in a box, SHO, rigid rotar hydrogen atom- approximation methods; MO and VB methods,  $H_2^+$ , MO method for diatomics, HMO method, SCF method, Solids Bonding in solids, Band theory, Properties of solids, low dimensional solids, Macromolecules, molecular weight of polymers, mechanism of polymerization.

CHE E603	Novel Reagents in Organic Synthesis	Е	3	P.C. Srinivasan
				S.Balasubramanian
				M.Bakthadoss

Use of palladium, nickel and silicon in Organic synthesis.

CHE E304	Electrochemistry and Electroanalytical Chemistry	Е	3	K.Chanderasekara Pillai
				P.Riyazuddin

Electrical double layer. Thermodynamics and models, Polarography – Theory and Instrumentation – Derivative Polarography – Amperometry – Cyclic Voltammetry and stripping voltammetry, Potentiometry, Ion selective electrodes, Potentiometric titrations, coulometric titrations – Electrogravimetry – Theory and instrumentation.

CHE E204	Chemistry of Natural Products	Е	3	P.C.Srinivasan
				A.K.Mohanakrishnan

Total syntheis of some examples of alkaloids, steroids and terpenes, Brief introduction to their biogenesis.

CHE E501	Conventional, non-conventional	and	renewable	E	3	P. Maruthamuthu
	energy sources and environment.					

Various forms of energy and their interconversion, Information on Ozone hole formation and remeady, the effect of excessive use of energy on environment. Role of solar radiation on pollution control problems.

	CHE C	2007 Project Wo	rk Viva-Voce	С	6	All Faculty
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## M.Sc. INORGANIC CHEMISTRY

Subject Code	Title of the Course	Core/		(	redits	
-			L	T	P	С
	I SEMESTER					
CHE C001	Fundamental of Analytical Chemistry	С	3	0	0	3
CHE C101	Coordination and Nuclear Chemistry	С	3	0	0	3
CHE C201	Stereochemistry and Organic Reaction Mechanism	С	3	0	0	3
CHE C301	Thermodynamics and Chemical Kinetics	С	3	0	0	3
CHE C302	Physical Chemistry Practical – I	С	0	0	2	2
CHE C202	Organic Chemistry Practical – I	mistry Practical – I C			2	2
CHE E201	Name Reactions in Organic Chemistry	Е	3	0	0	3
II SEMESTER						
CHE C002	Analytical Instrumentation	С	3	0	0	3
	Structure and bonding	С	3	0	0	3
CHE C203	Organic Reaction Mechanism	С	3	0	0	3
CHE C303	Quantum Chemistry and Group Theory	С	3	0	0	3
CHE C003	Analytical Chemistry Practical – I	С	0	0	2	2
CHE C101	Inorganic Chemistry Practical – I	С	0	0	2	2
CHE E002	Analysis of Complex Materials OR	Е	3	0	0	3
CHE E301	Solid State Chemistry					
III SEMESTER	l .					
CHE C601	Physical Methods in Chemistry	С	4	0	0	4
CHE C602	Biological Chemistry	С	4	0	0	4
CHE C104	Inorganic Chemistry Practical – II	С	0	0	2	2
CHE C105	Inorganic Chemistry Practical – III	С	0	0	2	2
CHE E602	Photochemistry	Е	3	0	0	3
CHE E103	Organometallic Chemistry	Е	3	0	0	3
IV SEMESTER	l					
CHE C106	Transition Metal Chemistry	С	4	0	0	4
CHE E603	Novel Reagents in Organic Synthesis	Е	3	0	0	3
CHE E304	Electrochemistry and Electroanlytical Chemistry	Е	3	0	0	3
CHE C107	Project	С	0	0	6	6

CHE C001	Fundamentals of Analytical Chemistry	С	3	S.Rajeswari P. Riyazuddin S.Sriman Narayanan
	nent of analytical data and sampling, Chemical Ed Complexometric titrations.	Equilibria, Ne	utralization	n Reactions, Redox,
CHE C101	Coordination and Nuclear Chemistry	С	3	M.Kandaswamy P.Ramamurthy V.Narayanan
Stabili Theory.	ty and Stereochemical aspects, Structural aspects a	nd Crystal Fi	eld Theory	y, Molecular Orbital
CHE C201	Stereochemistry and organic reaction mechanism	С	3	P.C.Srinivasan R.Raghunathan M.Bakthadoss
	nts of Stereochemistry, Confirmation analysis and unds. Aromaticity.	Mechanism of	of substitut	ion in aliphatic and
CHE C301	Thermodynamics and Chemical Kinetics	С	3	J.Santhanalakshmi K.Chandrasekar Pillai
properties-conce Debye -Huckel Chemical kinetic	d law of thermodynamics, Maxwell relation and the ept of fugacity and activity- activity coefficient, Phase theory, Conductivity of electrolytes, Onsagar equatics-complex reactions, transition state theory and col and ionic strength. Heterogeneous catalysis-various is  Physical Chemistry- Practical – I	rule and phason. Electroche lision theory	se equilibria emical cella reactions	a, Electrochemistry - s, electrode kinetics.
CHE C302	r nysicai Chemistry- Fracticai – 1		2	K.Chandrasekar Pillai
Experi and thermochem	iments in conductivity, EMF, kinetics, phase equilibilistry.	ria, solution e	quilibria, c	colligative properties
CHE C202	Organic Chemistry- Practical – I	С	2	A.K.Mohanakrishnan T.Mohandas M. Bakthadoss
Single	and double stages preparations.			
CHE 1013	Electronics and Computers for Chemists	Е	3	P.Riyazuddin S.Sriman Narayanan
	Electronics, Computers in Chemistry Programs in BA on, buffers, F and t tests, regression analysis.	SIC – Calcula	ition pH, so	olubility product,
CHE E101	Inorganic Reaction Mechanism	Е	3	M.Kandaswamy V. Narayanan S.Balasubramanian
	nd Labile Complexes, Stabilization of unusual oxidat ctions, Reactions of organometallic compounds.	ion states, Ele	ctron transi	fer reactions,
CHE E201	Name Reactions in Organic Chemistry	E	3	P.C.Srinivasan
Introde modification of	uction to various name reactions involving C-C bond substituents.	formation, het	erocycle sy	ynthesis and

 $Partition\ function, Thermodynamic\ parameters\ from\ statistical\ methods, Bose-Einstein, Maxwell-Boltzmann, Fermi\ Dirac\ statistics\ -\ Applications\ of\ statistical\ methods.$ 

CHE E002	Analytical Instrumentation	С	3	S.Rajeswari / T.Raju S.Sriman Narayanan
Emission Spectr	ption and Molecular Spectrometry, Atomic, Absorptio ometry, Chromatographic Techniques – General aspec hromatography, GC and HPLC.			
CHE C102	Main Group Elements and Inorganic Polymers	С	3	M.Kandaswamy P.Ramamurthy V.Narayanan
	nic polymers-isopoly acids - heteropoly acids - sili ranes and metallo carboranes, nitrogen, phosphorous, s			e polymers - boron
CHE C203	Organic Reaction Mechanism	С	3	A.K.Mohana Krishnan T.Mohandas / P.Rajakumar
Mecha	unism of various Organic reactions and rearrangements.			
CHE C303	Quantum Chemistry and Group Theory	С	3	V.R.Vijayaraghavan
CHE C003	onaland vibrational spectroscopy, Raman spectroscopy  Analytical Chemistry – Practical - I	С	2	T.Raju S.Sriman Narayanan
Spectr	ophotometry, Potentiometry / pH metry, Polarography	and Gas Ch	romatograp	hy.
CHE C101	Inorganic Chemistry - Practical - I	С	2	P.Ramamurthy V.Narayanan
				v.narayanan
of water. Fe <sup>2+</sup> , N Qualit ation.	itative Analysis: Estimation of Mg <sup>2+</sup> , Zn <sup>2+</sup> ,Ca <sup>2+</sup> and Ni Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing to Fe, Ce, Th, Ti, Zr, V, Be, U and Li.			method and hardness
of water. Fe <sup>2+</sup> , N Qualit eation.	In <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing t			method and hardness
of water. Fe <sup>2+</sup> , M Qualit cation. Fi, Mo, W, Se, T CHE E002	Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing to Fe, Ce, Th, Ti, Zr, V, Be, U and Li.	hree less co	ommon cation	method and hardness ons and one common  P.Riyazuddini S.Sriman Narayanan T. Raju
of water. Fe <sup>2+</sup> , M Qualit cation. Fi, Mo, W, Se, T CHE E002	Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing to Fe, Ce, Th, Ti, Zr, V, Be, U and Li.  Analysis of Complex Materials	hree less co	ommon cation	method and hardness ons and one common  P.Riyazuddini S.Sriman Narayanan T. Raju
of water. Fe <sup>2+</sup> , M Qualit cation. Fi, Mo, W, Se, T CHE E002  Ore an CHE E104  Nuclear forces a adioactive decaeactions, nuclea	Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing to Fe, Ce, Th, Ti, Zr, V, Be, U and Li.  Analysis of Complex Materials  and alloy analysis, Analysis of organic compounds, Fuel	E analysis, so E ities, structibarrier, ceactors in In	ommon cation 3  did and lique 3  ure of nucl ross sectiondia, Detect	P.Riyazuddini S.Sriman Narayanan T. Raju  id fuels.  M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  eus, nuclear models, on, types of nuclear tion of radiations and
of water. Fe <sup>2+</sup> , M Qualit ation.  Ci, Mo, W, Se, The E002  Ore an CHE E104  Nuclear forces a adioactive decaeactions, nuclear	Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing to Te, Ce, Th, Ti, Zr, V, Be, U and Li.  Analysis of Complex Materials  In alloy analysis, Analysis of organic compounds, Fuel  Nuclear Chemistry  And nuclear structure, binding energies, nuclear stability, hot-atom chemistry. Nuclear reactions, couloumbur fusion and nuclear fission. Nuclear reactor, nuclear research.	E  analysis, so  E  ities, structive barrier, ceactors in Iniculture. La	ommon cation 3  did and lique 3  ure of nucl ross sectiondia, Detect	P.Riyazuddini S.Sriman Narayanan T. Raju  id fuels.  M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  eus, nuclear models, on, types of nuclear tion of radiations and
of water. Fe <sup>2+</sup> , M Qualit cation. Fi, Mo, W, Se, T CHE E002  Ore an CHE E104  Nuclear forces a radioactive decreactions, nuclear carticle accelera CHE E204	Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method ative Analysis: Semimicro analysis of salts containing to Te, Ce, Th, Ti, Zr, V, Be, U and Li.  Analysis of Complex Materials  In alloy analysis, Analysis of organic compounds, Fuel  Nuclear Chemistry  In and nuclear structure, binding energies, nuclear stability, hot-atom chemistry. Nuclear reactions, couloumber fusion and nuclear fission. Nuclear reactor, nuclear retors. Applications, Tracers applied in industries and agripments.	E analysis, so E ities, structi barrier, ceactors in Iriculture. La	and liquid	P.Riyazuddini S.Sriman Narayanan T. Raju  M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  eus, nuclear models, m, types of nuclear tion of radiations and and actinides.  A.K.Mohana Krishnan

nanochemistry.

