



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to Barkatullah Vishvavidhyalaya, Bhopal)

DEPARTMENT OF APPLIED CHEMISTRY

Subject Code		AC 201		Subject Name		CHEMISTRY OF HIGH POLYMERS	
Marks Allotted				Duration of Theory Paper	Weekly Contact Hours		
Theory					L	T	
Maximum Marks		Minimum Marks		3 Hours	3	1	
End Sem	Sessional	End Sem	Sessional		3	1	
80	20	21*	12		3	1	
Total Minimum in Theory* 40% = 128							
Syllabus Description							Hrs
UNIT I – FUNDAMENTALS OF POLYMER CHEMISTRY Importance of monomers and polymers, Basic concepts of polymer science, Nomenclature of polymers, inter molecular forces and chemical bonding in polymers, concept of functionality, Polymerization process: Addition & condensation, classification of polymers (Chain/step growth polymers) organic-inorganic, natural- synthetic, polar non-polar with suitable examples, types of polymers. Nomenclature of polymers, names based on source, based on structure (IUPAC and Non IUPAC) Trade names. Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.							8
UNIT II – PRINCIPLES OF POLYMERIZATION Basic regularities of polymerisation, Multiple bonds and ring opening, Addition polymerization free radical, anionic, cationic and coordination polymerisation, Mechanism of vinyl and diene compounds, Ring opening 'living' methods (group transfer polymerization. synthesis of graft and block copolymers. Miscellaneous polymerization reactions Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.							8
UNIT III – TECHNIQUES OF POLYMERIZATION Homogeneous system: Bulk, solution, gas phase polymerization. Heterogeneous system: Suspension, precipitation, emulsion, inverse emulsion, dispersion, melt, interfacial (phase transfer catalyzed interfacial polymerization) and solid state polymerization. Merits and limitations of each process. Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.							
UNIT IV- PHYSICAL PROPERTIES OF HIGH POLYMERS Average molecular weight determination, degree of polymerization, poly-dispersity, crystallinity, glass transition temperature, physical significance of molecular weight and size, mechanical and other ultimate properties of polymer. Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.							8
UNIT V-COMMERCIAL POLYMERS Plastics: Manufacture, properties and applications of Polyethylene, polystyrene, Polyvinylchloride, Nylon-6,6, Bakelite, PET, Ureaformaldehyde resin. Technological							8

importance of plastics. Rubber and Elastomers: Chemical nature, sources, types, properties and uses of natural rubber, rubber compounding, reclaimed rubber, preparation, properties and uses of Buna-S and Buna-N rubber, polyurethane rubber. Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.	
Total Hours	40
TEXT BOOKS:	
<ul style="list-style-type: none"> • Polymer Science V. R. Gowariker, N. V. Vishwanathan and J. Sreedhar. Wiley Eastern Limited, Seventh Reprint(1995). • Principles of Polymer Science F. W. Billmeyer, Jr. • Principles of Polymer Chemistry P. J. Flory • Principles of Polymerization G. Odian, Wiley-Interscience Publication(1997) • Synthesis of Polymers: A Comprehensive Treatment Ed: A. D. Schuler (1991) Wiley-VCH 	
REFERENCE BOOKS:	
<ul style="list-style-type: none"> • Principles of Polymer Chemistry, Second Edition A. Ravve, Kluwer Academic Publishers (2000) ISBN 0-306-46368-7 • Polymer Synthesis: Theory and Practical D. Braun, H. Cherdron and H. Ritter, Springer, Heidelberg(2001) ISBN: 3-540-41697-8. • Polymer Science and Technology J. R. Fried, Practice-Hall(1995) • Polymer Chemistry-An Introduction R. B. Seymour and C. E. Carraher, Jr. Marcel Dekker Inc. New York. • Anionic Polymerization: Principles and Practical Applications H. L. Hsieh & R. P. Quirk. Marcel Dekker, Inc. New York(1996) • Cationic Polymerizations, Mechanisms, Synthesis and Applications Ed. K. Matyjasezewski. Marcel Dekker, Inc; New York(1996). 	
List/Links of e-learning resource	
<ul style="list-style-type: none"> • https://nptel.ac.in/course.html • https://iln.ieee.org/resources/e-learning • https://learncheme.com/ 	
Recommendation by Board of studies on	8.3.2022 (Tuesday)
Approval by Academic council on	16.6.2022 (Thursday)
Subject handled by department	Applied Chemistry



