MATHEMATICAL METHODS FOR BOUNDARY VALUE PROBLEMS

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TYPE OF COURSE : New | Core_Elective | UG
COURSE DURATION : 4 weeks (29 Jul'19 - 23 Aug'19)
EXAM DATE : 29 Sep 2019

PRE-REQUISITES : Basic UG course in Mathematics/ Undergraduate Calculus

INTENDED AUDIENCE : Undergraduates of any Engineering course, Mathematics, Physics and Postgraduate student of Mathematics/ Mechanical/ Aerospace/Chemical Engineering

COURSE OUTLINE :

This course is intended to provide methods to solve linear and nonlinear boundary value problems involving ordinary as well as partial differential equations. The course will start providing mathematical tools based on integral transformation, Fourier series solution and Greens function for obtaining analytic solutions for BVPs. This course, apart from being a part of regular undergraduate/ postgraduate mathematics course, will provide a guidance to solve BVPs arise in mathematical modeling of several transport phenomena.

ABOUT INSTRUCTOR :

Prof. S. Bhattacharyya is a senior Professor in the Department of Mathematics, IIT, Kharagpur. His specialization is Applied Mathematics. He teaches Integral Transform Techniques, Partial Differential Equations,Numerical solutions of PDEs and other related courses. His research works involve numerical solutions of PDEs and he has published more than 120 research papers in reputed international journals. He has undertaken sponsored research projects and guided 15 PhD students. He has organized and delivered lectures at conferences, AICTE sponsored short term courses and GIAN courses on the topics related to Applied Mathematics. He has received fellowships for research collaboration in USA, UK and Germany.

COURSE PLAN :

Week 1: Boundary Value Problems (BVP) and its Applications. Analytical Methods: MaximumPrinciple, Green's function; Separation of Variables ; Eigen Values, Eigen Functions.

Week 2: Integral Transform Techniques for BVPs and its limitations

Week 3: Numerical Techniques for BVP: Shooting Method; Finite Difference Method; Block tri-diagonal System of Equations

Week 4: Numerical Methods for Non-linear BVPs; Elliptic type of Partial Differential Equations; Successive-Over-Relaxation Method; Multigrid Methods.