POST GRADUATE DEPARTMENT

UNIVERSITY OF MUMBAI, FORT CAMPUS

Time Table of Post-Graduate lectures for M.Sc. Part-II Semester-IV: Inorganic Chemistry at Zone 1& 2 for the year 2018-2019

(Lectures will commence from 28th January 2019, at WILSON COLLEGE

			Paper-I
DAY/DATE	**Name of the Teacher/College**	**Paper/Unit/No. of Lectures**	**Topic: Properties of Inorganic Solids and Group Theory.**
Monday:2.00-4.00pm Jan : 28. Feb:4,11,18,25 March:4,11,18	Dr.S.Z.Bootwala Wilson College	Paper-I /Unit-I 15 Lectures	1.1Electrical Properties- (a) Electrical properties of solids:(i) Conductivity: Solid Electrolytes; Fast Ion Conductors ; Mechanism of Conductivity;Hopping Conduction. (b) Other Electrical Properties: Thomson and Seebeck Effects; Thermocouples and their applications; Hall Effect; Dielectric, Ferroelectric, Piezoelectric and Pyrroelectric Materials and their Inter-relationships and applications
Saturday: 4.00-6.00pm. Feb:2,9,16,23 March:2,9,16,23	To be announced	Paper-I /Unit-II 15 Lectures	1.2Magnetic Properties. (a) Behaviour of substances in magnetic field, mechanism of ferromagnetic and antiferromagnetic ordering , superexchange, Hysteresis, Hard and soft magnets, structures and magnetic Properties Of Metals and Alloys; Transition metal Oxides; Spinels; garnets, Ilmenites; Perovskite and Magneto plumbites, Application in transformer cores, information storage, magnetic bubble memory devices and as permanent magnets
Thursday: 2.00-4.00pm. Jan : 31. Feb:7,14,21,28 March:7,14,21,28	Dr. H.A.Parbat Wilson College	Paper-I /Unit-III 15 Lectures	1.3 Thermal and Optical Properties a) Thermal Properties: Introduction, Heat Capacitiy and its Temperature Dependance; Thermal Expansion of Metals; Ceramics and Polymers and Thermal Stresses. (b) Optical properties: Color Centres and Birefringence; Luminescent and Phosphor Materials; Coordinate Model; Phosphor Model; Anti Stokes Phosphor; Ruby Laser; Neodymium Laser
Monday:4;00-6.00pm Jan : 28. Feb:4,11,18,25 March:4,11,18	Dr. H.A.Parbat Wilson College	Paper-I/ Unit-IV 15 Lectures	1.4 Applications of group theory to –Electronic structures (a) Recapitulation of Points groups and Character tables. (b) Transformation Properties of Atomic Orbitals; (c) Sigma and pi- molecular orbitals for AB4 (tetrahedral) and AB_6(octahedral) molecules; (d) Ligand Field Theory : Electronic structures of free atoms and ions; Splitting of levels and terms in a chemical environment; Construction of energy level diagrams; Direct product ; Correlation diagrams for d^2 ions in octahedral and tetrahedral ligand field; Methods of Ascending and Descending Symmetry; Hole formalism.

