



# DESIGN FOR QUALITY, MANUFACTURING AND ASSEMBLY

## PROF. SARAVANA KUMAR

Department of Mechanical Engineering  
IIT Madras

## PROF. PALANIAPPAN RAMU

Department of Mechanical Engineering  
IIT Madras

**TYPE OF COURSE** : New | Elective | UG/PG

**COURSE DURATION** : 8 weeks (29 Jul'19 - 20 Sep'19)

**INTENDED AUDIENCE** : B.E/B.Tech, M.E/M.Tech,  
M.S, B.Sc, M.Sc, PhD

**EXAM DATE** : 29 Sep 2019

**INDUSTRIES APPLICABLE TO** : Fiat Chrysler Automotive, Daimler India, Cyient, Saint Gobain

## COURSE OUTLINE :

In the context of product design, it is very important to appreciate the limitations of a design from manufacturing and assembly perspective and to produce high quality products at low cost. This course will introduce methods that can provide guidance to design teams in simplifying product structure to reduce manufacturing and assembly costs, quantify improvements and how robust design concepts can be used for ensuring quality. This course aims at introducing the need to account for variability, mathematically represent it, formulate it and control it. Concepts such as quality, robustness, six sigma and orthogonal array will be discussed.

## ABOUT INSTRUCTOR :

Prof. Saravana Kumar is interested in development of representational and computational tools for virtual and physical prototyping applied to arrive at solutions to design problems. Some of the specific research areas include CAD and 3D data acquisition technologies: geometrical modelling schemes, X-ray tomography, photogrammetry and image-based modelling systems, and rapid prototyping.

Prof. Palaniappan Ramu research interest revolves around optimization and treating uncertainties in product and process design to obtain reliable, robust and quality designs. Most of his work is focused on reduction of computer or physical experiments, building better metamodels, intelligently explore design space and enable better predictions and optimal designs under uncertainties.

## COURSE PLAN :

**Week 01** : Introduction, course expected outcomes, discussion on quality

**Week 02** : Measuring quality: Quality loss function. Discussion on robustness, six sigma concepts

**Week 03** : Quantifying robustness: Signal to Noise Ratio, problem formulation using SNR. Design of experiment discussions

**Week 04** : Orthogonal array, linear graphs, triangular tables, finding optimum combinations. Case studies

**Week 05** : Design for Manufacturing: over the wall design, most influential phase in design, best practices in injection molding and sheet metal working

**Week 06** : Design for additive manufacturing, single point and multipoint tools

**Week 07** : Design for Assembly: Boothroyd Dewhurst method, theoretical minimum number of parts, Xerox producibility index (XPI) method

**Week 08** : Do's and don't's in manual assembly, assembly time estimation, design for robotic assembly considerations. Design for sustainability