SIR PADAMPAT SINGHANIA UNIVERSITY

Udaipur

SCHOOL OF ENGINEERING

Course Curriculum of Ph.D. Degree Programme in Chemistry (Batch-2018-19)

Credit Structure

Category	Credits
Departmental Major Subjects	6
Minor Subject	3
Total	9

Course Structure: Ph.D. Degree (2018-19)

(Departmental Major Subjects)

S. No.	Course Code	Course Title	L	T	P	Credit(s)
1	CH-602	Modern & Conceptual Organic Chemistry	3	0	0	3
2	CH-603	Chemistry of Macromolecules	3	0	0	3
3	CH-604	Recent Developments in Asymmetric Catalysis	3	0	0	3
4	CH-605	Natural Products & Drug Discovery	3	0	0	3
5	CH-606	Advanced Inorganic & Physical Chemistry	3	0	0	3
6	CH-607	Experimental methods in Chemistry	3	0	0	3
7	CH-608	Advanced Spectroscopy	3	0	0	3
8	CH-609	Chemical & Electrochemical Energy Systems	3	0	0	3
9	CH-610	Environmental Toxicology	3	0	0	3
10	CH-611	Total & Stereo selective synthesis of natural products	3	0	0	3
11	CH-612	Chemistry of Medicinal Plants	3	0	0	3
12	CH-613	Basic Chemistry	3	0	0	3

Note: The student has to select the courses of minimum 6 credits from the department & one minor course on Research Methodology.

Detailed Syllabus for Ph.D. Degree Programme in Chemistry

Semester-I

(Departmental Major Subjects)

CH-602 L-T-P-C
Modern & Conceptual Organic Chemistry 3-0-0-3

Objective: *This course aims at understanding the mechanism of various Organic reactions, theories of bonding, explanation of advanced stereochemistry.*

Course Content

Conceptual Organic Chemistry: Review of concepts of inductive effect, electromeric effect, resonance effect, hyper conjugation, the formalism of curved arrow mechanisms. Relationship between thermodynamic stability & rates of reactions - kinetic versus thermodynamic control of product formation – Hammond postulate - kinetic isotope effects with examples - catalysis by acids & bases & nucleophiles with examples from acetal, cyanohydrin & ester formation & hydrolysis reactions - solvent effect, bulk & specific solvent effects - examples of solvent effect from SN2 substitution & E2 elimination reaction - introduction to carbon acids, pKa of weak acids. Concept of aromaticity, delocalization of electrons - Hückel‘s rule, criteria for aromaticity, examples of neutral & charged aromatic systems – annulenes - NMR as a tool for aromaticity - anti- & homo-aromatic systems. Mechanism of electrophilic & nucleophilic aromatic substitution reactions, with examples.

Stereochemistry: Introduction to molecular symmetry & chirality – examples from common objects to molecules – axis, plane, center, alternating axis of symmetry. Stereoisomerism – definition based on symmetry & energy criteria – configuration & conformational stereoisomers. Center of chirality – molecules with C, N, S based chiral centers – absolute configuration - enantiomers – racemic modifications - R & S nomenclature using Cahn-Ingold-Prelog rules – molecules with a chiral center & Cn – molecules with more than one center of chirality definition of diastereoisomers

constitutionally symmetrical & unsymmetrical chiral molecules erythro, threo nomenclature E & Z nomenclature out/in isomers. Axial, planar & helical chirality examples – stereochemistry & absolute configuration of allenes, biphenyls & binaphthyls, ansa & cyclophanic compounds, spiranes, exo-cyclic alkylidenecycloalkanes. Topicity & prostereoisomerism topicity of ligands & faces, & their nomenclature NMR distinction of enantiotopic/diastereotopic ligands. Conformational analysis of acyclic & cyclic systems – substituted n-butanes cyclohexane & its derivatives decalins fused & bridged bicyclic systems conformation & reactivity some examples – chemical consequence of conformational equilibrium - Curtin-Hammett principle.

