

Tentative programme schedule of short term course on
Computer Aided Engineering: Applied CFD and FEM,
 18-24 January, 2016, IIT Mandi

Day↓ Time→	9.30-10.00	10.00-11.00		11.30-1.00		2.00-3.00	3.00-4.00		4.15-5.00	5.00-5.30
DAY 1: Monday (18th Jan)	Registration	Inauguration		Computer Aided Engineering (CAE): FEM, CFD		Geometric features and organisation for CAE	Nodes-to-Lines-to-Surfaces-to-Geometry		Element types: 1D, 2D and 3D, 2D mesh, critical region, Mesh refinement, quality check	
	FEM theory			Weak (variational) form type method		Stresses in critical region			How to decide?	
DAY 2	Review of overnight assignment	Subdomain, Galerkin, Petrov-Galerkin, Least square, Collocation, Rayleigh-Ritz		Rayleigh-Ritz Method, Global matrix		Solution strategies: Quad, tria or higher order element?	Abrupt geometry: plate with a hole, Effect of mesh density		1D, 2D or 3D FEM: Same result, different method?	Overnight lab assignments : winners at the end of the course will get a certificate with tablet, hard disc etc. as prize
	Reverse Engineering 1: Why and how with CAE		T E A	Reverse Engineering 2: Geometry from Mesh	L U N C H	Automotive application	Biomedical application	T E A	Concept of interface modelling	
DAY 3	Review of overnight assignment	3D, Tetra Meshing, face extraction Reverse Engineering		Raw scanned data to perfect feature based geometry		Non-Linear analysis of Hybrid Journal Bearing using FEM (TN)	Advances in multi-physics CFD-FEM modelling		Orthodontics: FEM modelling of periodontal ligament and alveolar bone of a teeth	
	Industry case study			Design for vibration 2: Harmonic response		Convective heat transfer	Scaling laws		Scaling laws for internal & external flows	
DAY 4	Review of overnight assignment	Design for vibration and thermal: a multidisciplinary problem Structural design based on natural dynamic response		Structural design based on forced harmonic response		Differential equations and concept of boundary layer	Rules for scaling analysis		Order of magnitude method	

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DAY 5: Friday (22nd Jan)	CFD theory		T E A	Solution techniques	L U N C H	Concept of internal and external flows	Flow with obstruction	T E A	Concept of interface modelling	Overnight lab assignments : winners at the end of the course will get a certificate with tablet, hard disc etc. as prize	
	Review of overnight assignment	Conservation equation, flow classification		Schemes, solution methods: steady, unsteady convection-diffusion equations		Fluid and solid volume extraction	Wind tunnel technique, boundary layer, pressure, velocity etc. prediction		Conjugate heat transfer		
How and why 2D CFD model?		2D CFD model		Turbomachinery application		Blade design					
DAY 6	Review of overnight assignment	Industry case study		Flow over cylinder, lift and drag		Flow with blade rotation: concept of moving reference frame	From 3D to 2D blade aerodynamic design and CFD model		Flow rates and losses prediction using CFD		
Reverse Engineering 3: From photos to 3D CAD		Reverse Engineering 4: Geometry from Mesh		Project evaluation		Closing ceremony					
DAY 7	Best practices for taking still images	CFD/FEM project		CFD/FEM project		Presentation Winner prize distribution	Feedback and vote of thanks				