CHE C601	Physical Methods in Chemistry	С	4	V.R.Vijayaraghavan P.Rajakumar / P.Ramamurth V. Narayanan S.Sriman Narayanan / T.Raju
liatomic molecu organic molecu echniques – No pectra – Molec ESR-g-value, a liffraction – Bra	onic spectroscopy, application of group theory, formald ales, Photoelectron Spectroscopy, esca - NMR - Princ les, coupling constants, Karplus curve, J values, <sup>13</sup> Ce, and pulse techniques, FTNMR, NMR of phosphorous a ular ion peak, meta stable peak, techniques, Application nisotropy, simple organic radicals, transition metals agg equation, space groups and point groups, diffraction metals, Fe and Sn systems, Thermal methods of analysis -	iples, theor -NMR-deco nd Fluorine in determinand coordinethods. Mo	y, chemica oupling — containing ning structuination con ssbauer spe	l shift, spectra of double resonance molecules - Mass are of compounds. mpounds - X-ray extroscopy -theory
CHE C602	Biological Chemistry	С	4	M.Kandaswamy R.Raghunathan S.Balasubramanian / T.Raju
Essential and lassification, kind assification, kind assification, kind assifications, biologous and assifications, biologous and assifications and assifications and assifications and assifications and assifications and assifications are assifications and assifications are assifications as a second assification and assification and assification are assification and assification and assification are assification and assification are assification as a second assification are assification as a second assification as a second assification as a second as a	of elements in biological systems, Corbohydrates, prote- trace metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model com- ical redox reactions, cytochromes, iron-sulfur proteins, pl and storage. Applications, medicinal, metal ion poisoning.	systems. Inperature	Enzymes, 1 Coenzyme r oxygen	nomenclature and es, heme enzymes, carriers. Nitrogen
essential and lassification, ki exygen carriers exations, biolog	trace metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter , hemeproteins, nonhemeoxygen carriers, model com ical redox reactions, cytochromes, iron-sulfur proteins, pl	systems. I mperature pounds for hotosynthes	Enzymes, 1 Coenzyme r oxygen	nomenclature and es, heme enzymes, carriers. Nitrogen
Essential and classification, ki exygen carriers ixations, biolog energy transfer a CHE C004	trace metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and	systems. Inperature, pounds for hotosynthes	Enzymes, 1 Coenzymes r oxygen is and chlo	nomenclature and es, heme enzymes, carriers. Nitrogen rophyll, biological
Essential and lassification, ki xygen carriers ixations, biolog nergy transfer a CHE C004	trace metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and Separation Techniques	systems. Inperature, pounds for hotosynthes	Enzymes, 1 Coenzymes r oxygen is and chlo	nomenclature and es, heme enzymes, carriers. Nitrogen rophyll, biological
Essential and lassification, ki oxygen carriers ixations, biolog nergy transfer a  CHE C004  Analy  CHE C005  Spectr	race metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and Separation Techniques  sis of alloys, ores, and pharmaceuticals; separation technicals.	systems. Imperature pounds for hotosynthes  C  ques - chron	Enzymes, 1 Coenzymes, 2 Coenzymes oxygen is and chlo	s, heme enzymes, carriers. Nitrogen rophyll, biological  S.Rajeswari  techniques.  P.Riyazuddin
Essential and lassification, ki xygen carriers ixations, biolog nergy transfer a CHE C004  Analy  CHE C005  Spectr	race metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and Separation Techniques  sis of alloys, ores, and pharmaceuticals; separation technical practical - Instrumental Methods  ophotometry, potentiometry, Biamperometric titration	systems. Imperature pounds for hotosynthes  C  ques - chron	Enzymes, 1 Coenzymes, 2 Coenzymes oxygen is and chlo	s, heme enzymes, carriers. Nitrogen rophyll, biological  S.Rajeswari  techniques.  P.Riyazuddin
Analy  CHE C005  Spectrhromatography  CHE C104	race metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and Separation Techniques  sis of alloys, ores, and pharmaceuticals; separation technical practical - Instrumental Methods  ophotometry, potentiometry, Biamperometric titration; Flame photometry, Nephelometry and Fluorimetry.	systems. Imperature pounds for hotosynthes  C  ques - chron  C  C  C	Enzymes, 1 Coenzymes, 1 Coenzymes, 2 Coenzyme roxygen is and chlo	s, heme enzymes, carriers. Nitrogen rophyll, biological  S.Rajeswari  techniques.  P.Riyazuddin titrations, Gas  S.Balasubramanian
Essential and lassification, kingspen carriers ixations, biolog nergy transfer at CHE C004  Analy  CHE C005  Spectric hromatography  CHE C104	race metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and Separation Techniques  sis of alloys, ores, and pharmaceuticals; separation technical practical - Instrumental Methods  ophotometry, potentiometry, Biamperometric titration; Flame photometry, Nephelometry and Fluorimetry.  Inorganic Chemistry – Practical - II	systems. Imperature pounds for hotosynthes  C  ques - chron  C  C  C	Enzymes, 1 Coenzymes, 1 Coenzymes, 2 Coenzyme roxygen is and chlo	s, heme enzymes, carriers. Nitrogen rophyll, biological  S.Rajeswari  techniques.  P.Riyazuddin titrations, Gas  S.Balasubramanian
Essential and classification, kind planting the property of the Control of the Co	race metal ions, metal ion transport in biological netics of enzyme catalyzed reaction, effect of pH and ter, hemeproteins, nonhemeoxygen carriers, model comical redox reactions, cytochromes, iron-sulfur proteins, pland storage. Applications, medicinal, metal ion poisoning.  Practical – Analysis of Complex Materials and Separation Techniques sis of alloys, ores, and pharmaceuticals; separation technical Practical - Instrumental Methods ophotometry, potentiometry, Biamperometric titratic; Flame photometry, Nephelometry and Fluorimetry.  Inorganic Chemistry – Practical - II sis of ores and alloys - dolomite, galena, pyrites, solder broaders.	systems. Imperature pounds for hotosynthes  C  ques - chron  C  cons ,condu  C  stimation.	Enzymes, 1 Coenzymes, 2 Coenzymes or oxygen is and chlo 2 2 Coenzyme 2 2 Coenzymes or oxygen is and chlo 2 2 Coenzymes or oxygen is and chlo 2 Coenzymes or oxygen is and chlo 2 Coenzymes or oxygen is a coenzyme.	s, heme enzymes, carriers. Nitrogen rophyll, biological  S.Rajeswari  techniques.  P.Riyazuddin titrations, Gas  S.Balasubramanian  ze etc.  V.Narayanan  of complexes and

Three stage preparations.

CHE C205 Organic Chemistry – Practical - III C 2 M.Bakthadoss / T.Mohandas

Synthesis of some oxygen and nitrogen containing heterocyclic compounds.

CHE C304 Physical Chemistry – Practical - II C 2 V.R.Vijayaraghavan J.Santhanalakshmi

Experiments in chemical kinetics, thermodynamics, thermochemistry,  $\,$  photochemistry and enzyme kinetics - 15 experiments.

CHE C305 Physical Chemistry – Practical - III C 2 V.R.Vijayaraghavan J.Santhanalakshmi

Experiments in conductivity, electrode equilibria, spectrophotometry, partial molar volumes, acid base equilibria - 15 experiments.

CHE E003	Classical and Radioanalytical methods of Analysis.	Е	3	S.Rajeswari P.Riyazuddin

Analysis of complex materials - ore analysis, alloy analysis, analysis of organic Compounds - fuel and gas analysis - radioanalytical techniques

CHE E004	Optical and Surface Analytical Techniques	Е	3	T.Raju
				S.Sriman Narayanan

Polarimetry, Refractometry, Chemical and Electron microscopy, X-ray spectroscopy, ESCA and Auger electron spectrometry.

CHE E602	Photochemistry	Е	3	P.Maruthamuthu
				V.R.Vijayaraghavan
				T. Mohandas
				P.Ramamurthy
				V.Narayanan

Fundamentals of photochemistry - absorption - emission of radiation - lifetimes - photochemical laws - quantum yield - intersystem crossing - Stern-Volmer equation - electron transfer - energy transfer; - Photochemical techniques-flash photolysis - lasers in photochemistry; radiation chemistry - primary processes-track effects-dosimetry - pulse radiolysis - Inorganic photochemistry-photoredox reactions-substitution reactions - photosensitisation reactions; organometallic photochemistry - metal carbonyls - photochemistry in energy conversion - formation of fuels - hydrogen production - semiconductor electrodes - chemically modified electrodes - photogalvanic cells. - Organic Photochemistry: Norrish reactions. photochemistry of cyclohexadieneones. Reactions of olefines. Oxidation reduction reactions. Reaction of oxygen with olefines. Reduction of ketones. singlet oxygen - selected reactions - Photo Fries reaction. Barton reaction and Di-pi-methane rearrangement.

ſ	CHE E103	Organometallic Chemistry	Е	3	M.Kandaswamy
					P.Ramamurhty
					S.Balasubramanian

Types of ligands in organometallic compounds, 18 electron rule, general methods of preparations, carbon sigma donors, carbon pi donors, chain and cyclic pi donors, multidecker sandwitch complexes, metallocenes, bis pi-arene metal complexes. Complexes of pi acceptor ligands, mono and poly metal carbonyls, preparation, structure and reactivity, reaction pathways, substitution, addition elimination and rearrangemnt, ligand protonation, fluxinal isomerism, catalysis, hydrogenation, hydroformylationn, oxidation, polymerisation, cyclooligomerisation and isomerisation.

I	CHE E203	Chemistry	of Heterocycles	, Organo-lithiums	and	Е	3	P.C.Srinivasan / R.Raghunathan
		Assymmetri	ic synthesis					

Synthesis of heterocycles with N, O and S – five and six membered rings. Preparation of Organolithiums, Assymmetric synthesis.

-					
I	CHE E302	Advanced Chemical Thermodynamics and Kinetics	E	3	K.ChandrasekarapillaiE.Murugan

Statistical thermodynamics, Irreversible thermodynamics, Chemical kinetics – Gas and solution reactions.

