

Teaching Dynamics and Vibrations through ICT-Enabled Experiments

Course Title	Teaching Dynamics and Vibrations through ICT-Enabled Experiments
Course Category	Pedagogy
Relevant Discipline(s)	Engineering (Mechanical, Civil, Chemical, Electrical, Aerospace), Physics
Duration of course in equivalent integer no. of days(min 3 days, 1 day = 6 hrs of lectures/hands on sessions)	5 days (3 full days on holidays, plus 4 half days in evenings)
Proposed dates	2020 December, 25-27 (3 full days, Friday - Sunday), 28-31 (4 half days, Monday - Thursday evenings)

Brief Course Description and Course Contents

While ‘hands-on’ skills are highly sought after by industry and other employers of UG and PG engineering/science graduates, labs and experiments typically receive lower weightage/credits in the typical engineering or science curriculum. The teaching of and learning from this limited lab curriculum is itself constrained by a lack of resources, both hard (lab setups/infrastructure, availability of consumables) as well as soft (trained teachers, easy-to-understand literature). This course seeks to (disruptively) address these gaps in lab education by leveraging developments over the past decade in the availability of pervasive computing power, affordable sensors/actuators and high-bandwidth internet.

The course will use a new pedagogy to not only train teachers (UG and PG) to teach experiments, but also discuss how students can be introduced to a topic and enthused to learn through experiments. Hence, each experiment in the course will be the centre-piece for a topic, around which the corresponding theory will be built, and not merely an adjunct to the theory taught in classroom lectures. This edition of the course will limit itself to topics in dynamics and vibrations (corresponding broadly to typical UG and PG courses such as “*Kinematics and Dynamics of Machines*” in Mechanical Engineering, and “*Dynamics*” in Physics), while future editions will extend the pedagogy to other topics.

The course hours will be divided approximately into 50 % of hands-on experiments (at each student’s location, with the online assistance of the instructor) and 50 % of lectures (conducted online in real-time, but also available as recordings).

The topics (and essential skills) covered will be:

- Introduction to the theory of measurements;
- Essentials of sensors and actuators;
- Elements of data acquisition and signal processing;
- Fundamentals of UG and PG dynamics and vibrations;
- And how all of the above can ‘fit’ together for a seamless connection between the learning in the laboratory and that in the classroom.

Note: Several of the topics covered above also correspond to and overlap with topics listed under the MHRD's *Model Curriculum for UG Courses in Emerging Areas* (under the courses "*Internet of Things (IoT)*" and "*Robotics*", and to a lesser extent "*Data Science*").

Target audience: UG and PG teachers of Mechanical/Civil/Aerospace/Chemical/Electrical Engineering or Physics. Due to the hybrid mode of conducting the course, participants will be required to spend an equivalent amount of time outside the class timings to prepare for before, and review and complete exercises after class.

Instructor Details			
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1	V. Kartik	Mechanical Engineering	vkartik@iitb.ac.in