nature is fractional

FOS' 20

15th –19th February, 2020

Department of Electrical Engineering, IIT, Kharagpur

Workshop on
"Fractional Order System"
10 lectures
15 hours practical session

Bioprocess Instrumentation Lab,
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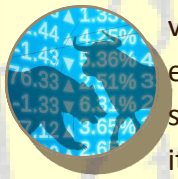
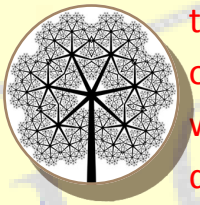


In the past few decades, fractional order (FO) calculus has emerged as a potential tool in various domains of science and engineering. The arbitrariness in the order of the differential equation in FO calculus introduces more degrees of freedom in design and analysis, resulting in more accurate modelling, better robustness in control and greater flexibility in signal processing. By this time it is established that the electrochemical phenomena like double layer charge distribution or the diffusion process can be better explained with fractional order system. As a result the modelling of lithium ion battery, fuel cells, supercapacitors are carried out with fractional differential equation. The characterization of ceramic bodies, fractal structures, viscoelastic materials, the decay rate of fruits and meats, study of corrosion in metal surface are also promising area of its applications.FO system is now an emerging topic and a popular choice to study the real time events such as earthquake propagation, volcanic phenomenon, designing of phermo-kinetics, modelling of human lungs and skin. Even the characteristics of economic market fluctuation adopts fractional calculus based system modelling. So in other words, FO analysis has now reached from the inert physical network to living networks of biology, ecology, physiology and sociology, reminding us Leibnitz's prediction in his letter to L'Hopital (1695) that the fractional differential operator is ``an apparent paradox from which one day useful consequences will be drawn"

As real systems are better described by FO structure, they are better controlled by FO controllers. Recent researches on FO controllers have shown promising result in this direction. Many researchers are actively engaged to develop fractional order device/fractor as this not only offers the possibility of highly useful electronic circuit elements but also allows for the study of complexity in a much broader context.



FOS' 20, an initiative of Bioprocess Instrumentation Lab, Dept. of EE, IITKGP, gives the unique opportunity to come together and share thoughts, to know each other and discuss the findings of the different research groups. The workshop will also facilitate to transfer knowledge to the researches who are new to the domain of fractional order system.

FOS' 20

Chairman: Prof. Siddhartha Sen **Convenor : Prof. Karabi Biswas**

Day 1: 15-02-2020, Saturday FN: (9:30 am-1:00pm) Venue: N -208, Electrical Engineering Department
9:30 am: Inauguration of 'FOS'20' workshop
10:00 am -11:30 am: **Lecture 1**: Speaker: Dr. Karabi Biswas Topic: Fractional order capacitor: a journey from multi component to single component device
11:45 am -1:00pm: **Lecture 2**: Speaker: Dr. Munmun Khanra Topic: Fractional dynamics in electrochemical energy storage systems
Lunch Recess: 1:00 pm - 2:30 pm
AN: (2:30 pm-5:30pm) Venue: N-208, Bioprocess Instrumentation Lab **Practical session**: Hands on simulation of multicomponent fractors (ladder fractors)

Day 2: 16-02-2020, Sunday FN: (9:30 am-1:00 pm) Venue: N-208, Electrical Engineering Department
9:30am -11:00 am: **Lecture 3**: Speaker: Ms. Dina Anna John Topic: Solid state fractional capacitor
11:15 am -1:00pm: **Lecture 4**: Speaker: Dr. Lobna A. Said Topic: An overview of fractional-order calculus: Application in electrical engineering
Lunch Recess: 1:00 pm - 2:30 pm
AN: (2:30 pm-5:30pm) Venue: N-208, Bioprocess Instrumentation Lab **Practical session**: Hands on practical Session on designing fractors
Day 3: 17-02-2020, Monday FN: (9:30 am-1:00pm) Venue: N-208, Electrical Engineering Department
9:30 am -11:00 am: **Lecture** 5: Speaker: Mr. Shantanu Das Topic: Importance of fractional calculus in real life engineering & science applications
11:15 am -1:00 pm: **Lecture 6**: Speaker: Prof. Siddhartha Sen Topic: Fractional order filter circuit
Lunch Recess: 1:00 pm - 2:30 pm
AN: (2:30 pm-5:30pm) Venue: N-208, Bioprocess Instrumentation Lab **Practical session**: Hands on practical Session on designing fractors
Day 4: 18-02-2020, Tuesday : FN: (9:30 am-1:00pm) Venue: N-208, Electrical Engineering Department
9:30 am -11:00 am: **Lecture 7**: Speaker: Dr. Avishek Adhikary Topic: Realization of GIC based dynamic fractor in all the four quadrant
11:15 am -1:00 pm: **Lecture 8**: Speaker: Mr. Shantanu Das Topic: Fractional Order control
Lunch Recess: 1:00 pm - 2:30 pm
AN: (2:30 pm-5:30pm) Venue: N-208, Bioprocess Instrumentation Lab **Practical session**: Hands on practical Session on designing of fractional order filters
Day 5: 19-02-2020, Wednesday FN: (9:30 am-1:00pm) Venue: N-208, Electrical Engineering Department
9:30 am -11:00 am: **Lecture 9**: Speaker: Prof. M. V. Aware Topic: Analogue/Digital realization of FO-PID for Industrial drives
11:15 am -1:00 pm: **Lecture 10**: Speaker: Dr. Farooq Ahmad Khanday Topic: Recent advances in the design and applications of fractional-order analog integrated circuits and systems
Lunch Recess: 1:00 pm - 2:30 pm
AN: (2:30 pm-5:30pm) Venue: N-208, Bioprocess Instrumentation Lab **Practical session**: Hands on practical Session on designing of fractional order circuit

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