

ABOUT VIRTUAL SMART STRUCTURES AND DYNAMICS LABORATORY

Welcome to Virtual Smart Structures and Dynamics Laboratory (VSSDL)

This laboratory provides platform to inquisitive students to perform basic experiments related to smart structures and structural dynamics, either remotely or through simulation.

A smart structure is defined as a structural system having built-in or intrinsic sensors, actuators and control mechanism, whereby it is capable of sensing a stimulus, responding to it in a predetermined manner and extent, in a short time, and reverting to its original state as soon as the stimulus is removed. In the present context, the structures have been instrumented with smart piezoelectric material based sensors, which inform the status (here dynamic characteristics) to the user.

Lack of resources has always been a hurdle to perform experiments, especially when they involve sophisticated and expensive instruments. Also, good teachers are always a scarce resource. Web-based and video-based courses address the issue of teaching to great extent. Joint experiments by two participating institutions and also sharing costly resources has always been a challenge. With the development of virtual labs, above limitations can no more hamper students and researchers in enhancing their skills and knowledge. Web enabled experiments have been designed for remote operation and viewing so as to motivate the students.

The Civil Engineering Department provides the service of Virtual Laboratory via this website: <http://www.ssdliitd.ac.in/vssdl/home.html>. Two types of experiments are covered: **Remote trigger** type (Experiments 1 to 4) and **Simulation** type (Experiments 5 to 8)



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Project)

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Areas of Interest:

- Structural health monitoring
- Smart materials and structures
- Non-destructive evaluation
- Tensegrity structures
- Experimental structural identification
- Adaptation and transfer of aerospace technologies to civil engineering
- Bio-mechanics
- Energy Harvesting

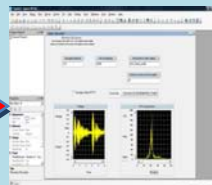
TRIGGER
BASED

Basic idea and types of virtual lab experiments

SIMULATION
BASED



Physical Lab at IIT-Delhi triggered remotely



View at student's PC



Simulation based lab at student's PC

Remote address to faculty members and students of colleges participating under QEEE

VSSDL TEAM MEMBERS

Ms Naveet Kaur (RS)
Ms Susmita Naskar (TA)

SPECIAL QEEE PILOT (01 Feb–15 April 2014)

This pilot provided a complete learning management system that included web-resources, video-lectures, animated demonstrations and self evaluation. VSSDL successfully provided a platform of advanced learning to 11 colleges.



Dr. Suresh Bhalla interacting with 11 engineering colleges in India at multiple locations using A-VIEW



Team members (Naveet and Susmita) demonstrating how to perform experiments



Faculty and students interacting with Dr. Bhalla and team on how to perform Virtual lab experiments



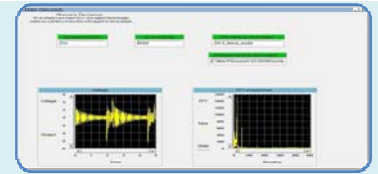
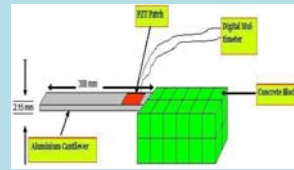
Visit: <http://www.ssdliitd.ac.in/vssdl/home.html>

BRIEF DESCRIPTION OF EXPERIMENTS

REMOTE TRIGGER BASED EXPERIMENTS

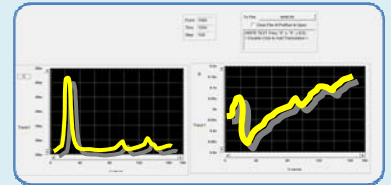
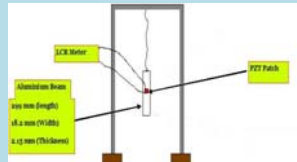
Experiment 1

Vibration Characteristics of Cantilever Beam Using Piezoelectric Sensors



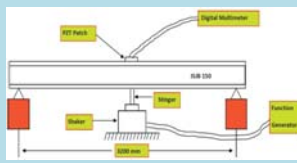
Experiment 2

Identification of High Frequency Modes of Beam in "Free-Free" Conditions Using Electro-Mechanical Impedance (EMI) Technique



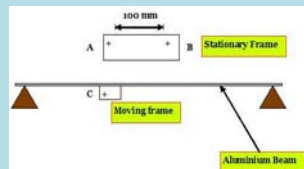
Experiment 3

Forced Excitation of Steel Beam Using Portable Shaker



Experiment 4

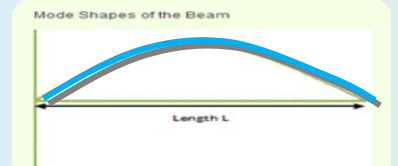
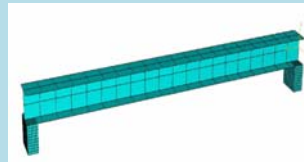
Photogrammetry for Displacement Measurement



SIMULATION BASED EXPERIMENTS

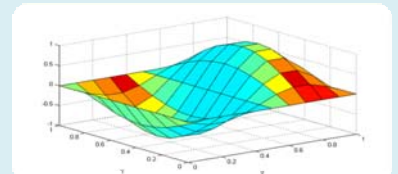
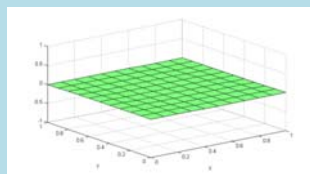
Experiment 5

Modes of Vibration of Simply Supported Beam



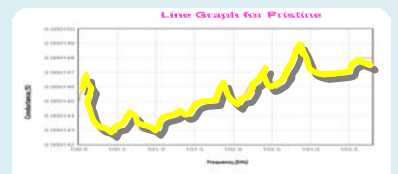
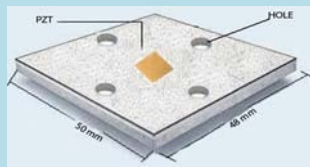
Experiment 6

Modes of Vibration of Simply Supported Plate



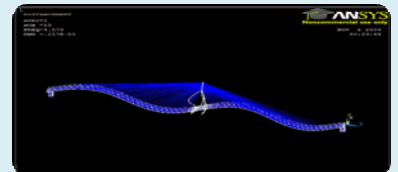
Experiment 7

Damage Detection and Qualitative Quantification Using Electro-Mechanical Impedance (EMI) Technique



Experiment 8

Dynamics of Bandra Worli Sea Link Bridge



CLOSER TO REALITY

<http://www.ssdl.iitd.ac.in/vssdl/home.html>

SCALABILITY