CHE C006	Separation Techniques	C	4	S.Rajeswari
				S.Sriman Narayanan / T.Raju

Distillation, Solvent extraction, Floatation and dialysis. Theory and applications. Chromatographic techniques – Column, TLC, Paper and ion-exchange chromatorgraphy, GC, GC-MS, GCIR, HPLC, HPTLC, GPC, SFC theory and applications.

CHE C106	Transition Metal Chemistry	C	4	M.Kandaswamy
				P.Ramamurhty /V.Narayanan
				S.Balasubramanian

Inert and labile complexes - substitution reactions-dissociative and associative processes-hydrolysis, isomerisation and racemisation reactions-trans effect - redox reactions - inner sphere and outer sphere - complimentary and non-complimentary reactions; nitrosyls - phosphine, arsine and cyanide complexes-stabilisation of unusal oxidation states - ligand design - template methods - macrocyclic effect - synthesis of macrocyclic ligands; magentic moments - Van Vleck equation- magenetic properties of A,E,T terms -spin orbit coupling - antiferromagnetic interactions - magnetic behaviour of lanthanides and actinides.

CHE C206	Orbital	symmetry	and	Modern	Synthetic	С	4	R.Raghunathan /
	Methodo	logy						P.Rajakumar

Introduction to Woodward Hoffmann rules to concerted reactions, Aromatic, nonaromatic and anitiaromatic systems. Mechanism of photochemical reactions. Synthon, formation of C-C, C=C bonds, disconnection approach, protective groups, sulphur, retero synthetic analysis.

CHE C306	Quantum Chemistry and Macromolecules	C	4	V.R.Vijayaraghavan
				E.J.Padma Malar /E.Murugan

Schrodinger equation - solutions to particle in a box, SHO, rigid rotar hydrogen atom- approximation methods; MO and VB methods,  $\rm H_2^+$ , MO method for diatomics, HMO method, SCF method, Solids Bonding in solids, Band theory, Properties of solids, low dimensional solids, Macromolecules, molecular weight of polymers, mechanism of polymerization.

CHE E603	Novel Reagents in Organic Synthesis	Е	3	P.C. Srinivasan
				S.Balasubramanian / M.Bakthadoss

Use of palladium, nickel and silicon in Organic synthesis.

CHE E304	Electrochemistry and Electroanalytical Chemistry	Е	3	K.Chanderasekara Pillai
				P.Rivazuddin

Electrical double layer. Thermodynamics and models, Polarography – Theory and Instrumentation – Derivative Polarography – Amperometry – Cyclic Voltammetry and stripping voltammetry, Potentiometry, Ion selective electrodes, Potentiometric titrations, coulometric titrations – Electrogravimetry – Theory and instrumentation.

CHE E204	Chemistry of Natural Products	Е	3	P.C.Srinivasan
	-			A.K.Mohanakrishnan

Total syntheis of some examples of alkaloids, steroids and terpenes, Brief introduction to their biogenesis.

CHE C107	Project Work Viva-Voce	C	6	All Faculty
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## M.Sc., ORGANIC CHEMISTRY

Subject Code	Subject Code Title of the Course Core/		Credits				
		elective	L	T	P	С	
	I SEMESTER				•		
CHE C001	Fundamental of Analytical Chemistry	С	3	0	0	3	
CHE C101	Coordination Chemistry	С	3	0	0	3	
CHE C201	Stereochemistry and Organic Reaction Mechanism	С	3	0	0	3	
CHE C301	Thermodynamics and Chemical Kinetics	С	3	0	0	3	
CHE C302	Physical Chemistry Practical – I	С	0	0	2	2	
CHE C202	Organic Chemistry Practical – I	С	0	0	2	2	
CHE E101	Inorganic Reaction Mechanism	Е	3	0	0	3	
	II SEMESTER						
CHE C002	Analytical Instrumentation	С	3	0	0	3	
CHE C102	Main Group Elements and Inorganic Polymers	С	3	0	0	3	
CHE C203	Organic Reaction Mechanism	С	3	0	0	3	
CHE C303	Quantum Chemistry and Group Theory	С	3	0	0	3	
CHE C003	Analytical Chemistry Practical – I	С	0	0	2	2	
CHE C103	Inorganic Chemistry Practical – I	С	0	0	2	2	
CHE E002	Analysis of Complex Materials	E	3	0	0	3	
	III SEMESTER						
CHE C601	Physical Methods in Chemistry	С	4	0	0	4	
CHE C602	Biological Chemistry	С	4	0	0	4	
CHE C204	Organic Chemistry – Practical II	С	0	0	2	2	
CHE C205	Organic Chemistry- Practical III	С	0	0	2	2	
CHE E602	Photochemistry	Е	3	0	0	3	
CHE E203	Chemistry of Heterocycles, Organolithiums and Assymmetric Synthesis	Е	3	0	0	3	

	IV SEMESTE	R					
CHE C206	Orbital Symmetry and Modern Synthetic Methodolo	gy	С	4	0	0	4
CHE E603	Novel Reagents in Organic Synthesis		E	3	0	0	3
CHE E204	Chemistry of Natural Products		E	3	0	0	3
CHE C207	Project		С	0	0	6	6
CHE C001	Fundamentals of Analytical Chemistry	С	3	P. Riy	eswari /azuddin nan Nara		
	ment of analytical data and sampling, Chemical Equ d Complexometric titrations.	ilibria, Ne	eutralizatio	n Reaction	s, Redo	x,	
CHE C101	Coordination Chemistry	С	3	M.Ka	ndaswar	nv	
0112 0101	esorumusu enomesu,			P.Ran	namurth ayanan		
heory.  CHE C201	Stereochemistry and organic reaction mechanism	С	3	P.C.Si R.Rag	rinivasaı ghunatha kthadoss	n .n	
	ents of Stereochemistry, Confirmation analysis and Mounds. Aromaticity.  Thermodynamics and Chemical Kinetics	echanism	of substitut	J.Sant	ohatic ar hanalak andrasek	shmi	i
CHE C301	Thermodynamics and Chemical Kinetics  and law of thermodynamics, Maxwell relation and therm	C	3 equation of	J.Sant K.Cha	hanalak andrasek rtial mol	shmi ar Pilla ar	i
CHE C301  Secon roperties-concopelye -Huckel Chemical kineti	Thermodynamics and Chemical Kinetics	C nodynamic alle and phate. Electroch ton theory	equation of see equilibrium emical cell reactions	J.Sant K.Cha of state-Par ia, Electroc ls, electrod	hanalak andrasek tial mol hemistry e kinetic	shmi ar Pilla ar / - es.	i
CHE C301  Secon oroperties-conc Debye -Huckel Chemical kineti	Thermodynamics and Chemical Kinetics  ad law of thermodynamics, Maxwell relation and therm ept of fugacity and activity- activity coefficient, Phase ru theory, Conductivity of electrolytes, Onsagar equation ics-complex reactions, transition state theory and collisi	C nodynamic alle and phate. Electroch ton theory	equation of see equilibrium emical cell reactions	J.Sant K.Cha of state-Par ia, Electroc ls, electrod in solution	hanalak andrasek tial mol hemistry e kinetic	shmi ar Pilla ar / - cs. of	
Secon roperties-conce Huckel Chemical kinetiolvent polarity CHE C302	Thermodynamics and Chemical Kinetics  In all law of thermodynamics, Maxwell relation and thermodynamics and activity-activity coefficient, Phase rustheory, Conductivity of electrolytes, Onsagar equations ics-complex reactions, transition state theory and collisis and ionic strength. Heterogeneous catalysis-various isother physical Chemistry-Practical – I	C nodynamic ale and phate and theory therms, fast	equation of see equilibrium emical cellor reactions.	J.Sant K.Cha of state-Par ia, Electroc ls, electrod in solution J.Sant K.Cha	chanalak andrasek rtial mol hemistry e kinetio n-effect chanalak andrasek	shmi ar Pilla ar / - es. of shmi ar Pilla	
Secon roperties-conce Huckel Chemical kineticolvent polarity CHE C302  Exper	Thermodynamics and Chemical Kinetics  In all law of thermodynamics, Maxwell relation and thermodynamics and activity-activity coefficient, Phase rustheory, Conductivity of electrolytes, Onsagar equations ics-complex reactions, transition state theory and collisis and ionic strength. Heterogeneous catalysis-various isother physical Chemistry-Practical – I	C nodynamic ale and phate and theory therms, fast	equation of see equilibrium emical cellor reactions.	J.Sant K.Cha  of state-Par ia, Electroc ls, electrod in solution  J.Sant K.Cha  colligative	chanalak andrasek tial mol hemistry e kinetic n-effect chanalak andrasek properti	shmi ar Pilla ar / - es. of shmi ar Pilla es	i
Secon roperties-conce Pebye -Huckel Chemical kinetical vent polarity CHE C302  Exper nd thermochen CHE C202	Thermodynamics and Chemical Kinetics  ad law of thermodynamics, Maxwell relation and therm ept of fugacity and activity- activity coefficient, Phase ru theory, Conductivity of electrolytes, Onsagar equation ics-complex reactions, transition state theory and collisi and ionic strength. Heterogeneous catalysis-various isotl  Physical Chemistry- Practical – I  Timents in conductivity, EMF, kinetics, phase equilibrianistry.	C nodynamic ale and phate and theory herms, fast	equation of see equilibria emical cell reactions.	J.Sant K.Cha  of state-Par ia, Electroc ls, electrod in solution  J.Sant K.Cha  colligative	chanalak andrasek tial mol hemistry e kinetic n-effect chanalak andrasek properti	shmi ar Pilla ar / - es. of shmi ar Pilla es	i
Secon roperties-concebye -Huckel Chemical kinetiolvent polarity CHE C302  Exper nd thermochen CHE C202  Single	Thermodynamics and Chemical Kinetics  ad law of thermodynamics, Maxwell relation and therm ept of fugacity and activity- activity coefficient, Phase ru theory, Conductivity of electrolytes, Onsagar equation ics-complex reactions, transition state theory and collisi and ionic strength. Heterogeneous catalysis-various isoth Physical Chemistry- Practical – I  Timents in conductivity, EMF, kinetics, phase equilibrianistry.  Organic Chemistry- Practical – I	C nodynamic ale and phate and theory herms, fast C C	equation of see equilibria emical cellor reactions.	J.Sant K.Cha of state-Par ia, Electroc is, electrod in solution  J.Sant K.Cha colligative  A.K.M T.Mol	chanalak endrasek rtial mol hemistry e kinetic n-effect chanalak endrasek properti	shmi ar Pilla ar / - es. of shmi ar Pilla es	i
Secon roperties-conce Pebye -Huckel Chemical kinetical vent polarity CHE C302  Exper nd thermochen CHE C202	Thermodynamics and Chemical Kinetics  ad law of thermodynamics, Maxwell relation and therm ept of fugacity and activity- activity coefficient, Phase ru theory, Conductivity of electrolytes, Onsagar equation ics-complex reactions, transition state theory and collisi and ionic strength. Heterogeneous catalysis-various isoth Physical Chemistry- Practical – I  Timents in conductivity, EMF, kinetics, phase equilibrianistry.  Organic Chemistry- Practical – I	C nodynamic ale and phate and theory herms, fast	equation of see equilibria emical cell reactions.	J.Sant K.Cha  of state-Par ia, Electroc is, electrod in solution  J.Sant K.Cha  colligative  A.K.M T.Moi	chanalak andrasek tial mol hemistry e kinetic n-effect chanalak andrasek properti	shmi ar Pilla ar / - cs. of shmi ar Pilla es crishnar M. Bal	i
Secon roperties-conce bebye -Huckel Chemical kinetiol vent polarity  CHE C302  Exper nd thermochen  CHE C202  Single  CHE E305  Basic	Thermodynamics and Chemical Kinetics  ad law of thermodynamics, Maxwell relation and therm ept of fugacity and activity- activity coefficient, Phase ru theory, Conductivity of electrolytes, Onsagar equation ics-complex reactions, transition state theory and collisi and ionic strength. Heterogeneous catalysis-various isoth Physical Chemistry- Practical – I  Timents in conductivity, EMF, kinetics, phase equilibrianistry.  Organic Chemistry- Practical – I	C nodynamic and phate in theory therms, fast C C	equation of see equilibria emical cell reactions.	J.Sant K.Cha of state-Par ia, Electroc ls, electrod in solution  J.Sant K.Cha colligative  A.K.M T.Moi	chanalak rtial mol hemistry e kinetich n-effect chanalak properti Mohanak handas /	shmi ar Pilla ar / - cs. of shmi ar Pilla es crishnar M. Bal	i