Text/Reference Books

1. Advanced Organic Chemistry Part A: Structure & Mechanisms, Carey F. A. & Sundberg R. A. 5th Ed.Springer. New York. 2007
2. Mechanism & theory in organic chemistry. Lowry. T. H. &. K. S Richardson. Harper & Row, 2nd Ed.New York, 1981
3. Physical Organic Chemistry. Isaacs N. S. ELBS. 2nd Ed.Longman.UK .1987.
4. Stereochemistry of Organic Compounds. Principles & Applications. Nasipuri D. 2nd Ed. Wiley Eastern. 1994.
5. Stereochemistry. Morris D. G. RSC Tutorial Chemistry Text 1. 2001
6. Stereochemistry of Organic Compounds. Eliel E. L. & Wilen S. H. John Wiley & Sons. New York. 1994.
7. Principles of Biochemistry Jeremy M., John L. & Lubert Stryer 6th Ed. W.H. Freeman & Co. 2006.
8. Lehninger Principles of Biochemistry . Nelson D. L. & M. M. Cox. 5th Ed. W. H. Freeman &Co. 2008
9. Outlines of Bio.chemistry .Conn E.E. Stumpf P. K. Bruening, G. & Doi R.H. 5th Ed. John Wiley & Sons. 2001
10. Harper's Illustrated Biochemistry Murray R.K. McGraw Hill.2001.

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Semester-I

(Departmental Major Subjects)

CH-603 L-T-P-C
Chemistry of Macromolecules 3-0-0-3

Objective: *This course provides in-depth study of various macromolecules & their properties.*

Course Content

Basic concepts - classification, nomenclature, molecular weights, molecular weight distribution, glass transition, degree of crystallinity, morphology, & viscosity-molecular weight, mechanical property - molecular weight relationships. Molecular weights & Methods of determination, molecular weight distribution, size & shape of macromolecules. Intrinsic viscosity, Mark-Houwink relationship. Chain structure & configuration, conformation, size of an ideal chain (freely jointed chain & other models), Real chains, Flory theory. Thermodynamics of polymer solutions. Molecular motion (self-diffusion, hydrodynamic radius, Rouse Model, Zimm Model, entangled polymer dynamics & de Gennes reptation model) Glass transition temperature – elementary theories & methods of determination. Variation of glass transition with structure. Rubber elasticity - concepts, thermodynamic equation of state. Elementary theories of viscoelasticity (Maxwell, Voight). Mechanisms & Methods of Polymerization - Step (condensation) polymerization - Description - Reactivity Functional Groups - Kinetic & thermodynamic considerations - Molecular weight distribution. Chain polymerization, controlled radical polymerizations (INIFERTER, ATRP, RAFT, SET). Living Polymerizations. Ziegler-Natta & metathesis polymerizations.

Text/Reference Books

1. Introduction to Polymers.Young R. J. & Lovell P. A. 2nd Ed. Chapman & Hall 2002.

2. Textbook of Polymer Science Billmeyer F. W. 3rd Ed. John Wiley. 1994.
3. Textbook of Polymer Science Gowarike V. R. Viswanathan,N. V. New Age International. 2005.
4. Principles of Polymerization Odian G., 4th Ed. Wiley-Interscience. 2004.
5. Introduction to Physical Polymer Science. Sperling L. H. Wiley- Interscience, 1986.
6. Polymer Physics. Rubinstein M. & Colby R. A.Oxford University Press 2003.

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Semester-I

(Departmental Major Subjects)

CH-604 L-T-P-C
Recent developments in Asymmetric Catalysis 3-0-0-3

Objective: *This course provides the broad spectrum of recent developments in Asymmetric Catalysis.*

Course Content

Asymmetric catalyst in organic synthesis, stereoselective catalytic reduction-homogenous hydrogenation, Stereoselective heterogenous hydrogenation, transfer hydrogenation,stereoselective oxidation.Determination of Enantiomeric purity, various tools, chiral derivatising agents, chiral shift reagents, chiral solvating agents.Asymmetric methodologies, a symmetric aldol, epoxidation, allylation & alkylation reactions.Stereoselective Transformations: Stereoselective synthesis of tri- & tetra-substituted olefins; Synthetic applications of, Claisen rearrangement & its variants, aza-Cope rearrangement (Overman rearrangement), ene reaction (metallo-ene; Conia ene); Prins reaction, Construction of Ring Systems: Different approaches towards the synthesis of three, four, five & six-membered rings; photochemical approaches for the synthesis of four membered rings, oxetanes & cyclobutanes. Diels-Alder reaction (inter- & intramolecular), ketene cycloaddition (inter- & intramolecular), Pauson-Kh& reaction, Bergman cyclization; Nazarov cyclization, cation-olefin cyclization & radical-olefin cyclization, inter-conversion of ring systems (contraction & expansion); construction of macrocyclic rings, ring closing metathesis. Retrosynthetic Analysis: Basic principles & terminology of retrosynthesis, synthesis of aromatic compounds, one group & two group C-X disconnections, one group C-C & two group C-C disconnections, amine & alkene

