TRANSFORM CALCULUS AND ITS APPLICATIONS IN DIFFERENTIAL EQUATIONS

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TYPE OF COURSE : Rerun | Core | PG

COURSE DURATION : 12 weeks (24 Jan' 22 - 15 Apr' 22)

EXAM DATE : 24 Apr 2022

INTENDED AUDIENCE : Mathematics (Any student with a course in Mathematics in their curriculum)

COURSE OUTLINE :

For undergraduate students in the discipline of Mathematics, the course on Transform Calculus has become an integral part. This course is designed to train students with the basic Integral Transform techniques. Application of these transforms techniques in solving ordinary differential equations and partial differential equations will be discussed. We will also introduce some higher level concepts that will prepare them for future research and development projects. The course outline is given for each week. We will introduce each topic and give an overview of the topic and underlying theory. This will be followed by some solved numerical examples on each topic for their better understanding. Weekly assignments will be provided and graded.

ABOUT INSTRUCTOR :

Prof. Adrijit Goswami joined the Institute as a Faculty member in 1992. He received his M.Sc. and Ph.D. degree from Jadavpur University, India in 1985 and 1991 respectively. His research interest and publications have been on Operations Research and Theoretical Computer Science. His initial interest has been in developing mathematical models in Inventory Control under deterministic, probabilistic and fuzzy environment. For the past several years he has been involved in various aspects of database systems, data mining and cryptography and computer network as a researcher. Professor Goswami has guided 14 research scholars in their Ph.D. programs and at present guiding 7 students. He is author and co-author of more than 90 research publications in major International journals in the area of Operations Research and Theoretical Computer Science. He is also member of the editorial board of several International/National research journals. His current interests and publications have been on Production Planning and Control, Supply Chain management, Data Mining, Cryptography, Hierarchial access Control and Network security.

COURSE PLAN :

Week 1**:** Introduction to Laplace transform: Definition and properties

Week 2**:** Laplace Transform of derivatives and integrals

Week 3**:** Laplace Transform of some special functions

Week 4**:** Inverse Laplace Transform

Week 5**:** Application of Laplace Transform to Ordinary Differential Equations and Integral Equations

Week 6**:** Fourier Series

Week 7**:** Introduction to Fourier Transforms: Definition and properties

Week 8**:** Fourier Sine and Cosine transforms of different functions

Week 9**:** Parseval's Identity for Fourier Sine and Cosine Transforms

Week 10**:** Application of Fourier Transform to Ordinary Differential Equations and Integral Equations

Week 11**:** Application of Fourier Transform to Partial Differential Equations

Week 12**:** Finite Fourier transform and its application to Boundary Valued Problems