Introduction to various name reactions involving C-C bond formation, heterocycle synthesis and modification of substituents.

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P.C.Srinivasan

 $Substitution\ Reactions,\ Reactions\ of\ organometallic\ compounds.$ 

Name Reactions in Organic Chemistry

CHE 1017

Partition function, Thermodynamic parameters from statistical methods, Bose-Einstein, Maxwell-Boltzmann, Fermi Dirac statistics — Applications of statistical methods.  CHE C002	CHE 1019	Essentials of Statistical Thermodynamics	E	3	
Absorption and Molecular Spectrometry, Atomic, Absorption spectrometry, Flame Photometry, Plasma Emission Spectrometry, Chromatographic Techniques – General aspects, Classification, Principle and applications of TLC, Paper Chromatography, CC and HPLC.  CHE C102				Bose-Einste	ein, Maxwell-
Emission Spectrometry, Chromatographic Techniques – General aspects, Classification, Principle and applications of TLC, Paper Chromatography, GC and HPLC.  CHE C102	CHE C002	Analytical Instrumentation	С	3	T.Raju
P.R.amamurthy V.Narayanan   P.R.amamurthy V.Narayanan	Emission Spectro	ometry, Chromatographic Techniques - General aspec			
hydrides - corboranes and metallo carboranes, nitrogen, phosphorous, sulphour polymers.  CHE C203	CHE C102	Main Group Elements and Inorganic Polymers	С	3	P.Ramamurthy
Mechanism of various Organic reactions and rearrangements.  CHE C303 Quantum Chemistry and Group Theory C 3 V.R.Vijayaraghavan  Foundations of quantum theory, Schrodinger equation, structure of the atom. Molecular structure - MO and VB methods, VSEPR theory; HMO METHOD, Group theory. Applications in Spectroscopy, and quantum chemistry, rotationaland vibrational spectroscopy, Raman spectroscopy.  CHE C003 Analytical Chemistry - Practical - I C 2 T.Raju S.Sriman Narayanan  Spectrophotometry, Potentiometry / pH metry, Polarography and Gas Chromatography.  CHE C103 Inorganic Chemistry - Practical - I C 2 P.Ramamurthy V.Narayanan  Quantitative Analysis: Estimation of Mg²+, Zn²+, Ca²+ and Ni²+ by complexometric method and hardness of water. Fe²+, Mn²+ by colorimetric method Qualitative Analysis: Semimicro analysis of salts containing three less common cations and one common cation.  Ti, Mo, W, Se, Te, Ce, Th, Ti, Zr, V, Be, U and Li.  CHE E002 Analysis of Complex Materials  E 3 P.Riyazuddini S.Sriman Narayanan T. Raju  Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.  CHE E104 Nuclear Chemistry  E 3 M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	Inorgar hydrides - corbor	nic polymers-isopoly acids - heteropoly acids - sil anes and metallo carboranes, nitrogen, phosphorous, s	icates - pht ulphour poly	halocyanin ymers.	e polymers - boron
CHE C303 Quantum Chemistry and Group Theory C 3 V.R.Vijayaraghavan  Foundations of quantum theory, Schrodinger equation, structure of the atom. Molecular structure - MO and VB methods, VSEPR theory; HMO METHOD, Group theory. Applications in Spectroscopy, and quantum chemistry, rotationaland vibrational spectroscopy, Raman spectroscopy.  CHE C003 Analytical Chemistry – Practical - I C 2 T.Raju S.Sriman Narayanan  Spectrophotometry, Potentiometry / pH metry, Polarography and Gas Chromatography.  CHE C103 Inorganic Chemistry - Practical - I C 2 P.Ramamurthy V.Narayanan  Quantitative Analysis: Estimation of Mg²+, Zn²+,Ca²+ and Ni²+ by complexometric method and hardness of water. Fe²+, Mn²+, Ni²+ by colorimetric method Qualitative Analysis: Semimicro analysis of salts containing three less common cations and one common cation.  Ti, Mo, W. Se, Te, Ce, Th, Ti, Zr, V, Be, U and Li.  CHE E002 Analysis of Complex Materials E 3 P.Riyazuddini S.Sriman Narayanan T. Raju  Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.  CHE E104 Nuclear Chemistry E 3 M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	CHE C203	Organic Reaction Mechanism	С	3	T.Mohandas
Foundations of quantum theory, Schrodinger equation, structure of the atom. Molecular structure - MO and VB methods, VSEPR theory; HMO METHOD, Group theory. Applications in Spectroscopy, and quantum chemistry, rotationaland vibrational spectroscopy, Raman spectroscopy.  CHE C003   Analytical Chemistry - Practical - I   C   2   T.Raju S.Sriman Narayanan	Mechai	nism of various Organic reactions and rearrangements.			
and VB methods, VSEPR theory; HMO METHOD, Group theory. Applications in Spectroscopy, and quantum chemistry, rotationaland vibrational spectroscopy, Raman spectroscopy.  CHE C003	CHE C303	Quantum Chemistry and Group Theory	С	3	V.R.Vijayaraghavan
Spectrophotometry, Potentiometry / pH metry, Polarography and Gas Chromatography.  CHE C103 Inorganic Chemistry - Practical - I	and VB methods chemistry, rotation	, VSEPR theory; HMO METHOD, Group theory. A chaland vibrational spectroscopy, Raman spectroscopy	Applications	in Spectro	scopy, and quantum  T.Raju
CHE C103 Inorganic Chemistry - Practical - I  C 2 P.Ramamurthy V.Narayanan  Quantitative Analysis: Estimation of Mg <sup>2+</sup> , Zn <sup>2+</sup> , Ca <sup>2+</sup> and Ni <sup>2+</sup> by complexometric method and hardness of water. Fe <sup>2+</sup> , Mn <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method Qualitative Analysis: Semimicro analysis of salts containing three less common cations and one common cation.  Ti, Mo, W, Se, Te, Ce, Th, Ti, Zr, V, Be, U and Li.  CHE E002 Analysis of Complex Materials  E 3 P.Riyazuddini S.Sriman Narayanan T. Raju  Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.  CHE E104 Nuclear Chemistry  E 3 M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.					S.Sriman Narayanan
Quantitative Analysis: Estimation of Mg²+, Zn²+,Ca²+ and Ni²+ by complexometric method and hardness of water. Fe²+, Mn²+, Ni²+ by colorimetric method Qualitative Analysis: Semimicro analysis of salts containing three less common cations and one common cation.  Ti, Mo, W, Se, Te, Ce, Th, Ti, Zr, V, Be, U and Li.  CHE E002 Analysis of Complex Materials E 3 P.Riyazuddini S.Sriman Narayanan T. Raju  Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.  CHE E104 Nuclear Chemistry E 3 M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactors, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	Spectro	photometry, Potentiometry / pH metry, Polarography	and Gas Chr	romatograp	hy.
of water. Fe²+, Mn²+, Ni²+ by colorimetric method Qualitative Analysis: Semimicro analysis of salts containing three less common cations and one common cation.  Ti, Mo, W, Se, Te, Ce, Th, Ti, Zr, V, Be, U and Li.  CHE E002   Analysis of Complex Materials   E   3   P.Riyazuddini S.Sriman Narayanan T. Raju  Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.  CHE E104   Nuclear Chemistry   E   3   M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	CHE C103	Inorganic Chemistry - Practical - I	С	2	
Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.  CHE E104   Nuclear Chemistry   E   3   M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	of water. Fe <sup>2+</sup> , M Qualita cation.	n <sup>2+</sup> , Ni <sup>2+</sup> by colorimetric method tive Analysis: Semimicro analysis of salts containing			
CHE E104 Nuclear Chemistry  E  3  M.Kandaswamy P.Ramamurthy V.Narayanan S.Balasubramanian  Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	CHE E002	Analysis of Complex Materials	Е	3	S.Sriman Narayanan
Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	Ore and	d alloy analysis, Analysis of organic compounds, Fuel	analysis, sol	lid and liqu	id fuels.
models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.	CHE E104	Nuclear Chemistry	Е	3	P.Ramamurthy V.Narayanan
CHE 1018 Functional Group Transformation in Organic E 3 A.K.Mohana Krishnan	models, radioacti reactions, nuclear	ve decay, hot-atom chemistry. Nuclear reactions, could fusion and nuclear fission. Nuclear reactor, nuclear r	oumb barrier eactors in In	r, cross sect dia, Detect	tion, types of nuclear ion of radiations and
Chemistry	CHE 1018	1	nic E	3	A.K.Mohana Krishnan

Interconversion of various functional groups in Organic compounds by various methods.