synthesis, important strategies of retrosynthesis, functional group transposition, important functional group interconversions

Text/Reference Books

1. Advanced Organic Chemistry Part A & B Cary F. A. & Sundberg R. I. 5th Ed. Springer 2009.
2. Organic Synthesis. Smith M. B, 2nd Ed. 2005
3. Organic Synthesis .Warren S. The disconnection Approach. John Wiley & Sons 2004.
4. Palladium Reagents & Catalysts, New Perspectives for the 21st Century. Tsuji, J.John Wiley & Sons. 2003.
5. Catalytic Asymmetric Synthesis Ojima,I. 2nd Ed. Wiley−VCH New York 2000.
6. Modern Methods of Organic Synthesis Carruthers W. Cambridge University Press. 1996.
7. Organic Chemistry. Clayden Greeves J. N. Warren S. & Wothers P. Oxford University Press. 2001.
8. Asymmetric Catalysis in Organic Synthesis. Noyori,R. John Wiley & Sons.1994.
9. Strategic Applications of named Reactions in Organic Synthesis Kuerti L. & Czako B.Elsevier Academic Press, 2005.

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Semester-I

(Departmental Major Subjects)

CH-605 L-T-P-C
Natural products & Medicinal Chemistry 3-0-0-3

Objective: *This course provides the broad spectrum of chemistry of natural products which are very important for medical & health purpose. The classification, isolation & synthesis of alkaloids,purines & caffeine have been explained in this paper.*

Course Content

Natural Products-Classification,isolation, synthesis & structural elucidation of terpenoids, alkaloids & purines. Terpenoids : Alkaloids :Papaverine, Nicotine, Quinine & Atropine.Purines : Caffeine.Occurance,isolation, & biosynthesis of mono, di-terpenoids, flavonoids & alkanoids.Drug Discovery, Design & Development. Structure-activity relationships: Strategies in drug design. QSAR & combinatorial synthesis. Optimization of drug-target interactions & access to drug targets. Pro-drugs & drug delivery systems. Illustration of drug development through specific examples: a) Antibacterials: sulfonamides & penicillins b) Antivirals: case studies with inhibitors of reverse transcriptase (nucleoside reverse transcriptase- & non-nucleoside reverse transcriptase inhibitors) & protease inhibitors. c) Anticancer agents: antimetabolite-based approaches, those which affect signaling pathways or structural proteins such as tubulin. Drug resistance, Drug synergism & combination therapy.

Text/Reference Books

1. A guide book to mechanisms in Organic chemistry by Peter Sykes : ELBS.
2. Organic chemistry, Finar I.L Vol. I 6^{th} Ed. & Vol. II. 5^{th} Ed. ELBS.
3. Organic chemistry . Mukherjee S & Kapoor, Vol. I.& II, Wiley Eastern.
4. Reaction mechanism in Organic chemistry. Mukerjee & Singh, Macmillan India.
5. Organic spectroscopy by William K .2^{nd} Ed.ELBS.

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Semester-I

(Departmental Major Subjects)

CH-606 L-T-P-C
Advanced Inorganic & Physical Chemistry 3-0-0-3

Objective: *This course gives idea about basic quantum mechanics-Functions & operations postulates of quantum mechanics.*

