National Institute of Technology Meghalaya An Institute of National Importance													CURRICULUM					
Progr	ramme	Minor degree in Sports Engineering Year of Regula														on	2024	
Depa	rtment	Mechanical Engineering Semester													mester	V		
Cour						dit Structure Marks Distribut												
Coc		Course Name Modelling and Simulation in Sports Engineering								T		P	C	INT			END	Total
ME :	301				fluid	2	0							100	200			
Cou		To develop the student's ability to understand fluid dynamics principles, including flow patterns, viscosity, and pressure distribution, laying the groundwork for sports applications. To learn to practically apply Computational Fluid Dynamics tools in sports engineering, using simulations to analyze and optimize fluid flow for better sports equipment and performance.								CO	D1 t s	Able to grasp the basics of fluid dynamics, understanding the fluids behavior in context to sports Able to apply Computational Fluid Dynamics tools to enhance sports equipment and performance.						
Objectives		To enab knowled perform studies t	Outcome	CO)3 1	Able to solve problems in aerodynamics, hydrodynamics, and performance. Able to contribute to innovate in sports												
		methodo		СО)5 a	technology by applying fluid dynamics principles. Able to gain practical experience in setting up and interpreting fluid dynamics simulations for sports scenarios.						ting up						
NI-	CO-			Т	1		ping with I			nes (P						_		g with PSO
No.	COs	PO1	PO2	PO3	PO4	PO5	PO6	PC			PO	9 P	O10	PO11	PO1	2 P	SO1	PSO2
	CO1	3	2	-	1	2	-	-	2		-	-	•	-	2	-	-	-
	CO2 CO3	3	2	-	1	2	-		2		-			-	2		-	-
	CO4	3	2	-	1	2	-	-	2		-	<u> </u>			2		-	-
	CO5	3	2	-	1	2	-	-	2		-	-	•	-	2		-	-
SYLLABUS																		
No.	Interest	Content Hours COs													COs			
I	Role of equations wakes	duction to Fluid Dynamics in Sports: Overview of Fluid Dynamics-Basic principles and applications in sports, of Fluids in Sports Performance: Aerodynamics and hydrodynamics, Significance in Different Sports, Continuity tion, Euler's equation of motion, Momentum equation, Energy equation, Boundary Layer Flows, potential flow, es and vortices, drag and lift, Significance in Different Sports.													4	CO1		
II	of Par Nume	damentals of Fluid Dynamics Modelling and Simulation: Introduction and Conservation Principles, Classification artial Differential Equations and Approximate Solutions, Fundamentals and Common Methods of Discretization, nerical Solutions, Basic concepts and applications,													0	4	CO2 CO5	
III	Studie equip	orts Equipment Aerodynamics: Aerodynamics in Sports: The impact of fluid dynamics on equipment design, Case dies: Analysis of aerodynamic principles in sports equipment, Wind Tunnel Testing: Basics and relevance in sports ipment testing,														0	4	CO3
IV	other Desig	rodynamics in Aquatic Sports, Fluid Dynamics in Water: Hydrodynamics principles relevant to swimming and r water sports, Drag Reduction Techniques: Applying fluid dynamics to improve swimmer performance, Boat ign and Hydrodynamics: Optimizing boat shapes for enhanced performance,													0	4	CO3 CO5	
V	Metho injury	mization of Sports Performance, Integrating Fluid Dynamics for Performance Enhancement, Training hodologies: Using fluid dynamics insights for effective sports training, Safety Considerations: Fluid dynamics in my prevention and athlete safety, Future Trends: Emerging technologies and research in fluid dynamics for sports formance,													4	CO4 CO5		
VI	Fluid Analy	ne designing and sports data analysis: Game Design principles and elements relevant to sports simulations Role of id Dynamics in Virtual Environments: Incorporating realistic fluid behavior in sports-themed games Sports Data alysis: Collection, interpretation, and application of data for performance optimization, Simulation-Based Game velopment, Using fluid dynamics to enhance realism and accuracy in sports simulations.														4	All COs	
VII	Simulation lab: Case studies and examples from various sports, Fluid dynamics Software Tools, Overview and hands-														2	4	All COs	
Total Hours														48				
Essen		eadings																
1. 2.							to computa ", 4th Edit			amics	s: Th	e finite v	olume	method	ı'', Pears	on Ed	ucatio	n, 2008

Supplementary Readings

1. J D Anderson Jr., "Computational Flud Dynamics", McGraw Hill International Edition, 2017

Fluid Mechanics – Frank White, TMH, 8th Edition, 2015
 Mechanics of Fluids – Massey, ELBS, 9th Edition, 2011