



BIOREACTORS

PROF. G. K. SURAIISKUMAR

Department of Biotechnology
IIT Madras

INTENDED AUDIENCE : Biological Eng., Biotechnology, Biochemical Eng., Chemical Eng.,
BE (other experienced students such as ME/MS/PhD can also register to get a unique
viewpoint)

PRE-REQUISITES : Ability to appreciate simple mathematical analysis

INDUSTRIES APPLICABLE TO : All biotech and pharma industries (Biocon, Sanofi-Pasteur, Dr. Reddys, ...)

COURSE OUTLINE :

Bioprocesses are used by any biotechnology/pharma industry to produce biological products that are widely used. This course, Bioreactors, will consider the heart of any bioprocess. It will present all aspects that are relevant for an appreciation of all relevant aspects of bioreactors. This course is expected to be of interest to students who want to learn about bioreactors, teachers who want to better understand the basis of their material, as well as industry personnel who are looking to better understand the principles and apply them to creatively solve their existing challenges.

ABOUT INSTRUCTOR :

Prof. G. K. Suraishkumar is a Professor in the Department of Biotechnology, Indian Institute of Technology Madras (IITM). He has been at IITM as a Professor since May 2004, and was earlier a faculty member in the Department of Chemical Engineering at the Indian Institute of Technology Bombay (IITB) from April 1993 until mid-May 2004. He was also an Associate Faculty member in the erstwhile Centre for Biotechnology, which is now the Department of Biosciences and Bioengineering, at IITB, between 1995 and 2004.

He earned his Ph.D. from Drexel University, Philadelphia, USA in 1993, and his B.Tech. in Chemical Engineering from IITM in 1986. He also did his Masters work at the University of Cincinnati, USA, between 1986 and 1988.

He is passionate about improving student learning and has published papers in reputed international journals on the methods that he had developed for the same. He is the author of a book, Continuum Analysis of Biological Systems: Conserved Quantities, Fluxes, and Forces, which was published world-wide by Springer Publishing in March 2014; the foreword has been written by the reputed author of the famous textbook, Transport Phenomena, Professor R. B. Bird. Recently, he created two 10-h MOOCs on Bioreactors, and Biology for Engineers and other Non-biologists as NPTEL online certification (NOC) courses. Earlier, he created a 40-lecture NPTEL video course on Classical Thermodynamics for Biological Systems. He has also created other short videos on biochemical engineering principles.

His major area of research is reactive species – currently, the relevance of them in cancer and nanoparticle toxicity. Earlier, his research group had made significant, original contributions in the area of reactive species applied to improve bioreactor productivities and bio-oil which were financially supported through many sponsored research grants. The research contributions have been better disseminated through publications in reputed international journals – the complete list of publications is available as a link from his Department webpage, <https://biotech.iitm.ac.in/faculty/suraishkumar-g-k/>. He is also the inventor on 3 (granted) + 3 (under process) patents. Further, the technology developed in his group was successfully applied at Biocon industries, and has been featured in prestigious technology alerts such as the one by Frost and Sullivan. He has guided many Ph.D., and Masters theses. Some recognitions of his work by others are listed in his web-page given above.

Administratively, he played pivotal roles in the set-up of the Departments of Biotechnology, as the first formal Department Head, first at IIT Madras and later, at IIT Hyderabad. He was one of the main architects of the first postgraduate program in Clinical Engineering in India, which is a multi-Institute program, and a first of its kind in India. In addition, he contributed as the Head of the Sophisticated Analytical Instrumentation Facility, Chennai. He continues to contribute on National level faculty selection/advisory/institution level committees in relevant areas.

COURSE PLAN :

Week 01 : Introduction | Two important outcomes of a bioprocess: biomass (cells) and bio-products. Common

Week 02 : bioreactor operation modes.

Week 03 : Factors that affect bioreactor performance.

Week 04 : The cell-view of a bioreactor.