CHE 1020	Solid State Chemistry	Е	3	V.R.Vijayaraghavn
CHE 1020	Solid State Chemistry	L	1 3	V.R. Vijayaragnavn
Bonding nanochemistry.	g in solids, band theory, properties of solids, defects a	nd nonstoi	chiometry,	solid electrolytes,
CHE C601	Physical Methods in Chemistry	С	4	V.R.Vijayaraghavan P.Rajakumar P.Ramamurthy/ V. Narayanan S.Sriman Narayanan / T.Raju
diatomic moleculorganic molecule techniques – Noe Mass spectra – compounds. ESR- ray diffraction – l	nic spectroscopy, application of group theory, formaldes, Photoelectron Spectroscopy, esca - NMR - Principles, coupling constants, Karplus curve, J values, <sup>13</sup> Ct, and pulse techniques, FTNMR, NMR of phosphorous Molecular ion peak, meta stable peak, techniques, Ag-value, anisotropy, simple organic radicals, transition rebrage equation, space groups and point groups, diffract ations, Fe and Sn systems, Thermal methods of analysis	ples, theore-NMR-decorates and Flucture Application netals and coion method	y, chemical oupling – corine contain in determine coordination ls. Mossbau	shift, spectra of double resonance ning molecules ning structure of compounds X- er spectroscopy –
CHE C602	Biological Chemistry	С	4	M.Kandaswamy R.Raghunathan S.Balasubramanian / T.Raju
Essential and tra- classification, kin- oxygen carriers, fixations, biologic	of elements in biological systems, Corbohydrates, protection metal ions, metal ion transport in biological etics of enzyme catalyzed reaction, effect of pH and tendemeproteins, nonhemeoxygen carriers, model command redox reactions, cytochromes, iron-sulfur proteins, pled storage. Applications, medicinal, metal ion poisoning.	systems. I mperature - pounds for	Enzymes, n Coenzymes r oxygen c	omenclature and s, heme enzymes, carriers. Nitrogen
CHE C004	Practical – Analysis of Complex Materials and Separation Techniques	С	2	S.Rajeswari
Analysi	s of alloys, ores, and pharmaceuticals; separation techniq	ues - chron	natographic	techniques.
CHE C005	Practical - Instrumental Methods	С	2	P.Riyazuddin
	photometry, potentiometry, Biamperometric titratic Flame photometry, Nephelometry and Fluorimetry.	ons ,cond	uctrometric	titrations, Gas
CHE C104	Inorganic Chemistry – Practical - II	С	2	S.Balasubramanian
Analysi	s of ores and alloys - dolomite, galena, pyrites, solder bra	ass stainless	s stell, bronz	e etc.
CHE C105	Inorganic Chemistry – Practical - III	C	2	V.Narayanan
	tographic separation of inorganic compounds and ender of cobalt, manganese, copper and nickel complexes. Solv			
CHE C204	Organic Chemistry – Practical – II	С	2	A.K.Mohankrishnan
Three st	age preparations.			
CHE C205	Organic Chemistry – Practical - III	С	2	M.Bakthadoss T.Mohandas
Synthes	is of some oxygen and nitrogen containing heterocyclic	compounds		
CHE C304	Physical Chemistry – Practical - II	С	2	V.R.Vijayaraghavan J.Santhanalakshmi
Experim kinetics - 15 exper	nents in chemical kinetics, thermodynamics, thermoclariments.	nemistry,	photochemi	stry and enzyme

I Conthonalalzahmi	CHE C305	Physical Chemistry – Practical - III	С	2	V.R.Vijayaraghavan
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Experiments in conductivity, electrode equilibria, spectrophotometry, partial molar volumes, acid base equilibria - 15 experiments.

CHE E003	Classical and Radioanalytical methods of Analysis.	E	3	S.Rajeswari P.Riyazuddin

Analysis of complex materials - ore analysis, alloy analysis, analysis of organic Compounds - fuel and gas analysis - radioanalytical techniques

CHE E004	Optical and Surface Analytical Techniques	Е	3	T.Raju
				S.Sriman Narayanan

Polarimetry, Refractometry, Chemical and Electron microscopy, X-ray spectroscopy, ESCA and Auger electron spectrometry.

CHE E602	Photochemistry	E	3	P.Maruthamuthu
				V.R.Vijayaraghavan
				T. Mohandas / P.Ramamurthy
				V.Narayanan

Fundamentals of photochemistry - absorption - emission of radiation - lifetimes - photochemical laws - quantum yield - intersystem crossing – Stern-Volmer equation - electron transfer - energy transfer - Photochemical techniques-flash photolysis - lasers in photochemistry; radiation chemistry - primary processes-track effects-dosimetry - pulse radiolysis - Inorganic photochemistry-photoredox reactions-substitution reactions - photosensitisation reactions; organometallic photochemistry - metal carbonyls - photochemistry in energy conversion - formation of fuels - hydrogen production - semiconductor electrodes - chemically modified electrodes - photogalvanic cells. - Organic Photochemistry: Norrish reactions. photochemistry of cyclohexadieneones. Reactions of olefines. Oxidation reduction reactions. Reaction of oxygen with olefines. Reduction of ketones. singlet oxygen - selected reactions - Photo Fries reaction. Barton reaction and Di-pi-methane rearrangement.

CHE E105	Organometallic Chemistry	E	3	M.Kandaswamy
				P.Ramamurhty
				S.Balasubramanian

Types of ligands in organometallic compounds, 18 electron rule, general methods of preparations, carbon sigma donors, carbon pi donors, chain and cyclic pi donors, multidecker sandwitch complexes, metallocenes, bis pi-arene metal complexes. Complexes of pi acceptor ligands, mono and poly metal carbonyls, preparation, structure and reactivity, reaction pathways, substitution, addition elimination and rearrangemnt, ligand protonation, fluxinal isomerism, catalysis, hydrogenation, hydroformylationn, oxidation, polymerisation, cyclooligomerisation and isomerisation.

CHE E203	Chemistry of Heterocycles, Organo-lithiums and	E	3	P.C.Srinivasan / R.Raghunathan
	Assymmetric synthesis			

Synthesis of heterocycles with N, O and S - five and six membered  $\,$  rings. Preparation of Organolithiums, Assymmetric synthesis.

CHE E302 Advanced Chemical Thermodynamics and Kinetics	E 3 K.ChandrasekarapillaiE.Muruga
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 $Statistical\ thermodynamics,\ Irreversible\ thermodynamics,\ Chemical\ kinetics-Gas\ and\ solution\ reactions.$ 

CHE E502	Solar Energy Materials and Energy Conversions.	Е	3	P. Maruthamuthu
				S. Austin Suthanthirarai

Nature of solar radiation, materials used for absorption of solar radiation, solar heating, Energy systems, energy storage and energy transport. Frontier energy conversions; entropy reduction.

CHE C006	Separation Techniques	C	4	S.Rajeswari
				S.Sriman Narayanan / T.Raju

Distillation, Solvent extraction, Floatation and dialysis. Theory and applications. Chromatographic techniques – Column, TLC, Paper and ion-exchange chromatorgraphy, GC, GC-MS, GCIR, HPLC, HPTLC, GPC, SFC theory and applications.

CHE C106	Transition Metal Chemistry	С	4	M.Kandaswamy P.Ramamurhty V.Narayanan S.Balasubramanian
omerisation a omplimentary abilisation of acrocyclic lig	and labile complexes - substitution reactions-dissoci- and racemisation reactions-trans effect - redox reac- and non-complimentary reactions; nitrosyls - ph- unusal oxidation states - ligand design - template m ands; magentic moments - Van Vleck equation- mage- erromagnetic interactions - magnetic behaviour of lanth	etions - intosphine, and ethods - metic proper	ner sphere rsine and nacrocylcic erties of A,	and outer sphere - cyanide complexes- effect - synthesis of
CHE C206	Orbital symmetry and Modern Synthe Methodology	tic C	4	R.Raghunathan P.Rajakumar
a a	pproach, protective groups, sulphur, retero synthetic and	11 y 51 5.		
CHE C306	Quantum Chemistry and Macromolecules	С		V.R.Vijayaraghavan E.J.Padma Malar E.Murugan
Schro ethods; MO a blids, Band the	Quantum Chemistry and Macromolecules  dinger equation - solutions to particle in a box, SHO, and VB methods, H <sub>2</sub> <sup>+</sup> , MO method for diatomics, HN cory, Properties of solids, low dimensional solids, Macrolymerization.	rigid rotar	hydrogen a	E.J.Padma Malar E.Murugan atom- approximation od, Solids Bonding in
Schro nethods; MO a olids, Band the nechanism of p	dinger equation - solutions to particle in a box, SHO, nd VB methods, H <sub>2</sub> <sup>+</sup> , MO method for diatomics, HM cory, Properties of solids, low dimensional solids, Macro	rigid rotar	hydrogen a	E.J.Padma Malar E.Murugan atom- approximation od, Solids Bonding in
Schronethods; MO a blids, Band the nechanism of p	dinger equation - solutions to particle in a box, SHO, nd VB methods, $H_2^+$ , MO method for diatomics, HM cory, Properties of solids, low dimensional solids, Macrolymerization.	rigid rotar IO method, comolecules	hydrogen a SCF methos, molecular	E.J.Padma Malar E.Murugan  atom- approximation od, Solids Bonding in r weight of polymers,  P.C. Srinivasan S.Balasubramanian
Schronethods; MO a olids, Band the nechanism of p	dinger equation - solutions to particle in a box, SHO, nd VB methods, H <sub>2</sub> <sup>+</sup> , MO method for diatomics, HM cory, Properties of solids, low dimensional solids, Macrolymerization.  Novel Reagents in Organic Synthesis	rigid rotar IO method, comolecules	hydrogen a SCF methos, molecular	E.J.Padma Malar E.Murugan  atom- approximation od, Solids Bonding in r weight of polymers,  P.C. Srinivasan S.Balasubramanian
Schronethods; MO a solids, Band the nechanism of p  CHE E603  Use of CHE E304  Electroperivative Pola	dinger equation - solutions to particle in a box, SHO, and VB methods, $H_2^+$ , MO method for diatomics, HM cory, Properties of solids, low dimensional solids, Macrolymerization.  Novel Reagents in Organic Synthesis  f palladium, nickel and silicon in Organic synthesis.  Electrochemistry and Electroanalytical Chemistry  ical double layer. Thermodynamics and models, Polarography – Amperometry – Cyclic Voltammetry and rodes, Potentiometric titrations, coulometric titrations	rigid rotar IO method, romolecules  E  E  arography - stripping v	hydrogen a SCF methos, molecular 3	E.J.Padma Malar E.Murugan  atom- approximation od, Solids Bonding in r weight of polymers,  P.C. Srinivasan S.Balasubramanian M.Bakthadoss  K.Chanderasekara Pillai P.Riyazuddin  nd Instrumentation — y, Potentiometry, Ion

P. Maruthamuthu

All Faculty

CHE E501

CHE C207

Conventional, non-conventional

energy sources and environment.