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PAPER-II			
DAY/DATE	**Name of the Teacher/College**	**Paper/Unit/No.of Lectures**	**Topic: Organometallics and main group chemistry**
Tuesday: 2.00-4.00 Jan : 29. Feb:5,12,19,26 March:5,12,19,26	Dr.S.Z.Bootwala Wilson College	Paper-II/Unit-I / 15 Lectures	2.1 Organometallics and main group Chemistry (a) Metal-Metal Bonding and Metal Clusters, (b) Electron Count and Structures of Clusters,, (c) Isolobal Analogy. (d)Organo Palladium and Organo Platinum Complexes (preparations, properties and applications.).
Wednesday: 2.00-4.00 Jan : 30. Feb:6,13,20,27 March:6,13,20,27	Dr.S.Z.Bootwala Wilson College	Paper-II/Unit-II/ 15 Lectures	2.2Applications of Organometallic Compounds (a) Catalysis-Homogenous and Heterogenous Catalysis: Comparison, Fundamental Reaction Steps. (b) Organometallics as Catalysts in Organic Reactions: (i)Hydrosilation, (ii)Hydroborationn. (iii) Water gas Shifts Reaction (iv) Wacker process(Oxidation of alkenes)(v)Alcohol corbonylation (c)Coupling reactions : (i) Heck's reaction (ii) Suzuki reaction
Thursday: 4.00-6.00pm. Jan : 31. Feb:7,14,21,28 March:7,14,21,28	Dr.S.Z.Bootwala Wilson College	Paper-II/Unit-III/ 15 Lectures	2.3 Inorganic cluster and cage compounds (i) Introduction, (ii) Bonding in boranes, (iii)Heteroboranes, (iv) Carboranes, (v) cluster compounds, (vi) electron precise compounds and their relation to clusters
Friday: 2.00-4.00pm. Feb:1,8,15,22 March:1,8,15,22	Dr.S.Z.Bootwala Wilson College	Paper-II/Unit-IV /15 Lectures	2.4 Inorganic ring and chain compounds (15 Lectures) (a) Silicates, polysilicates and aluminosilicates, (b) Phosphazenes, phosphazene polymers (c) Polyanionic and polycationic compounds

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Paper-III			
DAY/DATE	**Name of the Teacher/College**	**Paper/Unit/No.of Lectures**	**Topic : Instrumental methods in Inorganic Chemistry .**
Tuesday: 4.00-6.00 Jan : 29. Feb:5,12,19,26 March:5,12,19,26	Dr. H.A.Parbat Wilson College	Paper-III/Unit-I/ 15 Lectures	3.1 Spectroscopy (a) Infrared spectroscopy: Fundamental modes of vibrations, selection rules, IR absorption bands of metal - donor atom, effect of complexation on the IR spectrum of ligands formations on the IR of ligands like NH_3, CN-, CO, olefins (C=C) and $C_2O_4^{2-}$. (b) Raman spectroscopy: Raman spectroscopy for diatomic molecules.Determination of molecular structures like diatomic and triatomic molecules (c) Applications of Group theory in Infrared and Raman spectroscopy. (c) Molecular Vibrations: Introduction; The Symmetry of Normal Vibrations; Determining the Symmetry Types of the Normal Modes; symmetry based Selection Rules of IR and Raman; Interpretation of IR and Raman Spectra for molecules such as H_2O, BF_3, N_2F_2, NH_3 and CH_4. d) Nuclear Magnetic Resonance Spectroscopy :Introduction to basic principles and instrumentation. Use of ^1H, ^{19}F, ^{31}P, ^{11}B NMR spectra in structural elucidation of inorganic compounds; Spectra of paramagnetic materials: Contact shift, application of contact shift, lanthanide shift reagent
Friday: 4.00-6.00pm. Feb:1,8,15,22 March:1,8,15,22	Dr.S.Z.Bootwala Wilson College	Paper-III/Unit-II/ 15 Lectures	3.2 Microscopy of Surface Chemistry-I Introduction to surface spectroscopy, Microscopy, problems of surface analysis, distinction of surface species, sputter etching and depth profile and chemical imaging ,instrumentations, Ion Scattering Spectra (ISS),Secondary Ion Mass Spectroscopy (SIMS),Auger Emission Spectroscopy(AES),
Saturday: 2.00-4.00pm. Feb:2,9,16,23 March:2,9,16,23	Dr.S.Z.Bootwala Wilson College	Paper-III/Unit-III 15 Lectures	3.3 Microscopy of Surface Chemistry-II ESCA, Scanning Electron Microscopy (SEM),Atomic force microscopy (AFM) and transmission electron microscopy (TEM):Instrumentation and applications.
Wednesday: 4.00-6;00 Jan : 30. Feb:6,13,20,27 March:6,13,20,27	Dr. H.A.Parbat Wilson College	Paper-III/Unit-IV/ 15 Lectures	3.4 Thermal Methods 3.4.1 Application of TGA in Thermal characterization of polymers, quantitative analysis of mixture of oxalates, moisture content in coal, study of oxidation state of alloys etc. 3.4.2 Application of DSC and DTA in determination of thermodynamic parameters such as heat capacity and standard enthalpy of formation of the compounds, investigation of phase transitions, thermal stability of

