DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE & Affiliated to Anna University, Chennai)
Re-Accredited with 'A' Grade by NAAC, Accredited by TCS
Accredited by NBA – BME, ECE & EEE
PERAMBALUR - 621 212. Tamil Nadu.
website : www.dsengg.ac.in

COURSE PLAN

Course Code/Name	U23CET43 / HYDRAULICS AND HYDRAULIC MACHINERY			
Year/Section/Department	II/ CIVIL ENGINEERING			
Credits Details	L:3	T: 0	P: 0	C:3
Total Contact Hours Required	45 HOURS			

Syllabus:

UNIT I/ OPEN CHANNEL FLOW	**No. of Periods:9**
Definition and differences between pipe flow and open channel flow - Types of Flow in channels - Properties of open channel -Velocity distribution in open channel - Determination of roughness coefficients – Manning‟s and Chezy‟s formula –Most economical sections – Wide open channel.	
UNIT II/ UNIFORM FLOW	**No. of Periods:9**
Uniform flow – Flow measurement by notches and weirs – Specific energy– Determination of normal depth and velocity - Critical flow and its computation – Channel Transition –Non erodible	
UNIT III/ VARIED FLOW	**No. of Periods:9**
Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions – Hydraulic jump – Types – Energy dissipation –	
UNIT IV/ TURBINES	**No. of Periods:9**
Impact of jets on plane and curved plates - Classification of Turbines - Reaction turbines Francis turbine, Radial flow turbines, draft tube and Cavitation- Propeller and Kaplan turbines - Impulse turbines - Performance of Turbine - Runway Speed - Similarity laws.	
UNIT V/ PUMPS	**No. of Periods:9**
Classification of Pumps - Centrifugal pump - Work done - minimum speed to start the pump – NPSH -multistage Pumps – Characteristics curve - reciprocating pump – negative slip - flow separation conditions - air vessels -indicator diagram and its variation – savings in work done - rotary pumps, Gear pump	

Objectives:

- ❖ To design open channel sections in a most economical fashion with minimum wetted perimeter and learn about critical flows
- ❖ To study about uniform flows in open channel and longitudinal slopes in open channel
- ❖ To develop an understanding of Characteristics of flow profiles and Hydraulic jump
- ❖ To analyze the impact of jets and curved plates and classification of turbine.
- ❖ To examine the classification of pumps and characteristics of pumps

Text Books:

T1. Bansal R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2017.

T2. Rajput R.K., "Fluid Mechanics and Hydraulic Machines", S.Chand Publishing Ltd, New Delhi, 2013.

Reference Books:

R1. Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2004.

R2. Jain.A.K., "Fluid Mechanics"(Including Hydraulic Machines),Khanna Publishers,12 th Edition, 2016.

R3. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.

R4. Subramanya K, "Fluid Mechanics and Hydraulic Machines-Problems and Solutions", Tata McGraw Hill Education, New Delhi, 2010.

R5. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.

Websites:

W1. Open Channel Flow (http://nptel.ac.in/courses/105107059/1)

W2. Uniform Flow (http://nptel.ac.in/courses/105107059/7)

W3. Varied flow (http://nptel.ac.in/courses/105107059/11)

W4. Pumps and Turbines (http://nptel.ac.in/courses/105107059/29)

Online Mode of Study (if Any):

- http://nptel.ac.in/courses/105107059/7
- http://nptel.ac.in/courses/105107059/2

Course Plan:

Topic Number	Topic	Reference Detail	Page Number	Mode of teaching	Number of Periods Required	Cumulative Period
UNIT I/ OPEN CHANNEL FLOW						
1	Definition and differences b/w pipe & open channel flow	T1	713	BB	1	1
2	Types of Flow in channels	T1	713	BB	1	2
3	Properties of open channel	T2	880	BB	1	3
4	Velocity distribution in open channel	R1	637	BB	1	4
5	Determination of roughness coefficients	T2,W1	882	BB	1	5
6	Manning‟s formula	T1	714	BB	1	6
7	Chezy‟s formula	T1	714	BB	1	7
8	Most economical sections	T1	724-747	BB	1	8
9	Wide open channel.	R1	652	BB	1	9
Outcome of Unit I: At the end of the unit, ❖ The students will be able to know the concepts of open channel flow, Channel transition and Identify economical Section						
UNIT II/ UNIFORM FLOW						

10	Uniform flow	T2	880	BB	1	10
11	Flow measurement by notches and weirs	T2	948	BB	1	11
12	Specific energy	T1	749	BB	1	12
13	Determination of normal depth and velocity	T1	750-751	BB	1	13
14	Determination of normal depth and velocity	T1	750-751	BB	1	14
15	Critical flow	T1	752-753	BB	1	15
16	Critical flow and its computation	T1	752-753	BB	1	16
17	Channel Transition	T2,W2	882	BB	1	17
18	Non erodible channels	T2, W2	880	BB	1	18

Outcome of Unit II:

At the end of the unit,

- ❖ They will possess the skills to solve the problems in the flow measurement and specific energy

UNIT III/ VARIED FLOW

19	Dynamic equations of gradually varied flow – Assumptions	T1	760	BB	1	19
20	Characteristics of flow profiles	T1	761	BB	1	20
21	Draw down and back water curves	T1	763	BB	1	21

22	Profile determination – Graphical integration, direct step and standard step method	R1	718-20	BB	1	22
23	Flow through transitions	T2	750	BB	1	23
24	Hydraulic jump	T1	754	BB	1	24
25	Hydraulic jump-Types	T1	754-757	BB	1	25
26	Energy dissipation	R1	720-725	BB	1	26
27	Surges	R,W	720-725	BB,PPT	1	27

Outcome of Unit III:

At the end of unit,

- ❖ They will possess the skills to solve problems in rapidly varied flows in steady state conditions.