Project Work Viva-Voce

and

Various forms of energy and their interconversion, Information on Ozone hole formation and remeady, the effect of excessive use of energy on environment. Role of solar radiation on pollution control problems.

renewable

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## M.Sc., PHYSICAL CHEMISTRY

Subject Code	Title of the Course	Core/			Credit	ts
· ·		elective	L	T	P	С
	I SEMESTER					
CHE C001	Fundamental of Analytical Chemistry	С	3	0	0	3
CHE C101	Coordination and Nuclear Chemistry	С	3	0	0	3
CHE C201	Stereochemistry and Organic Reaction Mechanism	С	3	0	0	3
CHE C301	Thermodynamics and Chemical Kinetics	С	3	0	0	3
CHE C302	Physical Chemistry Practical – I	С	0	0	2	2
CHE C202	Organic Chemistry Practical – I	С	0	0	2	2
CHE E101	Inorganic Reaction Mechanism	Е	3	0	0	3
	OR					
CHE E201	Name Reactions in Organic Chemistry					
	II SEMESTER					
CHE C002	Analytical Instrumentation	С	3	0	0	3
CHE C102	Main Group Elements and Inorganic Polymers	С	3	0	0	3
CHE C203	Organic Reaction Mechanism	С	3	0	0	3
CHE C303	Quantum Chemistry and Group Theory	С	3	0	0	3
CHE C003	Analytical Chemistry Practical – I	C	0	0	2	2
CHE C101	Inorganic Chemistry Practical – I	С	0	0	2	2
CHE E002	Analysis of Complex Materials	Е	3	0	0	3
	III SEMESTER					
CHE C601	Physical Methods in Chemistry	С	4	0	0	4
CHE C602	Biological Chemistry	С	4	0	0	4
CHE C304	Physical Chemistry Practical – II	С	0	0	2	2
CHE C305	Physical Chemistry Practical – III	С	0	0	2	2
CHE E602	Photochemistry	Е	3	0	0	3
CHE E302	Advanced Chemical Thermodynamics and Kinetics	Е	3	0	0	3
	IV SEMESTER					•
CHE C306	Quantum Chemistry and Macromolecules	С	4	0	0	4
CHE E603	Novel Reagents in Organic Synthesis	Е	3	0	0	3
CHE E304	Electrochemistry and Electroanlytical Chemistry	Е	3	0	0	3
CHE C307	Project	С	0	0	6	6
	, v	•		-		1
CHE C001	Fundamental of Analytical Chemistry	С	3	0	0	3

Treatment of analytical data and sampling, Chemical Equilibria, Neutralization Reactions, Redox, Precipitation and Complexometric titrations.

CHE C101	Coordination Chemistry	C	3	M.Kandaswamy
				P.Ramamurthy /V.Narayanan

Stability and Stereochemical aspects, Structural aspects and Crystal Field Theory, Molecular Orbital Theory.

CHE C201	Stereochemistry and organic reaction mechanism	С	3	P.C.Srinivasan
				R.Raghunathan / M.Bakthadoss

Elements of Stereochemistry, Confirmation analysis and Mechanism of substitution in aliphatic and aromatic compounds. Aromaticity.

CHE C301	Thermodynamics and Chemical Kinetics	C	3	J.Santhanalakshmi
				K.Chandrasekar Pillai

Second law of thermodynamics, Maxwell relation and thermodynamic equation of state-Partial molar properties-concept of fugacity and activity- activity coefficient, Phase rule and phase equilibria, Electrochemistry - Debye -Huckel theory, Conductivity of electrolytes, Onsagar equation. Electrochemical cells, electrode kinetics. Chemical kinetics-complex reactions, transition state theory and collision theory - reactions in solution-effect of solvent polarity and ionic strength. Heterogeneous catalysis-various isotherms, fast reactions.

CHE C302	Physical Chemistry- Practical – I	С	2	J.Santhanalakshmi
				K.Chandrasekar Pillai

Experiments in conductivity, EMF, kinetics, phase equilibria, solution equilibria, colligative properties and thermochemistry.

CHE C202	Organic Chemistry- Practical – I	С	2	A.K.Mohanakrishnan T.Mohandas / M. Bakthadoss
Singl	e and double stages preparations.			
CHE E305	Electronics and Computers for Chemists	Е	3	P.Riyazuddin S.Sriman Narayanan
	Electronics, Computers in Chemistry Programs in BAS tion, buffers, F and t tests, regression analysis.	IC – Calcul	ation pH, s	colubility product,
CHE E101	Inorganic Reaction Mechanism	Е	3	M.Kandaswamy /V. Narayanan S.Balasubramanian
	and Labile Complexes, Stabilization of unusual oxidation actions, Reactions of organometallic compounds.	n states, Ele	ectron trans	sfer reactions,
CHE E201	Name Reactions in Organic Chemistry	Е	3	P.C.Srinivasan
Introduction of	duction to various name reactions involving C-C bond for substituents.	ormation, he	terocycle s	synthesis and
CHE E306	Essentials of Statistical Thermodynamics	Е	3	
	ion function, Thermodynamic parameters from statistica mi Dirac statistics – Applications of statistical methods.		Bose-Einst	ein, Maxwell-
CHE C002	Analytical Instrumentation	С	3	S.Rajeswari / T.Raju S.Sriman Narayanan
Abso	Analytical Instrumentation  rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspec Chromatography, GC and HPLC.	n spectrome	etry, Flame	S.Sriman Narayanan  Photometry, Plasma
Abso	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspec	n spectrome	etry, Flame	S.Sriman Narayanan  Photometry, Plasma
Abso Emission Spect of TLC, Paper of CHE C102	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspec Chromatography, GC and HPLC.	n spectromets, Classifica	etry, Flame ation, Prince	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan
Abso Emission Spect of TLC, Paper of CHE C102	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspect Chromatography, GC and HPLC.  Main Group Elements and Inorganic Polymers  anic polymers-isopoly acids - heteropoly acids - sili	n spectromets, Classifica	etry, Flame ation, Prince	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan
Abso mission Spect f TLC, Paper ( CHE C102 Inorg ydrides - corb CHE C203	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspect Chromatography, GC and HPLC.  Main Group Elements and Inorganic Polymers  anic polymers-isopoly acids - heteropoly acids - silioranes and metallo carboranes, nitrogen, phosphorous, s	r spectromets, Classificates - phtulphour poly	etry, Flame ation, Prince 3 halocyanir ymers.	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan  ne polymers - boron  A.K.Mohana Krishnan T.Mohandas
Abso mission Spect f TLC, Paper ( CHE C102 Inorg ydrides - corbo CHE C203	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspect Chromatography, GC and HPLC.  Main Group Elements and Inorganic Polymers  anic polymers-isopoly acids - heteropoly acids - silioranes and metallo carboranes, nitrogen, phosphorous, s  Organic Reaction Mechanism	r spectromets, Classificates - phtulphour poly	etry, Flame ation, Prince 3 halocyanir ymers.	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan  ne polymers - boron  A.K.Mohana Krishnan T.Mohandas
Abso Smission Spect of TLC, Paper of CHE C102  Inorg ydrides - corb CHE C203  Mech CHE C303  Found nd VB metho	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspect Chromatography, GC and HPLC.  Main Group Elements and Inorganic Polymers  anic polymers-isopoly acids - heteropoly acids - silioranes and metallo carboranes, nitrogen, phosphorous, s  Organic Reaction Mechanism  anism of various Organic reactions and rearrangements.	r spectrome ts, Classifica C  C cates - pht ulphour poly  C C  C urre of the a applications	halocyanir ymers.	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan  ne polymers - boron  A.K.Mohana Krishnan T.Mohandas P.Rajakumar  V.R.Vijayaraghavan  cular structure - MO
Abso mission Spect f TLC, Paper 0 CHE C102  Inorg ydrides - corbo CHE C203  Mech CHE C303  Found d VB metho hemistry, rotal	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspect Chromatography, GC and HPLC.  Main Group Elements and Inorganic Polymers  anic polymers-isopoly acids - heteropoly acids - silioranes and metallo carboranes, nitrogen, phosphorous, s  Organic Reaction Mechanism  Quantum Chemistry and Group Theory  dations of quantum theory, Schrodinger equation, struct ds, VSEPR theory; HMO METHOD, Group theory.	r spectrome ts, Classifica C  C cates - pht ulphour poly  C C  C urre of the a applications	halocyanir ymers.	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan  ne polymers - boron  A.K.Mohana Krishnan T.Mohandas P.Rajakumar  V.R.Vijayaraghavan  cular structure - MO
Abso Emission Spect of TLC, Paper of CHE C102  Inorg ydrides - corbo CHE C203  Mech CHE C303  Found of VB metho hemistry, rotat	rption and Molecular Spectrometry, Atomic, Absorptio trometry, Chromatographic Techniques – General aspect Chromatography, GC and HPLC.  Main Group Elements and Inorganic Polymers  anic polymers-isopoly acids - heteropoly acids - silioranes and metallo carboranes, nitrogen, phosphorous, s  Organic Reaction Mechanism  anism of various Organic reactions and rearrangements.  Quantum Chemistry and Group Theory  dations of quantum theory, Schrodinger equation, struct ds, VSEPR theory; HMO METHOD, Group theory. A tionaland vibrational spectroscopy, Raman spectroscopy	r spectrome ts, Classificates - pht ulphour poly C  C C C C C C C C C C C C C C C C C C	try, Flame ation, Prince 3  halocyaning ymers.  3  tom. Mole in Spectro	S.Sriman Narayanan  Photometry, Plasma ciple and applications  M.Kandaswamy P.Ramamurthy V.Narayanan  me polymers - boron  A.K.Mohana Krishnan T.Mohandas P.Rajakumar  V.R.Vijayaraghavan  cular structure - MO oscopy, and quantum  T.Raju / S.Sriman Narayanar

of water. Fe<sup>2+</sup>, Mn<sup>2+</sup>, Ni<sup>2+</sup> by colorimetric method

Qualitative Analysis: Semimicro analysis of salts containing three less common cations and one common

cation.

Ti, Mo, W, Se, Te, Ce, Th, Ti, Zr, V, Be, U and Li.

CHE E002	Analysis of Complex Materials	Е	3	P.Riyazuddini S.Sriman Narayanan T. Raju			
Ore and	Ore and alloy analysis, Analysis of organic compounds, Fuel analysis, solid and liquid fuels.						