Course Content

Basic quantum mechanics-Functions & operations postulates of quantum mechanics-Schordinger equation-physical significance of wave function-Radial dependence curves-Radial probability distribution curves & their significance-Angular functions.Applications of Schrodinger's equation to a particle in a one dimensional box. Introduction, classification, laws of crystallography, crystallographic systems, space lattice, types of lattices, Brags Equation, Fourier synthesis, X-ray spectrometer, lane photograph, Rotating crystal method, Powder method, Neutron Diffraction, Heat capacities of solids, Molar heat capacities, application, quantum theories of specific heats (Einstein Equation, Debye equation) Born Hager cycle, cohesive energy Ionic crystal.Surface phenomena: Structure of clean surfaces; Notation of surface structure; Structure of adsorbate layers; Stepped surfaces; Surface relaxation & reconstruction; Dynamics & energetics of surfaces. Heterogeneous Catalysis: Adsorption isotherms, surface area, pore size & acid strength measurements; Porous solids; Catalysis by metals, semiconductors & solid acids; Supported metal catalysts; Catalyst preparation, deactivation & regeneration. Model catalysts: Ammonia synthesis; Hydrogenation of carbon monoxide; Hydrocarbon conversion.Instrumental methods of catalyst characterization: Diffraction & thermal methods; spectroscopic & microscopic techniques.

Text/Reference Books

1. Physics at Surfaces. Zangwill,A. Cambridge Univ. Press. 1988.
2. Catalytic Chemistry Gates B. Wiley, 1992.
3. Physical Chemistry of Surfaces Adamson A.W. Wiley. 1997.
4. Principles & Practice of Heterogeneous Catalysis Thomas J. M. & Thomas,W.J. Wiley-VCH 1997.
5. Surface Science: Foundations of Catalysis & Nanoscience Kolasinski K.W.Wiley 2002.
6. Heterogeneous Catalysis Chakrabarty D.K. & Viswanathan B. New Age. 2008.
7. Introduction to Surface Chemistry & Catalysis Somorjai G.A. Li Y. Wiley. 2010.
8. Physical chemistry of surfaces .Arthur W. Wiley 1990 .
9. Chemical kinetics & catalysis Masel R.I..Wiley-Interscience 2001.
10. The chemical physics of surfaces . MorrisonRoy S.& S. Roy.1990.
11. An introduction to chemisorption & catalysis by metals" Gasser R.P.H. 1985.
12. Modern techniques of surface science Woodruff D.P. Delchar T.A. Cambridge Univ. Press. 1994.
13. Introduction to Scanning Tunneling Microscopy Chen C. J.Oxford University Press. New York. 1993.

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Semester-I

(Departmental Major Subjects)

CH-607 L-T-P-C
Experimental methods in Chemistry 3-0-0-3

Objective: *This course explains various experimental methods used in Chemical analysis.*

Course Content

Vacuum & Gas Pressure: Concepts of vacuum (Low, medium, high & ultra-high vacuum; vacuum pumps & gauges; pressure measurements;); kinetic theory concepts (molecular density; mean free path of particles in the gas phase; incident molecular flux on surfaces; gas exposure; sticking coefficient; surface coverage; variation of parameters with pressure). Over layers & Diffraction: Two-dimensional lattice; reciprocal space; over layer structure; low energy electron diffraction (LEED). Imaging & Depth Profiling: Basic concepts in surface imaging; secondary electron microscopy (SEM); secondary Auger microscopy (SAM); scanning probe microscopy (SPM); scanning tunneling microscopy (STM); transmission electron microscopy (TEM); surface imaging; depth profiling. Associated techniques of microscopy & spectroscopy. Chemical Analysis: *Non-destructive techniques*: Wavelength & energy dispersive X-ray fluorescence spectroscopy (WDS & EDS); X-ray absorption spectroscopy (XANES & EXAFS); secondary ion mass spectrometry (SIMS); temperature programmed desorption (TPD); thermal desorption spectroscopy (TDS). *Destructive techniques*: Atomic absorption spectroscopy (AAS); inductively coupled plasma-atomic emission spectroscopy (ICP-AES). Electroanalytical Techniques: Voltametry; coulometry; amperometry; potentiometry; polarography; electrolytic conductivity; impedance spectroscopy. Separation Methods: Normal & reversed phase liquid chromatography (NP- & RP-LC); Gas Chromatography (GC); GC-MS; High Performance Liquid

Chromatography (HPLC); Size-Exclusion Chromatography (SEC); Ion Chromatography (IC).

