

**SECOND SEMESTER 2021-2022**

Course Handout Part II

Date: 30-12-2021

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

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| **Course Title** | CONCURRENT ENGINEERING |
| **Course No(s)** | DE ZG663 / QM ZG663 |
| **Instructor-In-Charge** | PIYUSH CHANDRA VERMA |

**Description :** Introduction of concurrent engineering and need, concurrent engineering tools, advances in design and manufacturing engineering, design for manufacture, design for assembly, rapid prototyping, simulation, concurrent approaches to design, manufacturing and other aspects of engineering.

**Course Objectives:**

* Teach the students the philosophy, perspectives and methodology of concurrent engineering
* Provides basic functional knowledge of product development and concurrent engineering from a cross functional perspective, to be able to manage quality during all stages of the life-cycle
* Provide the information relevant to implementation of concurrent engineering practices.

**Text Book(s):**

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| **T1** | Kevin Otto and Kristin Wood, Product Design: Techniques in reverse engineering and new product development, 1/e, Pearson Education, New Delhi, 2004. |

**Reference Book(s) & other resources:**

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| **R1** | Dieter Schmidt, Engineering Design, 4th Edition, McGraw Hill |
| **R2** | Product design for manufacture and assembly, Boothroyd,, Dewhurst, Knight , Third Edition, CRC |
| **R3** | Design for Manufacturability: How to Use Concurrent Engineering to Rapidly Develop Low-Cost, High-Quality Products for Lean Production by David M. Anderson Productivity Press (c) 2014 24x7 online |
| **R4** | Syan., C.S. & Menon, U., (Eds), Concurrent Engineering: Concepts, Implementation and Practice, Chapman & Hall, London, 1994 |
| **R5** | Kusiak, A., (Ed), Concurrent Engineering: Automation, Tools, and Techniques, John Wiley and Sons, New York, 1993 |
| **R6** | Huang G.Q. (Ed.), Design for X - Concurrent Engineering Imperative, Chapman and Hall, London, 1996 |

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| **LEARNING OUTCOMES** | |
| **LO1** | Understand the motivation behind concurrent engineering and apply the principles methods to improve quality |
| **LO2** | Analyze the quality requirements for a product and be able to implement the procedures for attainment and control of quality at different stages in the development and service life-cycle |
| **LO3** | Analyze and evaluate the design and process from various perspectives –robustness, reliability, manufacturability, assembly, disassembly, serviceability, environment-friendliness and suggest improvements |
| **LO4** | Evaluate and assess the economic aspects in concurrent design process |
| **LO5** | Work and meaningfully contribute in cross functional teams for concurrent engineering |

**Content Structure:**

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| **Contact Hour** | **List of Topic Title** | **Sub-Topics** | **Reference** |
| 1-2 | Introduction to CE | * Definition, basic principles, * Benefits and pitfalls * Design maturity, * Integrating Mechanisms | Lecture 1 Slides |
| 3-4 | Quality Function Deployment | * House of quality * QFD philosophy * Case studies | T1-Ch.7,  Lecture 2 Slides |
| 5-6 | Robust design | * Introduction * Taguchi methods * Examples | R1-Ch.15  Lecture 3 Slides |
| 7-8 | DFM and its importance in CE | * Introduction to DFM * Manufacturing process selection * Value analysis * DFM guidelines | T1-Ch.14,  R1-Ch.13,  Lecture 4 Slides |
| 9-10 | Poka Yoke and Manufacturability | * Introduction * Poka Yoke * Manufacturability Analysis | T1-Ch.14,  R1-Ch.13,  Lecture 5 Slides |
| 11-12 | Design For Assembly | * DFA guidelines * Various Techniques: Boothroyd * Various Techniques: Lucas | T1-Ch.14,  R1-Ch.13, R2,  Lecture 6 Slides |
| 13-15 | Rapid Prototyping | * Introduction * Role of prototyping in CE * Need and use of RP * RP techniques | T1-Ch.17,  Lecture 7 Slides |
| 16-18 | Design for Reliability | * Introduction to DFR * Reliability fundamentals * Reliability analysis during design * General ‘Design for Reliability’ principles /FMEA/ Safety | R1-Ch.14,  Lecture 8 Slides |
| 19-21 | Design for serviceability, maintainability, and reparability | * Design for serviceability * Factors affecting serviceability * Service modes * Serviceability evaluation | Lecture 9 Slides |
| 22-24 | Design for disassembly | * Introduction * Design for disassembly methodologies | T1-Ch.15,  Lecture 10 Slides |
| 25-27 | Design for Environment | * Introduction * Environmental issues in design * LCA * Eco-Design | T1-Ch.15,  Lecture 11 Slides |
| 28-30 | Economic aspects in CE | * Introduction * BEP * NPV * Examples | R1-Ch.16  Lecture 12 Slides |
| 31-34 | Product Development scope | * Introduction * Mission Statement * Customer Needs and satisfaction | T1-Ch. 3,4  Lecture 13 Slides |
| 35-37 | Decomposition in CE | * Introduction * Functional Decomposition * Function trees and Function Structures | T1-Ch. 5,  Lecture 14 Slides |
| 38-39 | Product Architecture | * Introduction * Types of architecture * Types of modularity | T1-Ch. 9,  Lecture 15 Slides |
| 40-42 | Concept Generation and Evaluation | * Introduction * Concept generation methods * Concept evaluation methods | T1-Ch. 10,11,  Lecture 15 Slides |

**Evaluation Scheme:**

**Legend:** EC = Evaluation Component; AN = After Noon Session; FN = Fore Noon Session

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| Evaluation Component | Type (Open book, Closed book, Online, etc.) | Weight | Duration | Day, Date, Session, Time |
| Quiz-I | Open Book | 5% | As per the instructor | February 1 to 15, 2022 |
| Quiz-II | Open Book | 5% | As per the instructor | March 1 to 15, 2022 |
| Report / Seminar/ Case Presentation/ Literature  Review / Laboratory | Open Book | 20% | As per the instructor | As per the instructor |
| Mid-Semester Test | Open /Closed Book | 35% | 90 mins | To be announced |
| Comprehensive Exam | Open /Closed Book | 35% | 120 mins | To be announced |

**Chamber Consultation Hour:** To be announced in the class room.

**Notices:** All notices concerning this course shall be displayed on the CMS (the Institute’s web based course management system). Besides this, students are advised to visit regularly CMS for latest updates.

**Make-up Policy:** Make-up shall be given only to the genuine cases with prior confirmation. Request for the make-up tests, duly signed by the students, should reach the under signed well before the scheduled test.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Instructor-in-charge**

(DE ZG663 / QM ZG663)