CHE E104	Nuclear Chemistry	Е	3	M.Kandaswamy
				P.Ramamurthy
				V.Narayanan
				S Ralacubramanian

Nuclear forces and nuclear structure, binding energies, nuclear stabilities, structure of nucleus, nuclear models, radioactive decay, hot-atom chemistry. Nuclear reactions, couloumb barrier, cross section, types of nuclear reactions, nuclear fusion and nuclear fission. Nuclear reactor, nuclear reactors in India, Detection of radiations and particle accelerators. Applications, Tracers applied in industries and agriculture. Lanthanides and actinides.

CHE E204	Functional	Group	Transformation	in	Organic	Е	3	A.K.Mohana Krishnan
	Chemistry							

Interconversion of various functional groups in Organic compounds by various methods.

CHE E308 Solid State Chemistry	E 3 V.R.Vijayaraghavn	
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Bonding in solids, band theory, properties of solids, defects and nonstoichiometry, solid electrolytes, nanochemistry.

CHE C601	Physical Methods in Chemistry	C	4	V.R.Vijayaraghavan
				P.Rajakumar
				P.Ramamurthy
				V. Narayanan
				S.Sriman Narayanan / T.Raju

Electronic spectroscopy, application of group theory, formaldehyde butadiene, dissociation energy of diatomic molecules, Photoelectron Spectroscopy, esca - NMR - Principles, theory, chemical shift, spectra of organic molecules, coupling constants, Karplus curve, J values, <sup>13</sup>C-NMR-decoupling - double resonance techniques - Noe, and pulse techniques, FTNMR, NMR of phosphorous and Fluorine containing molecules - Mass spectra - Molecular ion peak, meta stable peak, techniques, Application in determining structure of compounds. ESR-g-value, anisotropy, simple organic radicals, transition metals and coordination compounds - X-ray diffraction - Bragg equation, space groups and point groups, diffraction methods. Mossbauer spectroscopy - theory and applications, Fe and Sn systems, Thermal methods of analysis - TGA, DTA and DSC - Principle and applications.

CHE C602	Biological Chemistry	С	4	M.Kandaswamy
				R.Raghunathan
				S.Balasubramanian / T.Raju

Origin of elements in biological systems, Corbohydrates, proteins, lipids, nucleic acids, DNA, RNA - Essential and trace metal ions, metal ion transport in biological systems. Enzymes, nomenclature and classification, kinetics of enzyme catalyzed reaction, effect of pH and temperature -

Coenzymes, heme enzymes, oxygen carriers, hemeproteins, nonhemeoxygen carriers, model compounds for oxygen carriers. Nitrogen fixations, biological redox reactions, cytochromes, iron-sulfur proteins, photosynthesis and chlorophyll, biological energy transfer and storage. Applications, medicinal, metal ion poisoning.

CHE C004	Practical - Analysis of Complex Materials and	C	2	S.Rajeswari
	Separation Techniques			

Analysis of alloys, ores, and pharmaceuticals; separation techniques - chromatographic techniques.

CTIE COOS Tractical inistramental Methods C 2 T.Myazadani	CHE C005	Practical - Instrumental Methods	C	2	P.Riyazuddin
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Spectrophotometry, potentiometry, Biamperometric titrations ,conductrometric titrations, Gas chromatography; Flame photometry, Nephelometry and Fluorimetry.

CHE C104	Inorganic Chemistry – Practical - II	C	2	S.Balasubramanian
Analy	sis of ores and alloys - dolomite, galena, pyrites,	solder bra	ass stainless s	stell, bronze etc.
CHE C105	Inorganic Chemistry – Practical - III	C	2	V.Narayanan
	natographic separation of inorganic compounds of cobalt, manganese, copper and nickel comple			
CHE C204	Organic Chemistry – Practical – II	C	2	A.K.Mohankrishnan
Three	stage preparations.			
CHE C205	Organic Chemistry – Practical - III	С	2	M.Bakthadoss
Synth	esis of some oxygen and nitrogen containing hete	rocyclic (	compounds	T.Mohandas
Synth	esis of some oxygen and introgen containing nete	rocycne (	compounds.	
CHE C304	Physical Chemistry – Practical - II	C	2	V.R.Vijayaraghavan J.Santhanalakshmi
		•	•	•
Experinetics - 15 exp	iments in chemical kinetics, thermodynamics, periments.	thermocl	nemistry, pl	hotochemistry and enzyme
CHE C305	Physical Chemistry – Practical - III	С	2	V.R.Vijayaraghavan J.Santhanalakshmi
Exper quilibria - 15 d CHE E003	Classical and Radioanalytical methods		metry, partia	l molar volumes, acid base  S.Rajeswari P.Riyazuddin
	Analysis.			
	sis of complex materials - ore analysis, alloy an dioanalytical techniques	alysis, ar	alysis of org	anic Compounds - fuel and
CHE E004	Optical and Surface Analytical Techniques	Е	3	T.Raju S.Sriman Narayanan
Polari lectron spectro	metry, Refractometry, Chemical and Electron m metry.	icroscopy	, X-ray spec	troscopy, ESCA and Auger
CHE E602	Photochemistry	Е	3	P.Maruthamuthu V.R.Vijayaraghavan T. Mohandas P.Ramamurthy
				V.Narayanan
	I .			1

Fundamentals of photochemistry - absorption - emission of radiation - lifetimes - photochemical laws - quantum yield - intersystem crossing - Stern-Volmer equation - electron transfer - energy transfer; - Photochemical techniques-flash photolysis - lasers in photochemistry; radiation chemistry - primary processes-track effects-dosimetry - pulse radiolysis - Inorganic photochemistry-photoredox reactions-substitution reactions - photosensitisation reactions; organometallic photochemistry - metal carbonyls - photochemistry in energy conversion - formation of fuels - hydrogen production - semiconductor electrodes - chemically modified electrodes - photogalvanic cells - Organic Photochemistry: Norrish reactions. photochemistry of cyclohexadieneones. Reactions of olefines. Oxidation reduction reactions. Reaction of oxygen with olefines. Reduction of ketones. singlet oxygen - selected reactions - Photo Fries reaction. Barton reaction and Di-pi-methane rearrangement.

CHE E105	Organometallic Chemistry	Е	3	M.Kandaswamy
				P.Ramamurhty
				S.Balasubramanian

Types of ligands in organometallic compounds, 18 electron rule, general methods of preparations, carbon sigma donors, carbon pi donors, chain and cyclic pi donors, multidecker sandwitch complexes, metallocenes, bis pi-arene metal complexes. Complexes of pi acceptor ligands, mono and poly metal carbonyls, preparation, structure and reactivity, reaction pathways, substitution addition elimination and rearrangemnt, ligand

protonation, fluxinal isomerism, catalysis, hydrogenation, hydroformylationn, oxidation, polymerisation, cyclooligomerisation and isomerisation.

CHE E203	Chemistry of Heterocycles, Organo-lithiums and	Е	3	P.C.Srinivasan / R.Raghunathan
	Assymmetric synthesis			

Synthesis of heterocycles with N, O and S – five and six membered rings. Preparation of Organolithiums, Assymmetric synthesis.

CHE E302	Advanced Chemical Thermodynamics and Kinetics	Е	3	K.Chandrasekarapillai/E.Murugan

Statistical thermodynamics, Irreversible thermodynamics, Chemical kinetics – Gas and solution reactions.

CHE E502	Solar Energy Materials and Energy Conversions.	Е	3	P. Maruthamuthu
				S.Austin Suthanthiraraj

Nature of solar radiation, materials used for absorption of solar radiation, solar heating, Energy systems, energy storage and energy transport. Frontier energy conversions; entropy reduction.

Ī	CHE E502	Solar Energy Materials and Energy Conversions.		3	P. Maruthamuthu
					S.Austin Suthanthiraraj

Nature of solar radiation, materials used for absorption of solar radiation, solar heating, Energy systems, energy storage and energy transport. Frontier energy conversions; entropy reduction.

CHE C006	Separationc Techniques	C	4	S.Rajeswari	
				S.Sriman Narayanan /T.Raju	

Distillation, Solvent extraction, Floatation and dialysis. Theory and applications. Chromatographic techniques – Column, TLC, Paper and ion-exchange chromatorgraphy, GC, GC-MS, GCIR, HPLC, HPTLC, GPC, SFC theory and applications.

CHE C106	Transition Metal Chemistry	C	4	M.Kandaswamy
				P.Ramamurhty
				V.Narayanan
				S.Balasubramanian

Inert and labile complexes - substitution reactions-dissociative and associative processes-hydrolysis, isomerisation and racemisation reactions-trans effect - redox reactions - inner sphere and outer sphere - complimentary and non-complimentary reactions; nitrosyls - phosphine, arsine and cyanide complexes-stabilisation of unusal oxidation states - ligand design - template methods - macrocyclic effect - synthesis of macrocyclic ligands; magentic moments - Van Vleck equation- magenetic properties of A,E,T terms -spin orbit coupling - antiferromagnetic interactions - magnetic behaviour of lanthanides and actinides.

CHE C206	Orbital	symmetry	and	Modern	Synthetic	C	4	R.Raghunathan
	Methodo	ology						P.Rajakumar

Introduction to Woodward Hoffmann rules to concerted reactions, Aromatic, nonaromatic and anitiaromatic systems. Mechanism of photochemical reactions. Synthon, formation of C-C, C=C bonds, disconnection approach, protective groups, sulphur, retero synthetic analysis.

CHE C306	Quantum Chemistry and Macromolecules		4	V.R.Vijayaraghavan
				E.J.Padma Malar / E.Murugan

Schrodinger equation - solutions to particle in a box, SHO, rigid rotar hydrogen atom- approximation methods; MO and VB methods,  $H_2^+$ , MO method for diatomics, HMO method, SCF method, Solids Bonding in solids, Band theory, Properties of solids, low dimensional solids, Macromolecules, molecular weight of polymers, mechanism of polymerization.

CHE E603	Novel Reagents in Organic Synthesis	Е	3	P.C. Srinivasan
				S.Balasubramanian
				M.Bakthadoss

Use of palladium, nickel and silicon in Organic synthesis.

CHE E304	Electrochemistry	and	Electroanalytical	Е	3	K.Chanderasekara Pillai
	Chemistry					P.Riyazuddin

Electrical double layer. Thermodynamics and models, Polarography – Theory and Instrumentation – Derivative Polarography – Amperometry – Cyclic Voltammetry and stripping voltammetry, Potentiometry, Ion selective electrodes, Potentiometric titrations, coulometric titrations – Electrogravimetry – Theory and instrumentation.

CHE E204	Chemistry of Natural Products	Е	3	P.C.Srinivasan
				A.K.Mohanakrishnan

Total syntheis of some examples of alkaloids, steroids and terpenes, Brief introduction to their biogenesis.

CHE E501	Conventional, non-conventional and renewable		3	P. Maruthamuthu
	energy sources and environment.			

