School of Chemical Sciences,
North Maharashtra University, Jalgaon

Syllabus of the course offered under Choice Based Credit System (CBCS) for first year PG students from other Schools of North Maharashtra University (With effect from academic year 2015-16)

Medium of Instructions and Examination: English.

Number of Credits: 04.

Total number of Teaching Hours: 50 Hours Theory Lectures.

Examination : Internal Assessment: 40 Marks **Term End External Exam:** 60 Marks

Result Declaration: Grade points of this course earned by the student will be considered in CGPA calculation.

This course is offered for first year PG students from following tick marked Schools of NMU Campus in Semester-I as well as Semester-II			
MS: School of Mathematical Sciences	✓	**MGS:** School of Management Studies	
COS: School of Computer Sciences	✓	**SS:** School of Social Sciences	
PS: School of Physical Sciences	✓	**SL:** School of Languages Studies and Research Centre	
LS: School of Life Sciences	✓	**AH:** School of Arts and Humanities	
CS: School of Chemical Sciences		**ED:** School of Education	
EES: School of Environmental and Earth Sciences	✓	**TH:** School of Thoughts	

Syllabus
CS-001: Fundamental of Chemical Sciences

[50 Hrs, 60 Marks]

Unit-I: General Chemistry **[10 hrs]**

A) Atomic Structure: Discovery of atom, Rutherford atomic model, Bohr's theory and its limitation. (2 hrs)

B) Organic reaction Mechanism: Types of organic reactions, Reactive intermediates.

(2 hrs)

C) Coordination Chemistry: Ligand, Metal complexes/ Chelates, Metal complexes in biological system- Haemoglobin, Myoglobin, Chlorophyll. (2 hrs)

D) Statistical analysis: Accuracy, Precision, Error, Average, mean, deviation, standard deviation, Q-test, t-test, F-test. (2 hrs)

E) Instrumental Analysis: Applications of NMR, IR, UV-Visible, Mass spectroscopies, XRD, SEM, TEM. (2 hrs)

Unit-II: Polymer Chemistry [10 hrs]

A) Definitions of polymer, polymerization, and monomer, Types of polymerization (chain and step polymerizations), Types of polymers based on their applications – plastics, elastomers, fibers and resins.

B) Plastics – Definition, thermoplastic and thermosets, their differences, applications of plastics. Examples of plastics – polyethylene (PE), polypropylene (PP) and poly(vinyl chloride) (PVC) [synthesis, important properties and applications as plastics].

C) Elastomers – Definition, vulcanization of rubbers, applications of rubbers. Examples of rubber- natural rubber and styrene butadiene rubber [synthesis, important properties and applications as elastomers]

D) Fibers – Definition, applications of fibers. Examples of fibers – polyethyleneterephthalate (PET) [synthesis, important properties and applications as fibers]

Unit-III: Pesticides And Agrochemicals [10 hrs]

A) Pests – Concept, types of pests, categories of Pests - agricultural, stored grain, public health, structural pests etc. (01 hrs.)
B) Pest control - Natural and Applied controls & Integrated Pest Management. (01hrs.)
C) Agrochemicals - Definition and classification. Classification of pesticides based on target species, mode of action and chemical nature with examples. Generations of pesticides, their effects on ecosystem, Insect growth regulators. (03 hrs)
D) Pesticides Formulations – Necessity, types of formulations and examples. (02 hrs)
E) Pesticide Toxicity - LD_{50} & LC_{50} values, Acute, chronic, oral, dermal, inhalation toxicity, pesticide hazards, mode of entry, antidotes and safety measures, categories & warning symbols. (03 hrs.)

Unit-IV: Industrial Chemistry [10 hrs]

A) Unit Operation and Unit process: Definition and examples (each 3) (1 hrs)
B) Chemical Industry: Introduction, Raw materials and Sources, Products of chemical industry, necessary factors to start chemical industry. (2 hrs)
C) Industrial hazards: Introduction, Chemical hazards(Toxicity, flammability, Corrosivity), Operation hazards(Pressure, Temperature, Ignition, Explosion, Noise), Industrial hazardous waste management. (4 hrs)
D) Green Chemistry: Introduction, Principles of green chemistry with example (each one). (3 hrs)

Unit-V: Basic concept in Analytical chemistry: [10 hrs]

A) Definitions of the Seven Base Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity), Derived units, Conversion between units, Significant figures.

B) Chemical concentrations i) Mole, molar mass ii) Calculations in grams and moles iii) Solutions and their concentrations: a) Molar concentration, b) Analytical molarity c) Equilibrium molarity of a particular species, d) Percent concentration, e) Parts per million/billion (ppm, ppb), f) Volume ratios for dilution procedures

C). Preparing solutions: standard solutions, primary standards, secondary standards.

D) **Separation Techniques**.
Precipitation and crystallization, Diffusion, Floatation, Ultra centrifuge.

E) **Chromatography** - Chromatography, theory of chromatography, Types of chromatography hyphenated techniques GC-MS, LC-MS,

References:

1) Unit Processes in Organic Synthesis- P. H. Groggins
2) Green Chemistry: Theory & Practice P. T. Anastas & J. C. Warner
3) Comprehensive Industrial Chemistry- P. G .More
4) Organic Synthesis: Special Techniques V. K. Ahluwalia and Renu Aggarwal
5) Quantum Chemistry, R. K. Prasad, Wiley Eastern Ltd, 1992.
6) Physical Chemistry, G. M. Barrow, 5th Edition, 2007.
7) Principles of Inorganic Chemistry; Late B.R. Puri, L.R. Sharma & K.C. Kalia.
8) Concise Inorganic Chemistry, 5th edition J. D. Lee.
9) Principles of Polymerization: G. Odian, John Wiley & Sons, 2001.
10) Polymer Science, V. R. Gowarikar, New Age International Pvt. Ltd., New Delhi, 1997.
11) Principles of Polymerisation, P. Bahadur, N. V. Sastry, Narosa Publishing House, New Delhi, 2002.
12) Principles and Practice of Analytical Chemistry-Fifield F.W. and KealeyD, Blackey Academic.
13) Analytical Chemistry, Kellneretal, Wiley VCH
14) Analytical Chemistry-Christain G.D, Wiley WSE.
15) Deans Analytical Chemistry Handbook – Patnaik,
16) Mcgraw Hill Co.Fundamentals of Analytical Chemistry-Skoog D.A and West D.M,Saunders.
17) Chemistry of Insecticides and Fungicides : U.S.Shree Ramulu Oxford& IBH Pub., 2nd, 1995.
18) Principles of Pesticide Chemistry : S. K. Handa, Ed. By Agrobios (India), 2008.
19) Agrow Reports : New Developments in Crop Protection Product Formulation – Alan
20) Knowles,DS243, Pub : T & F Informa UK, 2005.
21) Manual for pesticides users- Salil Singhal : Pesticides Association of India, New Delhi, 1989.

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