Course Number and Name
BGE011 – COMPUTATIONAL FLUID DYNAMICS

Credits and Contact Hours
3&45

Course Coordinator's Name
Mrs.C.M.Meenakshi

Text Books and References

TEXTBOOKS:

1.Yunus Cengel.,John Cimbala., Fluid Mechanics,TMG.,2014.

2.S .Malasangara., An Introduction to Computational Fluid Dynamics.,2nd edition.,TMG.,2010.

REFERENCES:

1. K.Muralidhar & T.Sundarrajan-Computational Fluid Flow and Heat Transfer-Narosa, 2003
2. P.S.Ghoshdastidar-Computer Simulation of Flow and Heat Transfer-Tata McGraw Hill Publishing Company Ltd 1998.
3. H.K.Versteeg&W.Malalasekara-An Introduction to Computational Fluid Dynamics-Longman.
4. **book**boon.com/en/**computational**-**fluid**-**dynamics**-e**book**

Course Description

To impart the knowledge of numerical techniques to the solution of fluid dynamics and heat transfer problems.
To introduce Governing Equations of viscous fluid flows.
To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers
To enable the students to understand the various discretization methods, solutionprocedures and turbulence modeling.

Prerequisites	Co-requisites
MANUFACTURING TECHNOLOGY	Nil

required, elective, or selected elective (as per Table 5-1)
Non Major Elective

Course Outcomes (COs)	
CO1	Will acquire knowledge of numerical techniques to the solution of fluid dynamics and heat transfer problems.
CO2	Will get introduced to Governing Equations of viscous fluid flows
CO3	students will be enabled to understand the various discretization methods, solutionprocedures and turbulence modeling.
CO4	To learn about calculation of flow field
CO5	To study about TURBULENCE AND ALGEBRAIC MODELS
CO6	To study of heat conduction of FEA

Student Outcomes (SOs) from Criterion 3 covered by this Course												
COs/SOs	a	b	c	d	e	f	g	h	i	j	k	l
CO1	M											
CO2					H			M				H
CO3	M											H
CO4					H					L		H
CO5	M		H		H							H
CO6	M											

List of Topics Covered

UNIT I GOVERNING DIFFERENTIAL EQUATIONS   9

Conservation of chemical species-The energy equation-Momentum equation-time averaged equations for turbulent flow-Turbulence-Kinetic energy equation-The general differential equation-Nature of co-ordination-Independent variable-Choice of co-ordinates-one way and two way coordinates

UNIT II DISCRETIZATION METHODS   9

Nature of numerical methods-Methods of deriving of discretization equations-Taylor series formulation-Variational formulation-Methods of weighted residuals-Control volume formulation

UNIT III   HEAT CONDUCTION, CONVECTION AND DIFFUSION   9

Steady One Dimensional Conduction- Two and three dimensional conduction-Steady one dimensional convection and diffusion-Discretization equations for two dimensional convection and diffusion

UNIT IV   CALCULATION OF FLOW FIELD   9

Representation of pressure-gradient and continuity equation-stagged grid-momentum equations-pressure and velocity correction-pressure correction equation.Introduction to Finite Element Method-solution of steady heat conduction by FEM-incompressible flow-simulation by FEM.

UNIT V TURBULENCE AND ALGEBRAIC MODELS   9

One, two equation model-high and low Reynolds number models-Reynolds stress models-Prediction of fluid and heat transfer using standard codes.