



Course Specifications						
<b>Program</b> (s) on which this course is given	Bachelor Degree of Mechanical Power Engineering					
Department offering the program	Mechanical Power Engineering					
Department offering the course	Mechanical Power Engineering					
Academic Level	Third Year					
Date	2023-2024					
Semester(based on final exam timing)	$\sqrt{\text{Fall}}$ Spring					

I. Title:       Applications of Fluid Mechanics-1       Code:       MEP 3020 (New 2018 Bylaws)         2. Units/Credit hours per week:       Lectures       2       Tutorial       2       Practical       1       Total       5         B- Professional Information       Overall Aims of Course: This course builds upon the 2 <sup>nd</sup> year basic material in "Fluid Mechanics" but is more applied in nature. The course deals with different types of fluid flow problems from the differential control volume analysis point of view. The course examines various types of flows such as: internal viscous flow, frictionless flow and boundary layer flow.       I. Master essential facts and concepts relevant to various types of incompressible flow such as: Viscous flow, Frictionless Flow and Boundary Layer Flow.         2. Apply techniques of differential control volume analysis to drive basic governing conservation equations of fluid flow by using different types of coordinate systems.       3. Identify mass, linear momentum & energy equations for many incompressible flows.         3. Identify mass, linear momentum & energy equations for various types of fluid flows.       5. Apply analytic critical and systematic thinking to solve mass and linear momentum differential conservation equations for various types of fluid flows.         5. Apply analytic critical and systematic thinking to solve mass and linear differential equation of the boundary layer flow.       7. Recognize the role and importance of the concept of frictionless flow and conformal mapping techniques to solve some fluid flow problems.         8. Apply the similarity and numerical solution methodology to solve the non-linear differential equation	2. Units/Credit nours per week: <b>B- Profession</b> <b>Ov</b> <b>1. Course</b> <b>lescription:</b> 1. 2.	Lectures al Inform verall Aims more applied fferential con- ternal viscou Master esse flow, Friction Apply techn	2 <b>nation</b> of Course d in nature ntrol volum s flow, fri ential facts onless Flo	Tutorial e: This course e. The course of ne analysis po- ctionless flow and concepts	build build bint o bint o cond relev	2 ds upon with di f view. bounda	Practical the 2 <sup>nd</sup> year basi ifferent types of fl The course exam	1 ic materia luid flow	Total l in "Fluid Mechar problems from the	5 nics" but
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14. Refer to relevant interature	2. Intended       5.         Learning       6.         Outcomes       7.         of Course       7.         (ILOs):       8.         9.       10.         11.       12.         13.       13.	Identify ma Identify the differential Apply analy conservatio Identify ess applications Recognize to techniques to Apply the s of the bound Search for i . Exchange . Work in st . Effectively	f fluid flov ass, linear importance conservation ential bours of viscours the role an to solve so imilarity a dary layer nformatio knowledg tressful en cate effect y manage	lifferential con w by using dif momentum & ce and physica ion equations l and systema is for various to ndary condition is flow problem d importance ome fluid flow and numerical flow. In related to van e with engined vironment and ively. tasks and reso	ntrol feren al me for va tic th types ons, c ms. of the prol solut ariety ering d with	ayer Flo volume t types gy equ aning c arious t inking of fluic constrai e conce blems. ion me of incc commonin con	ow. e analysis to drive of coordinate sys ations for many in of each term in the ypes of fluid flow to solve mass and d flows. ns and assumptio ept of frictionless thodology to solv ompressible visco unity.	basic gov tems. ncompress e complex vs. l linear mo ns require flow and o re the non-	verning conservations sible flows. a non-linear partial comentum different ed to solve some lin conformal mapping -linear differential	on ial nited g equations

3.	Contents

Торіс	No.of hrs	Lecture	Tutorial
Chapter 1: Differential equation of mass conservation	4	2	2
Driving Navier-Stokes equations (linear momentum) for Newtonian fluids, angular momentum and energy eqns.	4	2	2
Chapter 2: Viscous flow in pipes and ducts	4	2	2
Flow between parallel plates with pressure gradients	4	2	2
Chapter 3: Differential equations for frictionless flow (Euler's eqns.)	4	2	2
Stream and potential functions, vorticity, irrotationality, elementary plane-flow solutions.	4	2	2
Superposition of plane-flows and Images	4	2	2
Plane flows past closed body shapes, axi-symmetric flows	4	2	2
Lift & drag on submerged bodies in ideal flow, airfoil theory	4	2	2
<b><u>Chapter 4</u></b> : Introduction to Boundary Layer flows, the differential equations, Exact equations for 2-D flow	4	2	2
Blasius exact solution for laminar flow, the Momentum Integral equations	4	2	2
Approximate solutions for 2-D laminar and turbulent boundary layers	4	2	2

Thormal Dave da	Lover over a flat mlate			<u> </u>	4	2		
Thermal Boundary Layer over a flat plate						2	2	
Revision of the course to confirm the objectives					4	2	2	
Time for Preparing for the term exam								
Total teaching hours in 14 weeks (+ 1 office hr/wk)					56	28	28	
4. Teaching and	Lectures $(\sqrt{)}$ Practical Training/ Laboratory $(\sqrt{)}$ Seminar/Workshop $(x)$							
Learning	Class Activity ( $$ )Case Study/Reports ( $$ )Projects (x)							
MethodsE-learning ( $$ )Assignments /Homework ( $$ )Other: ReportsAlso for Teaching and Learning:								
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	elem solving in tutorial cl		and the Tata much sites					
	ction from text material, o							
	ch assignments. Three as	•	neets $(1, 2 \text{ and } 5)$					
- Hand-outs materia	s in lectures and tutorial c	Jasses.						
5. Student Assessn								
		ing Chapta	r (1) and solving Sheet #1	and no	rt of the	ILO's		
		•	(1) and solving Sheet #1 $(2)$ and solving Sheet #2					
			) and solving Sheets #1-3					
			bics and all of the course I		t of the	ш0 <sup>5</sup>		
	to assess gams of an con it Schedule		Week	0.				
-Assessment 1; Test (1) & Report (1)			End of Week 4					
Mid-term Exam	<u> </u>		In Week 8					
	est (2) & Report (2)	End of Week 11						
Final Term Exam End of Term								
Weighting	of Assessments	l						
	ents & class performance		5 %					
Reports 1, 2     5 %								
Mid-term Exam 20 %								
Final-term Examination     70 %								
-Total 100 %								
6. List of Reference	es	I						
- Course Notes: Co	ompiled Notes correspon	iding to dif	ferent course sections					
- Essential Books	(Text Books):	C						
		kishi, " <i>Fur</i>	ndamentals of Fluid Mech	anics",	John W	Viley & Sons,	Inc., New	
York, 4th Edition	(2002).							
- Recommended B								
	e "Fluid Mechanics", 2 <sup>nd</sup>							
			anics", 3 <sup>rd</sup> ed., John Wiley	y& So	ns, 1989	9		
	eb Sites information, e							
	red for Teaching and L							
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	ancing the ability to thi	ink for stu	dents in Engineering Sc	chools				
Course Coordinator:	Prof.Samy Mourad	Prof. Ah	med Abdelrahman Ibral	him A	A. Prof.	Mohsen S.S	oliman	
Head of Department:	Prof. Sayed Kaseb							
	July 2023							