UNIT IV/ TURBINES

28	Impact of jets on plane and curved plates	T1	783-829	BB	1	28
29	Classification of Turbines	T1	833	BB,PPT	1	29
30	Reaction turbines Francis turbine	T1	852-868	BB	1	30
31	Radial flow turbines	T1	852-868	BB	1	31
32	draft tube and Cavitation	T1	884	BB	1	32

33	Propeller and Kaplan turbines	T1	875-876	BB	1	33
34	Impulse turbines	T1	875	BB	1	34
35	Performance of Turbine	T1	875	BB	1	35
36	Runway Speed - Similarity laws.	T1,W4	878	BB	1	36

Outcome of Unit IV:

At the end of unit,

- They will have knowledge in the performance characteristics of various types of turbines

UNIT V/ PUMPS

37	Classification of Pumps	T1,W4	911	BB,PPT	1	37
38	Centrifugal pump - Work done	T1	913	BB	1	38
39	Minimum speed to start the pump - NPSH -multistage Pumps	T1	934	BB	1	39
40	Characteristics curve - reciprocating pump	T1	956	BB	1	40
41	Negative slip - flow separation conditions	T1	959	BB	1	41
42	Air vessels	T1	981	BB	1	42
43	Indicator diagram and its variation savings in work done	T1	964	BB	1	43
44	Rotary pumps	T1,W4	1020	BB,PPT	1	44
45	Gear pump	T1,W4	1020	BB,PPT	1	45

Outcome of Unit V:

At the end of unit,

- ❖ They will have knowledge in Examine the pumps for various engineering applications based on their performance Curves

Course Outcome:

At the end of course:

Students should be able to do:

CO1: The students will be able to know the concepts of open channel flow, Channel transition and Identify economical Section

CO2: They will possess the skills to solve the problems in the flow measurement and specific energy.

CO3: They will possess the skills to solve problems in rapidly varied flows in steady state conditions.

CO4: They will have knowledge in the performance characteristics of various types of turbines.

CO5: They will have knowledge in Examine the pumps for various engineering applications based on their performance Curves.

Course Outcome Vs Program Outcome Mapping:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	3	1	2	2	1	2	1	1	3
CO 2	3	3	2	3	2	2	2	1	2	1	1	3
CO 3	3	3	2	3	1	2	2	1	2	1	1	3
CO 4	3	3	3	3	1	2	2	1	2	1	1	3
CO 5	3	3	3	3	1	2	2	1	2	1	1	3
CO 6	3	3	3	3	1	2	2	1	2	1	1	3
AVG	3	3	2.5	3	1	2	2	1	2	1	1	3

Internal Evaluation Components:

Webportal	Assignment	Components	Topic Number with Topic / Unit Details	Relevance to CO
Webportal 1	--	Assessment – I (60)	Unit I and II	CO 1 & CO2
	1	Assignment – Handwritten (20)	MOST ECONOMICAL TRAPEZOIDAL AND RECTANGULAR SECTION	CO1
	2	Assignment – Poster Presentation / PPT (20)	SPECIFIC ENERGY, DETERMINATION OF NORMAL DEPTH AND VELOCITY	CO2
Webportal 2	--	Assessment – II (60)	Unit III and IV	CO3 & CO4
	3	Seminar (20)	DYNAMIC EQUATION OF GRADUALLY VARIED FLOW	CO3
	4	Case Study Report (20)	TURBINES AND IT'S PRESENT ADVANCEMENT	CO4
Webportal 3	--	Model Exam (75)	Unit I to V	CO1 to CO6
	5	MCQ (15)	Unit I to V	CO1 to CO6
	-	Course Attendance (10)	--	--

Submission Details:

Phase 1(Before AT 1)		Phase 2 (Before AT 2)		Phase 3 (Model)
Assignment 1	Assignment 2	Assignment 3	Assignment 4	Assignment 5

GOOGLE CLASS CODE DETAILS: mmi7go4

CLASS NAME: civil 2 yr

PLAN OF ASSESSMENT TEST –DISTRIBUTION OF MARKS:

TEST	CO- MARK WISE DISTRIBUTION						BLOOM'S LEVEL MARK WISE DISTRIBUTION					
AT-1	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6
AT-2	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6
MODEL	CO1	CO2	CO3	CO4	CO5	CO6	BTL1	BTL2	BTL3	BTL4	BTL5	BTL6