Text/Reference Books

1. *Scanning Probe Microscopy & Spectroscopy* Wiesendanger R. Cambridge University Press.1994.
2. Handbook of instrumental techniques for analytical chemistry Settle &Frank A. Prince Hall. New Jersey. 1997.
3. Surface science: Foundations of catalysis & nanoscience Kolasinski, K. W. John Wiley & Sons West Susses. 2002.
4. Fundamentals of analytical chemistry. Skoog D. A.West D. M. Holler F. J. & Couch S. R.Brooks/ColeCengage learning, New Delhi, 2004.
5. Atkins Physical chemistry Atkins P. & Paula J. 8t^{h} Ed. Oxford University Press 2008.
6. Nano: The Essentials Pradeep T. McGraw-Hill Education 2010.
7. Electroanalytical Methods Scholz F.2nd Ed. Springer 2010.

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Semester-I

(Departmental Major Subjects)

CH-608 L-T-P-C
Advanced Spectroscopy 3-0-0-3

Objective: *This course introduces the students about the application of advanced spectroscopic techniques*

Course Content

NMR phenomenon, spin ½ nuclei, (1H, 13C, 31P & 19F), 1H NMR, Zeeman splitting, effect of magnetic field strength on sensitivity & resolution, chemical shift ∂, inductive & anisotropic effects on ∂, chemical structure correlations of ∂, chemical & magnetic equivalence of spins, spin-spin coupling, structural correlation to coupling constant J, first order patterns. Second order effects, examples of AB, AX & ABX systems, simplification of second order spectrum, selective decoupling, use of chemical shift reagents for stereochemical assignments. 13C NMR, introduction to FT technique, relaxation phenomena, NOE effects, 1H & 13C chemical shifts to structure correlations. Study of dynamic processes by VT NMR, restricted rotation (DMF, DMA, biphenyls, annulenes), cyclohexane ring inversion, degenerate rearrangements (bullvalene & related systems). Multinuclear NMR of B, Al, Si, F & P nuclei; structure & dynamics of representative inorganic molecules, deriving activation & thermodynamic parameters; application of NMR to magnetism & magnetic susceptibility measurements of paramagnetic metal complexes.Electronic spectroscopy, basic principle, electronic transitions in organic, inorganic & organometallic molecules & application to structure elucidation. Electron paramagnetic resonance (EPR) spectroscopy of inorganic compounds with unpaired electrons - determination of electronic structure, Zeeman splitting, g-values, hyperfine & super hyperfine coupling constants, practical considerations of measurements, & instrumentation. Infrared & Raman spectroscopy of

simple inorganic molecules, predicting number of active modes of vibrations, analysis of representative spectra of metal complexes with various functional groups at the coordination sites; application of isotopic substitution, organic functional group identification through IR spectroscopy. Mass spectrometry, basic principles, ionization techniques, isotope abundance, molecular ion, fragmentation processes of organic molecules, deduction of structure through mass spectral fragmentation, high resolution MS, soft ionization methods, ESI-MS & MALDI-MS, illustrative examples from macromolecules & supramolecules, studies of inorganic/coordination & organometallic representative compounds. Mossebauer spectroscopy - Mossebauer effect, recoilless emission & absorption, hyperfine interaction, chemical isomer shift, magnetic hyperfine & quadruple interaction & interpretation of spectra. Structure elucidation problems using the above spectroscopic techniques.

Text/Reference Books

1. Electron Paramagnetic Resonance of Transition Metal ions. Abragam A. Bleaney B. Oxford University Press. 1970.
2. Physical Methods for Chemist. Drago R. S. Saunders. 1992.
3. Fundamentals of Molecular Spectroscopy, Banwell C. N. & . McCash, E. M 4th Ed. McGraw-Hill. 1994.
4. NMR Spectroscopy. Gunther H. 2nd Ed.John Wiley & Sons. 1995.
5. Spectroscopic identification of organic compounds, Silverstein R. M. Bassler,G.C.& . Morril T. C. John Wiley.1991.
6. Spectroscopic methods in organic chemistry. Williams D. H. Fleming I. Tata McGraw Hill. 1988.
7. Organic Spectroscopy, Kemp W., 2nd Ed., ELBS-Macmillan 1987.

