## CHE-814 Product Technology

Credit Hours: 3 Pre-requisites: Nil

Course Objectives:

- The students will be able to learn the technical elements include chemistry, engineering, production technology (i.e. both classic chemical processes and processing/shaping technology).
- Students will be able to know the non-technical elements of Product design as well that include product and production economics, marketing, intellectual property (patent) know-how, and environmental aspects.
- Students will also go through the technology and chemistry of some major product groups: composites, adhesives, coatings and foams.

Course Contents: Overview of Product Technology

- Processing industry (the conversion industry): (1) Separation, conversion and purification (2) Formulating and shaping the intermediate products
- Design methodology and innovation: Origin of ideas or problems, define specifications, orientation, redefine specifications and option selection House of Quality, case study of chemical products for example paints, baby food, cosmetics.
- Process- Product- Processing relationship (P3R): Brainstorming for different chemical product and case studies, divide students into groups and discuss different chemical products for case study i.e. Paints, cosmetics, food products, beverages, packaging materials. Discuss the requirements and options.
- Material (Metals, ceramics, polymers) structure and their basic properties
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- Product, structure Matrix-formulation, Polymers and composites
- Technology Mapping, Case study of different chemical product will be discussed.
- Describe the product that has to be replaced and define all parts i.e. (1) Balance of materials (BOM) (2) House of quality (3) Selection, processing and performance of material and product (4) Product substance Matrix.
- Material, structure and properties: (1) Composites, their structure, and basic properties (2) Adhesives, types, chemistry and testing
- Development of new products, Shaping technology, Coating, calendaring, Gas and solid dispersions, Foams and their applications.
- Costing and business plan: Costing and business plan Economy of scale, discussion of projects given to students Presentation of projects, Protect your ideas, Patent and scientific publications

**Recommended Reading (including Textbooks and Reference books)**

- Kalpakjian & Schmid: Manufacturing Processes for Engineering Materials; 5th Edition
- Cussler & Moggeridge: Chemical Product Design; 2d Edition!
- Mitchell: An introduction to Materials Engineering and Science for Chemical and Material Engineers (Wiley)
- Ulrich & Eppinger: Product Design and Development (McGraw-Hill)
- Crawford: New Products Management (McGraw-Hill)
- Cooper: Winning at New Products (Addison Wesley)
- van Krevelen: Properties of Polymers (Elsevier)
- Cross: Engineering Design Methods – Strategies for Product Design (Wiley)
- Ashby: Materials Selection in Mechanical Design (Elsevier)
- Callister: Fundamentals of Materials Science and Engineering (Wiley)
- Shackelford: Material Science for Engineers (Pearson)