OPTICAL FIBER SENSORS

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PRE-REQUISITES : Introduction to Photonics (preferable)

INTENDED AUDIENCE : Final year UG, and PG students including MS/PhD students

INDUSTRIES APPLICABLE TO : Sterlite Technologies, SFO Technologies, TAG, Forbes Marshall

COURSE OUTLINE :
Optical Fiber Sensors is intended as a senior undergraduate / graduate level course that introduces the different types of optical sensor technologies and their applications in metrology, navigation, and structural health monitoring. The learning objectives of the course include:
-Identify different types of optical sensors and their performance characteristics
- Analyze a given sensing requirement and design appropriate sensor
- Realize and implement an optimal sensing solution for a given requirement

ABOUT INSTRUCTOR :
Prof. Balaji Srinivasan obtained his Ph.D. in 2000 from the University of New Mexico, USA. He subsequently worked as a Senior Development Scientist at Corning Incorporated, USA, where he led technology development efforts related to 3D Optical Cross-connects and Channel Selectable Tunable Filters. Since 2004 he has been with the Indian Institute of Technology Madras as a faculty in the Department of Electrical Engineering, presently as Professor.

Prof. Balaji research interests span the development of active and passive optical components / subsystems for distributed fiber optic sensors and fiber lasers. He has co-authored more than 150 journal and international conference publications, as well as 3 book chapters. He also has 7 patents to his credit (6 more pending). He has successfully executed or currently investigating 24 research projects worth over INR 17 Crores (USD 2.6M) of funding, resulting in the development of 6 technologies, 3 of which have been transferred to industry for commercialization.

Prof. Balaji presently serves in the Editorial Board of the prestigious Optics Express journal, and is one of the Directors of Unilumen Photonics Pvt Ltd, a fiber laser company incubated by IIT Madras. He has previously served as Member of the Photonics Working Group of the Department of Electronics and Information Technology (DEITy), Government of India, Steering Committee of the National Photonics Fellowship, the Editorial Board of the Springer Photonic Network Communications Journal, and as a Chair for the 2012 International Conference on Fiber Optics and Photonics. For his professional accomplishments, he has been awarded Senior Membership in OSA.

COURSE PLAN :

Week 1: Why optical sensors? • Different types Sensors & Instrumentation metrics • Optical receiver design; noise issues

Week 2: Why optical sensors? • Different types Sensors & Instrumentation metrics • Optical receiver design; noise issues (Cont'd)

Week 3: Amplitude Modulated sensors • Lock-in detection

Week 4: Amplitude Modulated sensors • Lock-in detection (Cont'd)

Week 5: Phase modulated sensors • Phase noise analysis and mitigation; Sensitivity limits

Week 6: Phase modulated sensors • Phase noise analysis and mitigation; Sensitivity limits (Cont'd)

Week 7: Wavelength modulated sensors • Interrogator design, sensitivity limits

Week 8: Wavelength modulated sensors • Interrogator design, sensitivity limits (Cont'd)

Week 9: Polarization Modulated Sensors • Analysis of current sensor

Week 10: Distributed Fiber Sensors • Raman & Brillouin scattering-based sensors

Week 11: Distributed Fiber Sensors • Raman & Brillouin scattering-based sensors

Week 12: Distributed Fiber Sensors • Raman & Brillouin scattering-based sensors (Cont'd)