

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
PROFORMA FOR NEW COURSE

1.	Title of the Course	Computational Fluid Dynamics
2.	Course Number	ME5101
3.	Status of the Course	Elective
4.	Structure of Credits	3-0-0-3
5.	Offered to	PG
6.	New Course/ Modification to	New Course
7.	To be offered by	Mechanical Engineering
8.	To take effect from	January 2018
9.	Prerequisite	Knowledge of undergraduate heat transfer and fluid mechanics.
10.	Whether approved by the Program	Yes
11.	<p>Course Objective: The primary objective of the course is to teach fundamentals of computational method for solving linear and non-linear partial differential equations (PDE) related to fluid dynamics and heat transfer. The course offers introductory concepts about solving PDE mainly in the finite difference (FD) framework though some amount of finite volume (FV) concept has also been introduced.</p>	
12.	<p>Course Content: Introduction: Governing equations for fluid flow and heat transfer, classifications of PDE, finite difference formulation, various aspects of finite difference equation, error and stability analysis, dissipation and dispersion errors, modified equations; Solutions of simultaneous equations: iterative and direct methods, TDMA, ADI; Elliptic PDE: One- and Twodimensional steady heat conduction and their solutions, extension to three-dimensional; Parabolic PDE: Unsteady heat conduction, explicit and implicit methods, solution of boundary layer equation, upwinding; Solution of incompressible N-S equation: Stream function and vorticity formulation, primitive variable methods: MAC and SIMPLE</p>	
13.	<p>Text Books:</p> <ol style="list-style-type: none"> 1. S. V. Patankar, Numerical Heat Transfer and Fluid Flow, Hemisphere Series on Computational Methods in Mechanics and Thermal Science. 2. K. Muralidhar and T. Sundararajan, Computational Fluid Flow and Heat Transfer, 2nd ed., Narosa, 2011. 	
14.	<p>References:</p> <ol style="list-style-type: none"> 1. P. S. Ghoshdastidar, Computer Simulation of Flow and Heat Transfer, 4th ed., Tata McGraw-Hill, 1998. 2. C. Hirsch, Numerical Computation of Internal and External Flows, Elsevier, 2007. 3. O. Zikanov, Essential Computational Fluid Dynamics, Wiley, 2010. 	