

# *Gujarat Technological University*

## **Composites as Sensors**

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(IUCEE)

Wed, Nov 20, 2013 **9:45 AM - 10:45 AM IST**

Registration Web Link: <https://www3.gotomeeting.com/register/353055718>

### **Presenter:**

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### **Abstract:**

Carbon is a good conductor of electricity and therefore any composite that incorporates carbon- in the form of powder or fibers- is potentially 'smart'. In this presentation, a crack length measurement gage fabricated from carbon powder and a polymer matrix is first described. In the simplest form, the gage is a rectangular strip with opposite edges silver painted and lead wires attached. It is calibrated by introducing a slit of increasing length and measuring the corresponding electrical resistance. The gage is modeled as a series of resistors connected in parallel. The experimental calibration curve is compared with the results for the simple electrical model and the differences are explained. An experiment using the gage to measure the crack length in an aluminum specimen is described.

In the second part of the presentation, a continuous carbon fiber reinforced epoxy quasi-isotropic composite specimen is investigated as a smart material. The approach is similar to the one used in the carbon powder-epoxy crack length gage described earlier. A slit was cut in the composite specimen with a diamond saw and the slit was lengthened in steps while the corresponding electrical resistance was measured. A similar electrical model was developed and the calibration test results were compared with the model predictions. Finally, a fatigue experiment was conducted. Damage in the composite being complex- consisting of multiple damage modes such as fiber breakage, matrix cracking, delamination, etc.- an 'equivalent crack length' was obtained by measuring the electrical resistance and referring to the calibration curve.