**Academic Quality Assurance Department**

**Course Syllabus Form**

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| **College**  | Applied Sciences |
| **Department** | Chemistry |
| **Program** | Chemistry |
| **Course Title** | Polymer Chemistry  | **Course Number:** | 15050470 |
| **Year** | 2023/2024 | **Semester:** | Summer |
| **Prerequisite(s)** | Organic Chemistry(2) [15050233] |
| **Instructor** | Dr. Mansour Ararawi |
| **Instructor's e-mail** | m.ararawi@ptuk.edu.ps |
| **Office Hours** | 10-12Sun,Mon, 11-12Tues, 10-11Thur |
| **Class Time** | Sun,Tues, Mon (10 – 12) | **Class Room:** | E107 |
| **Course description** | This course is an introduction to learn the nature of polymers , their methods of synthesis with an account on each polymerization process , examples of the important polymers in industrial applications ( such as the elastomers , and the fibers ) & their physical properties with emphasis upon the relationship between structure and property so as to include a comparison stereo regular polymers & other types of polymers . |
| **Course Intended Learning Outcomes (CILOs)** | 1- Which fundamental aspects separate polymers from other materials ?2- How to easily identify different types of polymers ?3- What are the different types of reactions that can be used to synthesize polymers ? 4- What are different structures of polymers and how these influence the properties of polymers?5- The reaction mechanisms of each of these reaction types and how the reaction mechanisms affect morphology .6- Which reaction polymers can undergo after polymerization, i.e. during use and what physical changes may occur ? |
| **Textbook(s)** | Charles E. Carraher, Polymer Chemistry. 6th Edition, 2003 by Marcel Dekker |
| **Other required material (References):** | 1. Fred Davis (Editor),Polymer Chemistry A Parcitical Approach , Oxford University Press lnc., New York (2004)
2. John Nicholson , The chemistry of polymers,3rd Edition , The Royal Society of Chemistry Publishing Cambridge-U.K (2006)
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| **Other Resources used (e.g. e-learning, field visits, periodicals, software, etc. )** |  |

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| **Course Teaching Methods** |
| **Teaching Method** | **CILOs** |
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| **Assessment Type** | **Details/Explanation of assessment in relation to CILOs** | **Weight** | **Date(s)** |
| **First Exam**  |  |  |  |
| **Second Exam**  |  |  |  |
| **MidExam** |  | 35% |  |
| **Laboratory/Practical**  |  |  |  |
| **Assignments** |  | 20% |  |
| **Project** |  |  |  |
| **Final Exam** |  | 45% |  |
| **Total** |  | 100% |  |

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| **Course Intended Learning Outcomes (CILOs)** |
| **CILOs**  | **Mapping to Program ILOs** |
| **On successful completion of the course, students will be able to:** | **a** | **b** | **c** | **d** | **e** | **f** | **g** | **h** | **I** | **j** |
| 1. Definition of polymer, polymerization, nature of polymers, methods of synthesis,
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| 1. Important polymers in industrial applications & their physical properties Polymer structure
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| Step-Reaction Polymerization: Definition , Examples , Requirements ). Examples1. Of Step –Reaction Polymers
 |  |  |  |  |  |  |  |  |  |  |
| Chain-Reaction Polymerization: Definition , Monomers , General Mechanism) .B. Free Radical Polymerization (Mechanism , Chain transfer – modefiers,1. Retarders , Inhibitors -, Limitations of Radical polymerization, General Characteristic.
 |  |  |  |  |  |  |  |  |  |  |
| Copolymerization: A. Basics. B. Advantages .C. Types of copolymers. D. FreeRadical Copolymerization |  |  |  |  |  |  |  |  |  |  |

**Course contents :**

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| **chapter** | **topics** | **Hours** |
| **1** | Introduction: A. Basics (Definition : polymer ,Monomer ,Oligomer , Polymerization, Importance of polymers , Average DP,Functionality, Types of Polymer Structures ,Average Molecular Masses , Polydispersity). B. Examples of the polymers (Addition, Condensation , Copolymers …CRU…Application ) .C. Some Characteristics of Polymer structure (Configurations , Conformations , Molecular Motion , Tm, T g,Crosslinking ).D. Bonding in Polymers (1̊̊ & 2̊ Bonds , Cohesive Energy ,Comparison b/w Elastomers , Fibers , and Plastics ) .E. Classification of Polymers (8 Approaches ) .F. Identification of polymers : Schematic Method .  | **12** |

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| **2** | Step-Reaction Polymerization : A. Definition , Examples , Requirements ). B Examples Of Step –Reaction Polymers ( Polyamides , Polyesters ,& Polycarbonates, Polyurethanes , Polysulfide, Epoxy Resins , Silicone Polymers, P/F & M/F Resins Polyether…) .C. Some Characteristics of Step – Reaction polymerization (include, Alkyd Resins ) .End Notes : polyanhydrides , polyuria .  | **14** |
| **3** | Chain-Reaction Polymerization: A. Basics (Definition , Monomers , General Mechanism) .B. Free Radical Polymerization (Mechanism , Chain transfer – modefiers,Retarders , Inhibitors -, Limitations of Radical polymerization, General Characteristic. C. lonic Polymerization (Monomers , Suitable Method , Requirements): C1 – cationic Polymerization ( Initiators , Mechanism, Characteristics).C2- Anionic Polymerization (Initiators, Mechanism, Characteristics, Living polymers).D . coordination "Ziegler-Natta" Polymerization (Advantages , stereo regularity, , Mechanism). | **14** |
| **4** | Copolymerization : A. Basics. B. Advantages .C. Types of copolymers. D. Free Radical Copolymerization . E. Step-Reaction Copolymerization .G. Block Copolymers .H.Graft Copolymers . | **4** |

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| **Prepared by:** | Dr. Mansour Ararawi | **Signature**  |  |
| **Head of Department**  | Dr. Mansour Ararawi | **Signature** |  |
| **Date**  | 20/7/2024 |