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DEPARTMENT OF APPLIED CHEMISTRY

Subject Code		AC 202		Subject Name		ENVIRONMENTAL & GREEN CHEMISTRY	
Marks Allotted				Duration of Theory Paper		Weekly Contact Hours	
Theory							
Maximum Marks		Minimum Marks		3 Hours		L	T
End Sem	Sessional	End Sem	Sessional			3	1
80	20	21*	12				
Total Minimum in Theory* 40% = 128							
Syllabus Description							Hrs.
<p>UNIT I – FUNDAMENTALS OF ENVIRONMENTAL AND GREEN CHEMISTRY: Concept and Scope of environmental and green chemistry. Principles of green chemistry. Designing safer chemicals, safe solvents and auxiliaries. Design of energy sufficiency. Reduction of derivatives. Design for analysis degradation. Real time for pollution prevention. Inherently safer chemicals for accident prevention. Tutorial: Involvement of faculty and students in identifying the Chemical applications, doubts and explanations.</p>							8
<p>UNIT II – GREEN ANALYTICAL METHODS : Introduction of Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Bio mimetic to understand the environmental status and evolution for future trends in Green Chemistry. Tutorial: Involvement of faculty and students in identifying the Chemical applications, doubts and explanations.</p>							8
<p>UNIT III – CHEMISTRY OF SOIL AND SOLID WASTE MATERIALS: The chemical nature and composition of the soil ,sources of soil pollution, soil profile, effect of urban and industrial solid waste. Physico chemical analysis of soil. Radioactive pollution. Radiation chemistry source and effect of radioactive pollution. E-waste and its remedies. Tutorial: Involvement of faculty and students in identifying the Chemical applications, doubts and explanations.</p>							8
<p>UNIT IV- CHEMISTRY OF AQUATIC AND AVIAN ENVIRONMENT: Chemical composition of aquatic environment, water pollution and trace level substances in water. Physico chemical and biological analysis of waste water and its treatment. The chemical nature and composition of the atmosphere. Organic and inorganic pollutants and particular matter in the atmosphere. Monitoring and analysis of Air pollution. Different case studies. Tutorial: Involvement of faculty and students in identifying the Chemical applications, doubts and explanations</p>							8
<p>UNIT V- APPLICATION OF GREEN TECHNOLOGY Green chemistry in industries, fuel cell and electric vehicles, solar energy and hydrogen production, energy from alternate sources; Solar photovoltaic technology, Biofuel production (bio-ethanol and biodiesel), Biomass, prevention of hazardous & toxic products. Agricultural related practices and food processing, Production of biodegradable materials, concept of green building for pollution free engineering processes. Tutorial: Involvement of faculty and students in identifying the Chemical applications, doubts and explanations</p>							8
Total Hours							40

TEXT BOOKS:

- V. Kumar, “An Introduction to Green Chemistry” Vishal publishing Co. Reprint Edition 2010.
- Rashmi Sanghi, M.M Srivastava “Green Chemistry” Fourth Reprint – 2009.
- Lynn Goldman, Christine Coussens, Implications of nanotechnology for environmental health research, National Academic Press, Washington, 2007.
- Matlack, A. S. Introduction to Green Chemistry. Marcel Dekker: New York, 2001.
- Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice. Oxford Univ. Press: Oxford.
- American Chemical Society. N.d. Green chemistry at a glance. [Internet]. [Cited January 3, 2012]. Available from: {<http://portal.acs.org/portal/PublicWebSite/greenchemistry/index.htm>}
- Anastas, P.T., & Warner, J.C. 1998. *Green Chemistry: Theory and Practice*. New York, NY: Oxford University Press.
- Ehrenberg, R. 2011. Better by design. *Science News*, 179(7): 26-27. Retrieved from EBSCOhost
- CayeDrapcho, NhuanPhúNghiem, Terry Walker (2008). *Biofuels Engineering Process Technology*. [McGraw-Hill].

REFERENCE BOOKS:

- Anastas & Warner, *Green Chemistry: Theory & Practice*, Oxford Univ. Press, New York, 1998 L T P C 15DGC002 ANALYTICAL.