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		Course Code: PSCHIOC-II 404 **PAPER – IV: RESEARCH METHODOLOGY**	
	Name of the Teacher/ College	Paper/Unit/No.of Lectures	Topic
,	To be announced	Paper-IV/Unit-I/ 15 Lectures	Unit 1 : Print: Primary, Secondary and Tertiary sources. Journals:Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, textbooks, current contents, Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, Formula Index, and other Indices with examples. Digital:Web sources, E-journals, Journal access, TOC alerts, Hot articles, Citation Index, Impact factor, H-index, E-consortium, UGC infonet, E-books, Internet discussion groups and communities, Blogs, preprint servers, Search engines, Scirus, Google Scholar, ChemIndustry, Wiki-databases, ChemSpider, Science Direct, SciFinder, Scopus.Information Technology and Library Resources: The Internet and World wide web, Internet resources for Chemistry, finding and citing published information
	To be announced	Paper-IV/Unit-II /15 Lectures	Unit II: DATA ANALYSIS The Investigative Approach:Making and recording Measurements, SI units and their use, Scientific methods and design of experiments. Analysis and Presentation of Data: Descriptive statistics, choosing and using statistical tests, Chemometrics, Analysis of Variance (ANOVA), Correlation and regression, curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, general polynomial fitting, linearizing transformations, exponential function fit, r and its abuse, basic aspects of multiple linear regression analysis.
	To be announced	Paper-IV/Unit-III/ 15 Lectures	Unit III: METHODS OF SCIENTIFIC RESEARCH AND WRITING SCIENTIFIC PAPERS Reporting practical and project work, Writing literature surveys and reviews, organizing a poster display, giving an oral presentation. Writing Scientific Papers: Justification for scientific contributions, bibliography, description of methods, conclusions, the need for illustration, style, publications of scientific work, writing ethics, avoiding plagiarism.
	To be announced	Paper-IV/Unit-IV	Unit IV: CHEMICAL SAFETY & ETHICAL HANDLING OF CHEMICALS

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			polymeric materials, purity of pharmaceuticals samples, M.P. and B.P. of organic compounds etc. 3.4.3 Basic principle, instrumentation and applications to other thermal methods like Thermomechanical analysis (TMA) and evolved gas analysis (EGA).

Paper-IV Course Code: PSCHIOC-I 404 (INTELLECTUAL PROPERTY RIGHTS &CHEMINFORMATICS			
	Name of the Teacher/ College	Paper/Unit/No.of Lectures	Topic
	To be announced	Paper-IV/Unit-I/ 15 Lectures	Unit 1: [15L] I. Introduction to Intellectual Property: II. Historical Perspective, Different types of IP, Importance of protecting IP. III. Patents:Historical Perspective, Basic and associated right, WIPO, PCT system, Traditional Knowledge, Patents and Health care-balancing promoting innovation with public health, Software patents and their importance for India. IV. Industrial DesignsDefinition, How to obtain, features, International design registration. V. Copyrights: Introduction, How to obtain, Differences from Patents. VI. Trade Marks:Introduction, How to obtain, Different types of marks – Collective marks, certification marks, service marks, trade names etc. VII. Geographical Indications:Definition, rules for registration, prevention of illegal exploitation, importance to India..
	To be announced	Paper-IV/Unit-II /15 Lectures	Trade Secrets: I. Introduction and Historical Perspectives, Scope of Protection, Risks involved and legal aspects of Trade Secret Protection. II. IP Infringement issue and enforcement:Role of Judiciary, Role of law enforcement agencies – Police, Customs etc III. .Economic Value of Intellectual Property:Intangible assests and their valuation, Intellectual Property in the Indian context –Various Laws in India Licensing and Technology transfer. IV. Different International agreements:(a) World Trade Organization (WTO): (i) General

