INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

<table>
<tr><td>Course Title</td><td>Advanced Partial Differential Equations</td><td>Course No</td><td colspan="4">MAT6XXX</td></tr>
<tr><td>Specialization</td><td></td><td>Structure (LTPC)</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>To be offered for</td><td>PG / Ph.D</td><td>Status</td><td colspan="2">Core ☐</td><td colspan="2">Elective ■</td></tr>
<tr><td>Faculty Proposing the course</td><td>Dr. Nachiketa Mishra</td><td>Type</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td rowspan="2">Date of DAC</td><td rowspan="2">12-08-2018</td><td>Members Present in DAC</td><td colspan="4">All Faculty Members of the Dept.</td></tr>
<tr><td>External Member:</td><td colspan="4">course structure is exactly matching with existing course & syllabus at TIFR Bangalore.</td></tr>
<tr><td>Pre-requisite</td><td>Differential equations & mathematical analysis</td><td>Submitted for approval</td><td colspan="4">39th Senate</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">Partial Differential Equations is one of the most broad areas of Mathematics involving several other areas of Mathematics such as mathematical analysis, numerical analysis, geometry etc. Apart from this PDEs appear in modeling a wide variety physical and real world problems in science and engineering.
• This course aims to study some important types of PDEs.
• In doing so we will learn various analytical and numerical tools and techniques useful in gleaning information about solutions of PDE problems.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">• Given a PDE problem one should be able determine whether the problem is well-posed or ill-posed.
• Should understand the notion of solution -- classical, weak or any other notion of solution.
• Should be able to obtain results on existence, uniqueness and regularity of solution.
• Should be able to employ appropriate tools and techniques for obtaining analytical results and qualitative behaviours</td></tr>
<tr><td>Contents of the course (With approximate break-up of hours)</td><td colspan="6">Module 1: Distribution Theory (10 hrs)

Module 2: Sobolev Spaces, embedding theorems, Rellich's Lemma, Trace Theorems (12 hrs)

Module 3: Second order elliptic equations:- Formulation of Dirichlet, Neumann & Oblique derivative problems, Weak formulation, Lax - Milgram Lemma, existence & regularity upto the boundary, Maximum principle, elementary variational inequality. (15 hrs)

Module 4: Linear evolution equations, existence of weak solutions, energy methods. (12 hrs)</td></tr>
<tr><td>Text Books</td><td colspan="6">1. S Kesavan - Topics in Functional Analysis and Applications, New Age International, 2015
2. Lawrence C. Evans - Partial Differential Equations, AMS, 2010</td></tr>
<tr><td>Reference Books</td><td colspan="6">1. Jose Barros-Neto - An introduction to the Theory of Distributions, M. Dekker, New York, 1973
2. Robert A. Adams - Sobolev Spaces, Elsevier, 2003</td></tr>
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