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Semester-I

(Departmental Major Subjects)

CH-609 L-T-P-C
Chemical & Electrochemical Energy Systems. 3-0-0-3

Objective: *This course explains about the various available energy resources.*

Course Content

Available energy options, their advantages & disadvantages. Environmental effects, comparative evaluation of energy options & energy needs. Fossil fuels: petroleum, natural gas & coal - Origin, processing & production of value added products - available current conversion technologies. Nuclear Energy: Principles of Fission - Fission reactors, U enrichment & processing of spent fuels. Nuclear reactor kinetics & control - nuclear fusion - magnetic & other confinement - evaluation of the option of nuclear energy. Electrochemical power sources - theoretical background on the basis of thermodynamic & kinetic considerations. Primary cells - various types, especially magnesium & aluminium based cells - magnesium reserve batteries. Secondary cells: classification based on electrolyte type, temperature of operation on the basis of electrodes - chemistry of the main secondary batteries - Batteries for electric vehicles - present status. Fuel cells - classification - chemistry of fuel cells - detailed description of hydrogen/oxygen fuel cells - methanol - molten carbonate solid polymer electrolyte & biochemical fuel cells. Solar energy conversion devices - photovoltaic cells - photoelectrochemical cells - semiconductor electrolyte junctions photocatalytic modes for fuel conversion process - photobiochemical options. Hydrogen as a fuel - production (thermal, electrolysis, photolysis & photoelectrochemical) storage & applications of hydrogen storage. Other methods of energy conversion: processes especially in the form of storage as chemical energy.

Text/Reference Books

1. Modern Batteries Vincent C. A. Edward Arnold. 1984.
2. Chemical & Electrochemical energy systems Narayanan R. & Viswanathan,B. Orient Longmans. 1997.
3. Basic Nuclear Engineering Sriram K., Wiley Eastern. 1990.
4. Fuel cell Hand Book Appleby A. S. J. & Foulkes F. K.Von Nostr& Reinhold. 1989.
5. Hand book of batteries & Fuel cells Linden D. McGraw Hill Book Company 1984.
6. Solar Hydrogen energy systems Ohta T., Peragamon Press 1979.
7. Energy Resources through photochemistry & catalysis Gratzel,M. Academic Press.1983.
8. Energy Technology Sources Systems & Frontiers conversions Ohta, , T. Pergamon. 1994.
9. The chemistry & technology of petroleum Speight, J. G. Marcel Dekker Inc.1980.

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Semester-I

(Departmental Major Subjects)

CH-610 L-T-P-C
Environmental Toxicology. 3-0-0-3

Objective: *This course aims at introducing the students about the environmental toxicology due to heavy metals, toxic effects of insecticides & other pollutant*.

Course Content

Environmental Toxicology, a detailed study of the following topics will be made on heavy metals: (1) Properties & occurrence (2) Production (3) Industrial uses (4) Metabolism & Physiology (5) Toxicology (6) Prophylaxis (7) Therapy.Aluminum, antimony arsenic, barium, beryllium, bismuth, cadmium, chromium, cobalt, copper, lead, magnesium, manganese, mercury, molybdenum, nickel, platinum, rubidium, silver, tin & zinc.In addition, toxic effects of insecticides & other pollutants will be studied on humans & other mammals.

Text/Reference Book

1. Environmental Toxicology. David. A & Pamela.W. ISBN9780521588607.2002.

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Semester-I

(Departmental Major Subjects)

CH-611 L-T-P-C
Total &Stereo selective synthesis of Natural products 3-0-0-3

Objective: *The aim of this paper is to introduce to the students about the synthesis of complex organic molecules & brief explaination about heterocyclic Chemistry.*

Course Content

General concepts on various types of organic reactions. Applications of those reactions in the synthesis of chiral compounds & industrially important molecules.

Synthesis of complex natural products-planning & extraction concepts of retrosynthetic analysis,total synthesis of natural products/retrosynthesis, disconnections, synthones, linear & convergent synthesis.Broad classification of natural products. Isolation, biosynthesis & stereo/enantio-selective synthesis of representative examples from the domain of Alkaloids, Steroids, Terpenes, Hormones, Pheromones, Macrolides, Penicillins & Prostagl&ins. Synthesis of lead molecules based on natural products for different therapeutic areas

Text/Reference Books

1. Classics in Total Synthesis by Nicolaou K. C. & Sorensen E. J. VCH 1996.
2. Classics in Total Synthesis II, . Nicolaou K. C & Snyder S. A. VCH. 2003.
3. Natural Products Chemistry & Applications, Bhat S.V. Nagasampagi B. A. & Meenakshi. S Narosa Publishing House. 2009
4. Classics in Stereoselective Synthesis by , E. M Carreira. Kvaerno L. Wiley VCH, 2009.