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			Agreement on Tariffs and Trade (GATT), Trade Relate Intellectual Property Rights (TRIPS) agreement(ii) General Agreement on Trade Related Services (GATS) Madrid Protocol.(iii) Berne Convention(iv) Budapest Treaty (b) Paris Convention WIPO and TRIPS, IPR and Plant Breeders Rights, IPR and Biodiversity.
	To be announced	Paper-IV/Unit-III/ 15 Lectures	I. Introduction to Cheminformatics:History and evolution of cheminformatics, Use of Cheminformatics, Prospects of cheminformatics, Molecular modeling and structure elucidation. II. Representation of molecules and chemical reactions:Nomenclature, Different types of notations, SMILES coding, Matrix representations,Structure of Molfiles and Sdfiles, Libraries and toolkits, Different electronic effects,Reaction classification. III. Searching Chemical Structures:Full structure search, sub-structure search, basic ideas, similarity search, three dimensional search methods, basics of computation of physical and chemical data and structure descriptors, data visualization..
	To be announced	Paper-IV/Unit-IV /15 Lectures	Applications: Prediction of Properties of Compound, Linear Free Energy Relations, Quantitative Structure – Property Relations, Descriptor Analysis, Model Building, Modeling Toxicity, Structure – Spectra correlations, Prediction NMR, IR and Mass spectra, Computer Assisted Structure elucidations, Computer assisted Synthesis Design, Introduction to drug design, Target Identification and Validation, Lead Finding and Optimization, analysis of HTS data, Virtual Screening, Design of Combinatorial Libraries, Ligand-based and Structure based Drug design, Application of Cheminformatics in Drug Design.

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		/15 Lectures	Safe working procedure and protective environment, protective apparel, emergency procedure, first aid, laboratory ventilation, safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric pressur, safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives,identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals

(8)

M. Sc.- Part – II (Semester - IV) Inorganic Chemistry 2018-19

NOTE: - Attention of the post-graduate students M. Sc.- (Part - II) (Sem. - IV) is invited to the following:

1. That they will be required to attend in each of the term not less than 75% of the total number of lectures delivered and also not less than 75% of the lectures delivered in each paper.

2. That in addition to attendance at lectures, they will be required to carry out regularly the practical work assigned to them in the laboratory and shall be required to maintain a record thereof in a properly bound journal. The work carried out by the students shall be reviewed by the respective teachers at the end of two terms. In case in the opinion of the Principal of the affiliated colleges or the Head of department of the recognized post-graduate Institution concerned, students has not done satisfactorily the work assigned to him by the respective teachers it shall be open to the Principals of the colleges or Head of the department of the recognized post-graduate institution concerned not to grant the terms to the student even though he might have kept the minimum attendance at the lectures.

N.B. Teachers participating in the scheme of post-graduate teaching and Instruction at the M. Sc. degree course in **Inorganic Chemistry** are hereby informed that no change will be permitted in the venue and timings of the lectures.

Sd/-
Assistant Registrar,
Post Graduate Studies Section

Mumbai – 400 032.
27th February 2019.

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P.S. Teachers participating in the scheme of post-graduate teaching and Instructions in the subject of **Inorganic Chemistry** are requested to submit the attendance rolls in respect of the lectures delivered by them during the academic year 2018-2019 within 15 days after completion of their lectures in the respective terms are over, to the Coordinator at the respective centre.

No. PG/ICD/2018-19 2253 of 2019. 27th February, 2019.

Copy forwarded with compliments to the teachers of the University included in the scheme of post-graduate teaching and instructions at the M. Sc. degree in **Inorganic Chemistry** and the Principals of the respective colleges for information and necessary action.

P.S.Dhumale 27/2/19
Assistant Registrar,
Post Graduate Studies Section

Mumbai – 400 032.
27th February, 2019.

J.Y.Dishe 27-02-2019 K 27/2 27/2/19