List/Links of e-learning resource

- **American Chemical Society (ACS) Green Chemistry Institute**
{<https://www.acs.org/content/acs/en/greenchemistry.html>}
- **Green Chemistry, United States Environmental Protection Agency (EPA)**
{<http://www.epa.gov/greenchemistry>}
- **Berkeley Center for Green Chemistry, University of California, Berkeley**
<http://bcgc.berkeley.edu/>
- **Beyond Benign, Green Chemistry Education**
<http://www.beyondbenign.org/>
- **Green Chemistry, University of Oregon**
<http://greenchem.uoregon.edu/>
- **The Institute for Green Science, Carnegie Mellon University (CMU)**
<http://www.chem.cmu.edu/groups/collins>
- **Greening Across the Chemistry Curriculum, University of Scranton**
<http://academic.scranton.edu/faculty/cannm1/dreyfusmodules.html>.
- **Jacobs, J.P.** 2011. 'Green Chemistry' Guru Charting New Course for EPA Science. In *New York Times*. [Internet]. [Cited September 19, 2011]. Available from: <http://www.nytimes.com/gwire/2011/06/20/20greenwire-green-chemistry-guru-charting-new-course-for-e-47583.html?pagewanted=all>
- **U.S. Environmental Protection Agency.** 1992. *The Guardian: origins of the EPA*. No. 1. Washington, D.C. [Internet]. [Cited January 3, 2012]. Available from: <http://www.epa.gov/aboutepa/history/publications/print/origins.html>

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Subject handled by department

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DEPARTMENT OF APPLIED CHEMISTRY

Subject Code		AC 203		Subject Name		DRUGS & PHARMACEUTICAL CHEMISTRY I	
Marks Allotted				Duration of Theory Paper	Weekly Contact Hours		
Theory					L	T	
Maximum Marks		Minimum Marks					
End Sem	Sessional	End Sem	Sessional	3 Hours	3	1	
80	20	21*	12				
Total Minimum in Theory* 40% = 128							
Syllabus Description							Hrs.
<p>UNIT I – ROLE OF NATURAL PRODUCTS IN DRUGS DISCOVERY:</p> <p>Introduction, nomenclature, classification & isolation of natural Products, general methods of structural elucidation, degradation methods. Classification, structure and synthesis of terpenoids & flavonoids, significances of natural products in new drugs discovery.</p> <p>Tutorial: Involvement of faculty and students in identifying the medicinal applications, doubts and explanations.</p>							8
<p>UNIT II – STEROIDS & HORMONES</p> <p>Steroids: Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry, Isolation, Structure determination and synthesis of Cholesterol, Bile acids, Testosterone, Estrogen, Progesterone, Biosynthesis of Steroids.</p> <p>Tutorial: Involvement of faculty and students in identifying the medicinal applications, doubts and explanations.</p>							8
<p>UNIT III – ALKALOIDS</p> <p>Alkaloids: Introduction, nomenclature and physiological action, Isolation & classification of alkaloids. General methods of structure elucidation of alkaloids in plants. Structure, stereochemistry, biosynthesis of atropine, quinine and morphine. General structure, properties and uses of purine & pyrimidines like caffeine, Theobromin, Theophylline.</p> <p>Tutorial: Involvement of faculty and students in identifying the medicinal applications, doubts and explanations.</p>							8
<p>UNIT IV- PROTEINS & VITAMINS</p> <p>Isolation & classification of proteins, Fibroues and Globular proteins, chemical bonds in protein and structure of proteins.</p> <p>Classification and nomenclature of vitamins, structure, synthesis and chemistry of vitamins: A,B,C,D,E and K .Significances of vitamins. Antivitamins.</p> <p>Tutorial: Involvement of faculty and students in identifying the medicinal applications, doubts and explanations.</p>							8
<p>UNIT V- PHARMACEUTICAL BIOCHEMISTRY</p> <p>Biochemistry and its importance in pharmaceutical science, bio-chemical organization, cell energy ATP and its biological significance. Enzyme, Carbohydrate, Lipid, Proteins and Nucleic acid metabolism. Enzyme immobilization, Introduction of DNA-recombinant</p>							8

