Proposal to PGPEC for Introducing a New Subject

1. Department Proposing the Subject: Rajendra Mishra School of Engineering Entrepreneurship

2. Subject Number: EP6XXXX (To be decided)

3. Subject Title: ENGINEERING DESIGN PROCESS

4. Subject Structure and Credit: 3-0-0 Credits: 3

5. Status of the Subject: Elective at undergraduate and postgraduate level to all Departments

6. Pre-requisites for the Subject: BASIC ENTREPRENEURSHIP (EP 60001), ENGINEERING DRAWING AND COMPUTER GRAPHICS (CE 13001), MECHANICS (ME 10001), INTRODUCTION TO MANUFACTURING PROCESSES (ME 19001)

7. Motivation: To provide to the students a realistic understanding of engineering design process with a cohesive structure on how to carry out design. The primary focus of discipline-specific courses on design is on the design of the elements or product in that domain, while it is essential to understand also the steps and the methods involved, those are crucial and can enormously influence the effectiveness of the design process as a whole. Its focus is beyond designing an element for a product or a machine or solving equations for optimization, rather it is the integrated design. Even though there is small overlapping with a course offered by another department, it is with a different focus and objective. Considering a course-to-course mapping, the overlapping is only fractional and in this course the assorted topics, besides new ones, are unified for a different purpose with a distinct focus. Learning the holistic approach and methods/computer-aided-tools is important, since about three-fourth of the cost of a product is determined during the design phase and the rest is in manufacturing, and thereby largely regulates the competitive position of the enterprise, particularly for a start-up. This course intends to provide prescriptive guidance on how to carry out engineering design and to inculcate in the students, the capability to integrate the design process in multidisciplinary product development environment. This course is designed with interdisciplinary characteristic, since certain commonalities exist, with respect to the process of design, across various engineering disciplines, particularly for products to be designed and developed by multi-disciplinary entrepreneurial teams.

8. Objective and Content

Objectives:

1. To study various analytical methods and techniques involved in effective engineering design process.
2. To develop necessary skills to carry out design innovatively, that can be competitive and accomplish it through the product realisation phase.

3. To enable to design, using state-of-the-art methodologies, marketable engineering products.

Content (in 100-150 words):

Introduction to Engineering Design Process; 2 Hrs

Engineering Product Development: Innovative Product Design and Engineering; Robust Design and Optimisation; 5 Hrs.

Rapid Prototyping; Reverse Engineering and Redesign with value engineering; Function Analysis Systems Technique; 4 Hrs.

Design Requirement Analysis and Planning: Kano Model, Benchmarking, Quality Function Deployment; Information assimilation; 4 Hrs.

Idea Engineering Methods; Concept Engineering: Concept Generation; Functional Decomposition and Design Synthesis, Morphological Method, TRIZ inventive design strategies; Pugh concept selection method and decision theories; 6 Hrs.

Embodiment design of engineering products; Detail Engineering Design; Design Review; Prototype Testing, Modelling and Simulation; 4 Hrs.

Tools for Product Design, Integrated Product and Process Design; Digital Manufacturing and Concurrent Engineering; Design for Manufacturing; 4 Hrs.

Product Realisation; Engineering Manufacturing and Materials; 4 Hrs.

Reliability and Design for SixSigma; Design FMEA, Lean Design Engineering; 4 Hrs.

Interface with Industrial design; Economic considerations in design. 3 Hrs. (Total 40 Hrs)

Evaluation: Quizzes, Mid Semester Examination, and End Semester Examination

8. Name of the Faculty Members of the Department who have Necessary Expertise and will be willing to teach the Subject Currently:

a) Dr. Pranab K Dan b) Prof. Partha Pratim Das

9. **Will the Subject Require Appointment of Adjunct Faculty**? If yes the Number of Such Adjunct Faculty: No

10. **Do the Content of the Subject Have an Overlap** with any Other Subject Offered in the Institute? If yes give Details:

a) Number and the name of the existing subject: Ten

IM41001: PRODUCT DEVELOPMENT

ME21010: GEOMETRIC MODELLING FOR DESIGN AND MANUFACTURE

IM31005: QUALITY DESIGN AND CONTROL

IM31002: QUALITY ENGINEERING

ME41613: DESIGN OPTIMISATION

IM60062: SIX SIGMA FUNDAMENTALS AND APPLICATIONS

ME60304: PRODUCT DEVELOPMENT AND CIM

ME40003: QUALITY ASSURANCE AND RELIABILITY

MT30001: MATERIALS ENGINEERING

RE60001: RELIABILITY ANALYSIS AND PREDICTION

b) Approximate percentage of Overlap: 15 % (Approximately)

11. **Suggested Reading**: Text Books:

1. Engineering Design, George E. Dieter, Linda C. Schmidt, 4th Edition 2013, Indian Edition, McGraw Hill

2. Product Design, Techniques in Reverse Engineering and New Product Development, Kevin N Otto and Kristin Wood, 2012, Pearson

Reference Books:

1. Design for Six Sigma in Technology and Product Development, Clyde M. Creveling, 2003 Pearson Education

2. Karl T Ulrich, Steven D Eppinger , " Product Design & Development." Tata McGraw-Hill 2008

3. Design and Analysis of Experiments, 5th edition, by D.C. Montgomery, John Wiley & Sons, 2001

4. David Bedworth: "Computer Integrated Design and Manufacturing" -TMH, New Delhi

12. **The Name of the Departments/Centers** Whose students are expected to take up the Course:

All departments

Date: **(Signature of the Head of the Department)**