

# Physics of the Visual System for Engineers

## Overview

This course will deal with the theory and practice of visual perception, with emphasis on techniques used in vision research and in visual information processing. Central areas of vision research including spatial vision, motion perception, color and binocular vision will be covered. Emphasis will be put on psychophysical methods. Anatomy and Physiology, light and optics, convolutions and Fourier methods, and network theory and systems are also examined.

This course will begin with an overview of language and processes underlying specific areas of vision such as measures of neural activity, feature specificity, and individual cells and psychophysics. The student will be systematically introduced to the more essential properties of light and optics relevant to visual perception; the use of convolutions, Fourier series, and Fourier transform to model processes in visual perception; and network theory and systems. Psychophysical methods play a valuable and important role in vision research and will be discussed in depth. Subsequent topics will deal with the geometry of visual perception; spatial vision; the perception of motion; and some specific issues in visual perception, including color perception, binocular vision, and stereopsis. Lectures on 3-D vision and lab demonstrations shall also be a part of the course.

Course participants will learn these topics through lectures. Also case studies and some clinical applications will be provided. Some project and research ideas will be presented.

<b>Dates for the Course</b>	<b>December 12<sup>th</sup> to 23<sup>rd</sup>, 2016</b>
<b>Host Institute</b>	<b>IIT Madras</b>
<b>No. of Credits</b>	<b>2</b>
<b>Maximum No. of Participants</b>	<b>50</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are an electrical, biomedical or computer engineer or research scientist interested in applying computational and theoretical methods to study basic and clinical applications of vision research.</li><li>▪ You are a biophysicist or bioengineer and wants to learn about the visual system. This course is also meant for people interested in human factors engineering as applied to vision – i.e., Google glasses, as well as professionals working in computer/machine vision.</li><li>▪ You are a student or faculty from academic institution interested in learning how to do research on vision and perception.</li></ul>
<b>Course Registration Fees</b>	<p>The participation fees for taking the course is as follows: <b>Student Participants:</b> Rs.2000 <b>Faculty Participants:</b> Rs.6000 <b>Government Research Organization Participants:</b> Rs.10000 <b>Industry Participants:</b> Rs.20000</p> <p>The above fee is towards participation in the course and the course material. <b>Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai</b> The demand draft is to be sent to the Course Coordinator at the address given below.</p>
<b>Accommodation</b>	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: <a href="http://hosteldine.iitm.ac.in/iitmhostel">http://hosteldine.iitm.ac.in/iitmhostel</a></p>

## Course Faculty

Prof. Vasudevan Lakshminarayanan is a professor of vision science, physics, systems design engineering and electrical engineering at the University of Waterloo. He has published widely in areas ranging from optical physics, applied math, basic and clinical applications of visual psychophysics, neuroscience, etc. and has won many awards including the Optics Medal of the Optical Society of India and a Fellow of a number of learned societies such as AAAS, APS, OSA, SPIE, etc.



Dr. A.R. Ganesan is an Associate Professor at the Indian Institute of Technology Madras, Chennai, India. He obtained his Ph.D. degree from the Indian Institute of Technology Madras in 1989. He has been a post-doctoral fellow in Malaysia, USA and an Alexander von Humboldt Fellow in Germany. He is the author of more than 70 journal papers and the co-author of the Indian Edition of the book on "Optics" with Eugene Hecht. His areas of research are Laser applications in Engineering Metrology, Holography, Adaptive Optics, Optical Instrumentation, Speckle Metrology, Non-Destructive Testing, Fiber Optics & Laser Instrumentation and Vision Science. He is a Fellow of the Optical Society of India, a member of SPIE and also an Associate Editor of Optical Engineering.



## Course Coordinator

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