technology.	
Tutorial: Involvement of faculty and students in identifying the medicinal applications, doubts and explanations.	
Total Hours	40
TEXT BOOKS:	
<ul style="list-style-type: none"> • Chemistry of Natural Products, Sujata V. Bhat, B.A. Nagasampagi, MeenakshiSivakumar, Springer. • The Chemistry of Natural Products, R.H. Thomson, Springer. • Bioactive Natural Products: Chemistry and Biology, GoutamBrahmachari, Wiley india Pvt. Ltd. • Organic Chemistry Vol. II, I.L. Finar, Pearson Education India. • Synthetic drugs, Chatwal, Anand, Himalaya Pub. • Medicinal Chemistry, Alfred Burgir, Wiley Inter. Pub. • Medicinal Natural Products: A Biosynthetic Approach, 3rd Edition, P. M. Dewick, 2009, John Wiley & Sons, Ltd. 	
REFERENCE BOOKS:	
<ul style="list-style-type: none"> • Chemistry of Natural products, Vol. I, II, O.P. Agrawal, Goel Pub. Meerut. • Chemistry of Natural products, Vol. I, II, Chatwal, Anand, Himalaya Pub. • Pharmaceutical Chemistry, Jayshree Ghosh, S. Chand Pub. • Fundamentals of Biochemistry, J. L. Jain, S. Chand Pub. • Medicinal Chemistry, Ashutosh Kar, Wiley eastern ltd. • Bioactive Marine Natural Products, D.S. Bhakuni and D.S. Rawat, 2005, Springers. • Natural Product Isolation, Second Edition, In: Methods in Biotechnology Vol 20, Satyajit Sarker, Zahid Latif and Alexander Gray, 2005, Humana Pres Inc., Totowa, NJ. • Chemistry of Plant Natural Products: Stereochemistry, Conformation, Synthesis, Biology, and Medicine, S. K. Talapatra and B. Talapatra, 2015, Springer. 	
List/Links of e-learning resource	
<ul style="list-style-type: none"> • https://nptel.ac.in/course.html • https://iln.ieee.org/resources/e-learning • https://learncheme.com/ 	
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DEPARTMENT OF APPLIED CHEMISTRY

Subject Code		AC 204		Subject Name		INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS		
Marks Allotted				Duration of Theory Paper	Weekly Contact Hours			
Theory					L	T		
Maximum Marks		Minimum Marks		3 Hours	3	1		
End Sem	Sessional	End Sem	Sessional					
80	20	21*	12					Total Minimum in Theory* 40% = 128
Syllabus Description							Hrs.	
<p>UNIT I – INSTRUMENTAL METHODS OF ANALYSIS & COLORIMETRY:</p> <p>Basic introduction and principle of Instrumental methods of chemical analysis. Theory of colorimetry and spectrophotometry. Beer-Lambert's law, Transmittance, absorbance. Instrumentation and application of colorimetry and spectrophotometry.</p> <p>Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.</p>							8	
<p>UNIT II – CONDUCTOMETRY & pH METRY:</p> <p>General principle and instrumentation of conductometry. Conductometric titrations including neutralisation precipitation, oxidation-reduction and high frequency titrations. Applications and analytical importance of conductometer. Electrical conductance, measurement of conductance, equivalent and molar conductivity. Principal and instrumentation of pH meter .pH measurement with glass electrode, working of glass electrode, mechanism of pH meter, calibration of glass electrode, Applications of pH meter.</p> <p>Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.</p>							8	
<p>UNIT III – POTENTIOMETRIC METHODS OF ANALYSIS:</p> <p>Introduction, Principle and instrumentation concept of the difference in potential between two electrodes dipped in solution of ions. Electrochemical cells, cell potentials, sign convention for electrode potentials, types of reference and indicator electrodes, ion-selective electrodes and their applications in chemical analysis. Measurement of cell unit, direct potentiometry and applications of potentiometric titrations.</p> <p>Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.</p>							8	
<p>UNIT IV- VOLTAMMETRY and POLAROGRAPHY</p> <p>General principle and instrumental set-up of polarograph. Important features of DME, concepts and expression of diffusion current Ilkovic equation half wave potential residual current. Current potential curves and reversible reactions. Applications for characterising organic compounds. Differential pulse polarography and analytical applications of polarography.</p> <p>Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.</p>							8	

