

CH-XXX	MOOC Alternative Course: Advanced Chemical Sciences	3CH
UNIT-I	Green Chemistry: Principles and Applications	
	Green Chemistry Definition, need for Green chemistry, evolution of Green Chemistry, twelve principles of Green Chemistry, future sustainability of Green Chemistry, atom economy, E-factor; Emphasis on Green solvents (supercritical fluids, ionic liquids, fluorinated biphasic system, PEGs, immobilized solvents and water); Green reagents and Green catalysts (nontoxic catalysts and biocatalysts); Green organic reactions (Aldol condensation, Cannizzaro reaction and Grignard reactions) and their comparison with classical reactions. Green preparations by ultrasound and microwave assisted reactions, enzymes and other alternate methods. Greener approaches for nanoparticle synthesis.	
UNIT-II	Introduction to Nanoscience	
	Nanoscience, History of Nanoscience, Nanotechnology, aspects of Nanotechnology, Nanoparticles, synthetic aspects and its utility, top-down approach, bottom-up approach, materialistic approach, conceptualization of carbon-based and non-carbon nanomaterials and its applicability.	
UNIT-III	Bioorganometallic Chemistry	
	Basic concept, Organometallic enzymes and coenzymes: occurrence, structure and function of vitamin B ₁₂ , corrinoid dependent enzymatic reactions, vitamin B ₁₂ model compounds; Organometallic compounds as drugs: η^6 -Aryl-ruthenium, ferroquine and ferrocifen as drugs; Organometallics as radiopharmaceuticals, tracers, ionophores and sensors; Role of organometallics in heavy metal toxicity (arsenic and mercury related cases).	
Text Books	<ol style="list-style-type: none"> 1. <i>Green Chemistry: An introductory Text</i> by Mike Lancaster, RSC publishing, 2nd Edition, 2010. 2. <i>Green Chemistry: Environment Friendly Alternatives</i>, R Sanghi and M. M. Srivastava, Narosa Publication, Ed. 2009. 3. <i>Green Chemistry: Greener Alternatives to Synthetic Organic Transformations</i>, V. K. Ahluwalia, Narosa Publication, Ed. 2011. 4. <i>New trends in Green Chemistry</i>. Ahluwalia, VK and Kidwai, M. Anamaya Publishers, New Delhi (2003). 5. <i>Strategies for Green Organic Synthesis</i> V. K. Ahluwalia, Ane Books Pvt. Ltd. 2012. 6. <i>Nano Science and Nano Technology</i> by Dr. Sundar Singh, Pragati Prakashan Publication 7. <i>Basic organometallic Chemistry</i> by B. D. Gupta, A. J. Elias, University Press (India) Pvt. Ltd., 2nd edn, Hyderabad, 2013. 	
Reference Books	<ol style="list-style-type: none"> 1. <i>Green Chemistry: Theory and Practice</i> by Paul T. Anastas and John C. Warner, Oxford University Press, Oxford, 1998. 2. <i>Polymer Composites from Nano-to Macro-Scale</i> by Klaus Friedrich, Stoyko Fakirov, Zhong Zhang, Springer Publication 3. <i>Organometallic compounds: synthesis, reactions, and applications</i>, Edited by: D. K. Verma and J. Aslam, Wiley-VCH GmbH, 1st edition, 2023. 4. <i>Advances in Bioorganometallic Chemistry</i>, Edited by: T. Hirao and T. Moriuchi, Elsevier; 1st edition, 2018. 	