

CH615- Solid State, Nuclear and Main Group Chemistry

COURSE PLAN			
Course Title	Solid State, Nuclear and Main Group Chemistry		
Course Code	CH 615	No. of Credits	3
Department	Chemistry	Faculty	Dr. G.Venkatesa Prabhu Dr.M. Sathiya
Pre-requisites Course Code		NA	
Course Coordinator(s) (if, applicable)		Dr. G.Venkatesa Prabhu Dr.M. Sathiya	
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Course Type	Core Course		
COURSE OVERVIEW			
This is a core inorganic chemistry course for the II-M.Sc. and three credits are awarded for this course. Three lectures will be conducted every week.			
COURSE OBJECTIVE			
To introduce fundamentals and various theories of solid state chemistry, X-ray diffraction method, nuclear chemistry, inorganic rings, and polymers to the students.			
COURSE OUTCOMES (CO)			
Students will learn about solid state chemistry, structural determination through nuclear chemistry, and inorganic rings and polymers.			
COURSE TEACHING AND LEARNING ACTIVITIES			
Sl. No.	Week	Topic	Mode of Delivery
	UNIT I		
1	II-Week July/2017	Types of solids- close packing of atoms and ions- bcc, fcc, and hcp voids- Goldschmidt radius ratio - derivation and its influence on structures - Structures of rock salt- cesium chloride.	C&T, PPT
2	III-Week July/2017	Structures of wurtzite, zinc blende, rutile, fluorite, antiferite, diamond, and graphite. Spinels: normal and inverse spinels and perovskite type solids.	C&T, PPT
3	IV-Week July/2017	Lattice energy of ionic crystals - Madelung constant. Born-Haber cycle and its applications.	C&T, PPT
	UNIT IV		
4	I-Week Aug/2017	Introduction to nuclear chemistry, Mass and charge, nuclear moments, binding energy, mass defect, packing fraction, stability, and magic numbers.	C&T, PPT

5	II-Week Aug/2017	Modes of radioactive decay and rate of radioactive decay- half-life, average life, radioactive equilibrium. Transient and secular-nuclear reactions: Energetics and types.	C&T, PPT
6	III-Week Aug/2017	Nuclear fission, liquid drop model, and nuclear fusion. Nuclear reactor and its essential features and types.	C&T, PPT
7	IV-Week Aug/2017	Tracer techniques, neutron activation analysis: carbon and rock dating. Application of tracers in chemical analysis, reaction mechanisms, medicine and industry.	C&T, PPT
	UNIT II		
8	V-Week Aug/2017	Band theory of solids. Free electron theory, zone theory, MO theory of solids.	C&T, PPT
9	II-Week Sep/2017	Dislocation in solids: Schottky and Frenkel defects. Line defects and plane defects:. non-stoichiometric compounds. Electrical properties: Energy bands, insulators, semiconductors and conductors	C&T, PPT
10	III-Week Sep/2017	Introduction to super conductors, dielectric properties, piezo-electricity, ferro electricity, and conductivity in pure metals. Superconductivity: Occurrence, BCS theory, high temperature super conductors	C&T, PPT
11	IV-Week Sep/2017	Introduction to nanoparticles. Metal nanoparticles. Particle size determination of nanoparticles.	C&T, PPT
	UNIT III		
12	V-Week Sep/2017	X- Ray diffraction: Basics, the seven crystal systems and Bravais lattices and Miller indices and labelling of planes.	C&T, PPT
13	I-Week Oct/2017	Symmetry properties: crystallographic point groups and space groups. X-ray diffraction: powder and rotating crystal methods.	C&T, PPT
14	II-Week Oct/2017	Systematic absences and determination of lattice types. Analysis of X-ray data for cubic system..	C&T, PPT

15	III-Week Oct/2017	Structure factor and Fourier synthesis. Fundamentals of electron diffraction and neutron diffraction	C&T, PPT
UNIT V			
16	IV-Week Oct/2017	Introduction and basics of inorganic rings and polymers: Catenation, heterocatenation, intercalation chemistry. One dimensional conductors and polymeric sulfur nitride. Preparation, properties of isopoly anions and heteropoly anions.	C&T, PPT
17	I-Week Nov/2017	Borazines, phosphazenes, and phosphazene polymers. Ring compounds of sulphur and nitrogen. Interhalogen compounds	C&T, PPT
18	II-Week Nov/2017	Oxoacids of selenium and tellurium. Noble gas chemistry and their halides and pseudohalides.	C&T, PPT

COURSE ASSESSMENT METHODS

Sl. No.	Mode of Assessment	Week/Date	Duration	% of Weightage
1	Assignment 1	Third week of August	NA	5
2	Cycle Test 1	Fourth week of August	60 minutes	20
3	Assignment 2	Third week of September	NA	5
4	Cycle Test 2	Third week of October	60 minutes	20
5	End Semester	Third week of November	180 minutes	50
TOTAL				100

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc.

1. L.V. Azaroff, Introduction to Solids, Mc.Graw hill, New York.
2. A. R. West, Solid State Chemistry and its Applications, John Wiley & Sons, 1984.
3. H. J. Arnikar, Essentials of Nuclear Chemistry, 4th Edn., New Age International Publishers Ltd., New Delhi, 1995.
4. F. A. Cotton, Wilkinson, G. and P. L. Gaus, Basic Inorganic Chemistry, 3rd Edn., John Wiley & Sons, New York, 1995.
5. J. D. Lee, Concise Inorganic Chemistry, 5th Edn., Chapman and Hall, London, 1996.
6. J. E. Huheey, E. A. Keiter and R. L. Keiter, Inorganic Chemistry - Principles of Structure and Reactivity, 4th Edn., Harper Collins, New York, 1993.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

1. Feedback from students during class committee meetings.
2. Anonymous feedback through questionnaire (as followed previously).

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. Test I and II will be conducted in regular classes.
2. If anyone fails to write Test I or II or I and II will have to write a retest which will include all the portions covered at that time.

3. Plagiarism is strictly not allowed.

4. 80% attendance is compulsory for writing the end semester exam. If anyone fails to meet the requirement, special classes will be arranged.

ADDITIONAL COURSE INFORMATION

The respective faculty will be available for consultation at times as per the intimation by the faculty.

Coordinator _____ CC-Chairperson _____ HOD _____