<p>UNIT V</p> <p>GRAVIMETRIC AND THERMOGRAVIMETRIC ANALYSIS:</p> <p>Theory and procedure of gravimetric techniques analysis. Machines of precipitation nucleation, particle size, crystal growth, colloidal stage, nature condition and treatment of precipitation co-precipitation and ageing crystal lattice of precipitation organic precipitation from homogenous solutions. Washing, drying and ignition of ppt. Theory, instrumentation and application of thermo gravimetric and differential thermal analysis. Thermal methods in quantitative analysis.</p> <p>Tutorial: Involvement of faculty and students in identifying the chemical applications, doubts and explanations.</p>	8
<p>Total Hours</p>	40
<p>TEXT BOOKS:</p> <ul style="list-style-type: none"> • Allen J. Bard and Larry R. Faulkner. Electro-chemical Methods. 2nd ed., John Wiley & Sons (2001). • G.D. Christian, Analytical Chemistry, 6th ed. John Wiley & Sons (2001). • A.I. Vogel, Textbook of Quantitative Chemical Analysis, 5th ed., Addison Wesley Longman Singapore Ltd. (1999) • Galen W. Ewing, Instrumental Methods of Chemical Analysis, 5th ed., Mc-Graw Hill Book company (1985). • Willard, Merritt, Dean, and Settle, Instrumental Methods of Analysis, 7th ed., C B S Publishers & Distributors (1986). • Douglas A. Skoog et al "Instrumental Analysis" Cengage Learning, edition 2007 . 	
<p>REFERENCE BOOKS:</p> <ul style="list-style-type: none"> • Spectroscopy by Chatwal Anand Himalaya Publishing House. • Analytical & Industrial Chemistry by Naik, Vithalkar, Bajaga, Bidkan, Ghatage, Mulik. • Instrumentation in Analytical Chemistry, 1988 – 1991” by Louise Voress. 	
<p>List/Links of e-learning resource</p> <ul style="list-style-type: none"> • Sourced from the Analytical Sciences Digital Library • http://www.chemindustry.com/db/category/cat179.asp Theory and applications - Polarography, Potentiometry, Cyclic • http://www.topac.com/polarography.html Polarography • http://www.aesociety.org Electroanalytical techniques • http://www.chemindustry.com/chemnames/V/Voltametry.asp Voltmeter. 	
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<p>Subject handled by department</p>	Applied Chemistry

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Subject Code		AC 205	Subject Name		PRACTICAL CHEMISTRY	
Marks Allotted				Duration of Practical Examination	Weekly Contact Hours	
Practical						
Maximum Marks		Minimum Marks				
End Sem	Sessional	End Sem	Sessional	8 Hours	12	
80	20	40	12			

Syllabus Description**Suggested List of Practicals (Minimum 12 Experiments be performed):**

- To determine Moisture content & Ash content in given sample of coal.
- To determine Dissolved oxygen present in given water sample.
- To estimate BOD of given water sample.
- To estimate COD of given water sample.
- To determine the Flash Point and Fire Point of lubricating oil.
- To determine the Viscosity Index of given lubricating oil by Redwood Viscometer.
- Determination of pH of a solution.
- pH metric titration of (a) Strong acid with a strong base
(b) Strong acid with a weak base
(c) Weak acid with a strong base
(d) Mixture of acid with a strong base.
- Potentiometric titration of Acid and base.
- Potentiometric titration of ferrous iron Fe(II) with potassium dichromate
- Estimation of strength of HCl via Conductometric titration of a strong acid with a strong base.
- Conductometric titration of (a) Strong acid with a strong base
(b) Strong acid with a weak base
(c) Weak acid with a strong base
(d) Mixture of acid with a strong base.
- To verify Beer Lambert's law of colorimetry and find out Lambda max.
- Estimation of unknown KMnO_4 solution by colorimetric measurements
- To determine amount of Iron in given sample by colorimetry.
- To determine Aniline point of lubricating oil
- To determine Cloud and pour point of lubricating oil.
- Estimation of unknown CuSO_4 solution by colorimetric measurements
- Estimation of unknown $\text{K}_2\text{Cr}_2\text{O}_7$ solution by colorimetric measurements
- To determine amount of Iron in given sample by UV spectrophotometry.
- Any other experiment set by department

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