Various forms of energy and their interconversion, Information on Ozone hole formation and remeady, the effect of excessive use of energy on environment. Role of solar radiation on pollution control problems.

CHE C307	Proiect Work Viva-Voce	C	6	All Faculty

## M.Sc. POLYMER SCIENCE

Subject code	Title of the course		Credi	ts	
Subject code	The or the course	L	Т	P	C
CHE C 401	Physical Chemistry – I	2	-	-	2
CHE C 402	Organic Chemistry – I	2	-	-	2
CHE C 403	Inorganic Chemistry – I	2	-	-	2
CHE E 401	Introduction to Polymers	3	-	-	3
CHE E 402	Reagents in Organic Synthesis	3	-	-	3
CHE C 404	Practicals – I Physical Chemistry	-	-	2	2
CHE C 405	Practicals – I Organic Chemistry	-	-	2	2
CHE C 406	Practicals – I Inorganic Chemistry	-	-	2	2
CHE C 407	Physical Chemistry – II	2	-	-	2
CHE C 408	Organic Chemistry – II	2	-	-	2
CHE C 409	Inorganic Chemistry – II	2	-	-	2
CHE E 403	Essentials of Polymer Physics	3	-	-	3
CHE E 404	Molecular spectroscopy	3	-	-	3
CHE C 410	Practicals – II Physical Chemistry	-	-	2	2
CHE C 411	Practicals – II Organic Chemistry	-	-	2	2
CHE C 412	Practicals – II Inorganic Chemistry	-	-	2	2
CHE C 413	Polymer Chemistry	4	1	-	4
CHE C 414	Physical Chemistry of Polymers	4	-	-	4
CHE C 415	Polymer Physics	4	-	-	4
CHE E 405	Speciality Polymers	3	-	-	3
CHE C 416	Polymer Practicals	-	-	4	4
CHE C 417	Plastics Technology	4	-	-	4

CHE C 418	Rubber and Fibre Technology	4	-	-	4
CHE E 406	Applied Polymer Science	3	-	-	3
CHE C 419	Research project	-	1	6	6

#### **Courses abstract:**

1	CHE C 401	Physical Chemistry I	4	_	_	
	CIL C TOI	Thysical Chemistry 1	7	_	_	1

Quantum mechanics - valence and structure of molecules - states of matter-gases, liquids and solids - symmetry, group theory and spectroscopy.

Stereochemistry - methods of determining reaction mechanisms - effect of structure on reactivity - the Hammett and Taft equation - nucleophilic substitution and electrophilic substitution reactions - principles and typical examples.

CHE C 403	Inorganic Chemistry – I	2	-	-	2	

Periodic properties and electronic configurations – acids and bases - principles of analytical chemistry - chemistry of hydrides - chemistry of silicates - a comparative study of the transition elements and inner transition elements.

CHE E 401	Introduction to Polymers	3	-	-	3
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Step-growth polymerization – chain-growth polymerization, stereochemistry of polymers - number average, weight average and viscosity average molecular weight of polymers - glass transition temperature of polymers and copolymers.

CHE E 402	Reagents in Organic Synthesis	3	-	-	3

Use of different reagents in organic synthesis and functional group transformations.

CHE C 404	Practicals – I Physical Chemistry	_	l –	2.	2.	

Viscosity of mixtures Cryoscopy, Rast and Ebulioscopy Phase rule - transition temperature, c.s.t., eutectic, compound formation partition Heat of neutralisation, combustion

CHE C 405	Practicals – I Organic Chemistry	_	_	2	2
CHE C 403	riacticals – i Organic Chemistry	_	ı -		<u> </u>

Analysis of two component and three component mixtures, separation and characterization with emphasis on characterization by derivatives.

CHE C 406 Practicals – I	norganic Chemistry -	-	2	2
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Quantitative analysis of inorganic mixtures by gravimetric, titrimetric and colourimetric methods (Mixtures as met with in common ores and alloys).

CHE C 407 Physical Chemistry – II	2	-	-	2	
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Elements of statistical mechanics - electro chemistry - kinetics of chemical reactions -colloids - principles of chromatography - nuclear chemistry.

CHE C 408	Organic Chemistry – II	2	-	-	2
reactions - molec	lical reactions - addition to carbon-carbon and carbon-ox ular rearrangements - oxidation reduction mechanisms - l ands - natural and synthetic polymers - concepts of arom	heterocyclic che			
CHE C 409	Inorganic Chemistry – II	2	-	-	2
Structu	ral inorganic chemistry - coordination chemistry.				
CHE E 403	Essentials of Polymer Physics	3	-	-	3
Physica properties of poly	l aspects of polymer solutions – rheology - kinetic theory	y of rubber elas	ticity -	physical	
CHE E 404	Molecular spectroscopy	3	-	-	3
	ical treatment and applications of rota tional, vibrational notoelectron spectroscopy.	, electronic, ma	gnetic re	esonance,	
CHE C 410	Practicals – II Physical Chemistry	-	-	2	2
	ermination of e.m.f., pH, potentiometric titrations ermination of conductivity – titrations_Kinetics of ester h	ydrolysis - inve	ersion of	cane sug	ar
CHE C 411	Practicals – II Organic Chemistry	-	-	2	2
	nation, diazotization, rearrangements, hydrolysis, reductive ketones, glucose, nitro, amino and methoxy groups and  Practicals – II Inorganic Chemistry		and oxic	2	2
	cro qualitative analysis of common cation and anion Sc, Te, Mo, Ce, Th, Ti, Zr, V, Be, U, Li and Cs. Simpleds.				
CHE C 413	Polymer Chemistry	4	-	-	4
polyaddition, rin	pment of polymer science - radical, ionic, coordinatio g-opening, electrochemical, ring-opening metathesis ferent kinds of polymerization techniques – polymer deg	and group tra			
CHE C 414	Physical Chemistry of Polymers	4	-+	-	4
theoretical consid	al and geometrical structure of macromolecules - cerations and empirical distribution model - molecular velass transition temperature - crystal structures of polyn	veight determin			
CHE C 415	Polymer Physics	4	-	-	4
	l aspects of polymer solutions - rheology and mechanica lasticity description and theories - glassy state and glass		inetic th	eory of ru	lbber
CHE E 405	Speciality Polymers	3	-	-	3
	mers - hyperbranched polymers - non-linear optical and acting polymers - biodegradable polymers	photonic polyi	mers - li	iquid crys	talline

CHE C 416	Polymer Practicals	-	-	4	4		
<ol> <li>Polymer synthesis in bulk 2. Polymer synthesis by suspension method</li> <li>Polymer synthesis by emulsion method 4. Preparation of polyurethane foams</li> <li>Suspension copolymerization 6. IR and NMR spectra of polymers</li> <li>Photopolymerization 8. Kinetics of addition polymerization</li> <li>Verification of Mark-Howinck's equation 10. Thermal analysis of polymers</li> <li>Compression Moulding 12 Injection moulding</li> </ol>							
CHE C 417	Plastics Technology	4	-	-	4		
Additives for plastics - processing techniques - manufacture and properties of individual polymers							
CHE C 418	Rubber and Fibre Technology	4	-	-	4		
		1					

Molecular requirements for a rubber substance - rubber processing - manufacturing of rubber based articles - manufacture, compounding and applications of isoprene, butyl, butadiene, chloroprene, EPDM, thiokol and silicon rubbers - critical considerations for fibre forming materials - spinning methods.

CHE E 406	Applied Polymer Science	3	-	-	3
Adhesiv	es - coatings - Composites.				
CHE C 419	Research project	-	-	6	6

Each student shall undertake a project under the supervision of a faculty member and submit a report which shall be evaluated by the board of examiners consisting of the supervisor, head of the department and an external subject expert. The examiners shall also examine the candidate in a viva-voce examination.

# M.Phil. ANALYTICAL CHEMISTRY

Course Code	Title of the Course	C/E	Credits				Faculty	
			L	T	P	C		
First Semester								
CHE C001	Research Metholdology	С	4	1	0	5	P.Riyazuddin	
CHE C002	Analytical techniques and	C	4	1	0	5	S.Sriman Narayanan	
	Instrumentation – I						T.Raju	
CHE C003	Analytical techniques and	C	4	1	0	5	S. Rajeswari	
	Instrumentation – II							
M. Phil. M. Phil.Second Semester								
CHE C004	Dissertation and viva-voce	С	-	-	-	21	Supervisor	

## M.Phil. INORGANIC CHEMISTRY

Course Code	Title of the Course	C/ E	Credits				Faculty	
			L	T	P	C		
First Semester								
CHE C101	Advanced Inorganic Chemistry	С	4	1	0	5	M.Kandaswamy/P.Ramamurhty V.Narayanan/S.Balasubramanian	
CHE C102	Advanced Organic Chemistry	С	4	1	0	5	P.C.Srinivasan/R.Raghunathan P.Rajakumar	
CHE C103	Advanced Physical Chemistry	С	4	1	0	5	T.Balakrishnan/J.Santhanalakshmi K.Chandra Sekara Pillai/E.Murugan	
Second Semester								
CHE C104	Dissertation and Viva- Voce	С	-	-	-	21	Supervisor	

# M.Phil. ORGANIC CHEMISTRY

Course Code	Title of the Course	C/ E	Credits			Faculty			
			L	T	P	С			
First Semester									
CHE C201	Advanced Inorganic	С	4	1	0	5	M.Kandaswamy/P.Ramamurhty		
	Chemistry						V.Narayanan/S.Balasubramanian		
CHE C202	Advanced Organic	C	4	1	0	5	P.C.Srinivasan/R.Raghunathan		
	Chemistry						P.Rajakumar		
CHE C203	Advanced Physical	C	4	1	0	5	T.Balakrishnan/J.Santhanalakshmi		
	Chemistry						K.Chandra Sekara Pillai		
							E.Murugan		
Second Semester									
CHE C204	Dissertation and Viva-	С	-		-		- 21 Supervisor		
	Voce								

# M.Phil. PHYSICAL CHEMISTRY

Course Code	Title of the Course	C/E	Credits				Faculty		
			L	T	P	C			
First Semester	First Semester								
CHE 301	Advanced Inorganic	C	4	1	0	5	M.Kandaswamy		
	Chemistry						P.Ramamurhty		
							V.Narayanan		
							S.Balasubramanian		
CHE 302	Advanced Organic	C	4	1	0	5	P.C.Srinivasan		
	Chemistry						R.Raghunathan		
							P.Rajakumar		
CHE 303	Advanced Physical	C	4	1	0	5	T.Balakrishnan		
	Chemistry						J.Santhanalakshmi		
							K.Chandra Sekara Pillai		
							E.Murugan		
Second Semester									
CHE 304	Dissertation and Viva- Voce	С	-	-	-	21	Supervisor		