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Semester-I

(Departmental Major Subjects)

CH- 612 L-T-P-C
Chemistry of Medicinal Plants 3-0-0-3

Objective: *Plant derived natural products play critical roles in modern drug discovery especially for anti-cancer, anti-asthmatic, anti-infective diseases. This course aims at the study of biosynthesis & structure elucidation of naturally occurring secondary metabolites & its importance in drug discovery.*

Course Content

Isolation, occurrence, biosynthesis of mono, sesqui & di terpenoids, flavonoids & alkaloids, steroids & saponins: sources, biological significance & structure elucidation of saponins & steroids, squalene biosynthesis, importance of medicinal plants for drug discovery, naturally occurring antimalarial drugs , anticancer drugs, anti HIV agents, role of natural products in drug discovery, modern drug discovery & development

Text/Reference Books

1. Stereochemistry & the Chemistry of Natural Products (Vol - 2) Finar I. L. 5th Ed. Pearson India. 2002
2. Organic Chemistry (Vol1) Finar I. L. 6th Ed. Pearson India. 2002
3. Glossary of Indian medicinal plants with Supplement Chopra R N. Nayar L Chopra S I C. Asolkar L V K& Kakkar K.: Council of Scientific & Industrial Research New Delhi. 1956-92.
4. The Treatise on Indian Medicinal Plants. Chatterjee A & Pakrashi S.C. (Vol-I), NISCAIR. New Delhi. 2005
5. An Introduction to Medicinal Chemistry Patrick Graham L. Oxford University Press 1995

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Semester-I

(Departmental Major Subjects)

CH- 613 L-T-P-C
Basic Chemistry 3-0-0-3

Objective: *The aim of this course is to provide students with the basic foundation in structural, physical, organic & medicinal chemistry needed to develop an understanding of biological systems & drugs at a molecular level.*

Course Content

Chemical Equilibrium & Chemical Thermodynamics, Covalent bonding in simple Electronegativity & its relation to bond polarity, ionic vs. covalent bonding, The role of non-covalent interactions between molecules in determining the properties of condensed-phase & biological materials., How molecular liquids behave as solvents, in particular their differing polarity, The properties of water as nature's solvent, in particular the dissociation Spectroscopy & Quantification:, Infrared (IR) spectroscopy , UV-visible spectroscopy & electronic structure, Nuclear Magnetic Resonance (NMR) spectroscopy : basic concepts , Chemical & Biological Kinetics: Nature & scope of kinetics, Catalysts, Stereochemistry, Introduction to drug discovery (Medicinal Chemistry Approach): Drug action at enzymes, Drug action at receptors, Nucleic acids, Drug target, discovery & development Screening of natural products, Isolation & purification , Structure determination , Structure-activity relationships, Synthetic analogues, Receptor theories, Lead compounds , case study, Pharmacodynamics, Quantitative structure-activity relationships (QSAR)

Text/Reference Books

1. Physical Chemistry. Atkins P. W. 5th Ed. ELBS. 1994
2. Physical Chemistry. Levine I. A. 4th Ed. McGraw-Hill.1995.
3. Bioprocess Engineering Principles. Doran P.M. 2nd Ed. Academic Press.2013

4. Fundamentals of Molecular Spectroscopy. Banwell C. N. & McCash E. M. 4th Ed. McGraw-Hill. 1962.
5. Advanced Inorganic Chemistry. Cotton F. A. & Wilkinson G. 3rd Ed . Wiley Eastern Ltd. 1972.
6. Organic Chemistry : Stereochemistry & the Chemistry of Natural Products
7. Finar I. L.(Vol-2) 5th Ed. Pearson India. 2002.
8. An introduction to Medicinal Chemistry. Patrick G.L. 5th Ed. Oxford University Press.1995.