ADAMAS UNIVERSITY

PURSUE EXCELLENCE

KOLKATA

ADAMAS UNIVERSITY

SCHOOL OF ENGINEERING & TECHNOLOGY

Department of Civil Engineering

B.Tech. Civil Engineering Programme

Course File (Theory)

Course Code & Name: CEE11004 & Fluid Mechanics and Hydraulic Machinery

Course Coordinator: Bahnisikha Das

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

THEORY COURSE FILE CONTENTS

Check list Course Outcomes Attainment

S. No.	Contents	Available (Y/N/NA)	Date of Submission	Signature of HOD
1.	Authenticated Syllabus Copy	Y	1.09.2021	
2.	Individual Time Table	Y		
3.	Students' Name List (Approved Copy)	Y		
4.	Course Plan, PO, PSO, COs, CO-PO Mapping, COA Plan, Session Plan and Periodic Monitoring	Y		
5.	Previous Year End Semester Question Papers	Y		
6.	Question Bank (All Units - Part A, Part B & C)	Y		
7.	Dissemination of Syllabus and Course Plan to Students	Y		
8.	Lecture Notes - Unit I, II & III	Y		
9.	**Sample Documents and Evaluation Sheet for Internal Assessment** – Tutorials / Assignments / Class Test / Open Book Test / Quiz / Project / Seminar / Role Play if any (Before Mid Term)			
10.	**Mid Term Examination** A. Question Paper / Any Other Assessment Tools Used B. Sample Answer Scripts (Best, Average, Poor) if required C. Evaluation Sheet D. Slow Learners List and Remedial Measures			
11.	Lecture Notes – Unit IV & V			
12.	**Sample Documents and Evaluation Sheet for Internal Assessment** – Tutorials / Assignments / Class Test /Open Book Test / Quiz / Project / Seminar / Role Play if any (After Mid Term)			
13.	Course End Survey (Indirect Assessment) & Consolidation			
14.	**End Term Examination** A. Question Paper & Answer Key B. Sample Answer Scripts (Best, Average, Poor) if required C. Evaluation Sheet **D.** Slow Learners List and Remedial Measures.			

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

15.	Content Beyond the Syllabus (Proof)			
16.	Innovative Teaching Tools Used for TLP			
17.	Details of Visiting Faculty Session / Industry Expert / Guest Lecture / Seminar / Field Visit / Webinars / Flipped Class Room / Blended Learning / Online Resources etc.			
18.	Consolidated Mark Statement			
19.	CO Attainment (Mid Term + Internal Assessment + End Term)			
20.	Gap Analysis & Remedial Measures			
21.	CO - PO Attainment			
22.	Class Record (Faculty Logbook)			

Signature of HOD/ Dean **Signature of Faculty**

Date: **Date:**

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

Syllabus Copy

CEE11004	Fluid Mechanics and Hydraulic Machinery	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	EME 41104 / Engineering Mechanics				
Co-requisites	SPH41109				

Course Objectives

1. To evaluate velocity, acceleration and pressure field of different fluid
2. To analyse problems related to calculation of fluid forces and flow of fluid.
3. To develop concept of flow measurements and flow through pipes
4. To gauge performance parameters of different hydraulic machines

Course Content

Module 1 **Lecture Hr. 9**

Introduction: Fluid Property, Viscosity, Surface tension & Capillarity

Pressure and its Measurement: Pascal's Law, Different types of pressure- Absolute, Gauge, Atmospheric and Vacuum, Pressure measuring instrument

Buoyancy and Flotation: Buoyancy, Meta-center and Meta-centric height, Conditions of equilibrium of floating body

Module 2 **Lecture Hr. 9**

Hydrostatics Forces on Surfaces: Determination of Total pressure and center of pressure on vertical plane surface and inclined plane surface submerged in liquid, Forces on curved surface submerged in liquid

Kinematics of Flow: Types of fluid flow, Continuity equation, Velocity potential function and Stream function

Dynamics of Fluid Flow: Euler's and Bernoulli's equation of motion, Flow through orifice and mouthpieces, Practical application of Bernoulli's equation- Venturimeter, Orificemeter & Pitot tube
Notches and Weirs: Classification of notches and weir, Discharge through different types of notches and weirs

Module 3 **Lecture Hr. 9**

Viscous Flow: Flow of viscous liquid through circular pipe and between two parallel plates, Kinetic and momentum correction factors, Loss of head due to friction in viscous flow

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS **Course Code: CEE11004**

6. Course : Fluid Mechanics and Hydraulic Machinery **L: 3**

7. Program : B.Tech. Civil Engineering **T: 0**

8. Target : 60% **P: 0**

C: 3

Turbulent Flow: Friction loss in turbulent flow through pipe, Shear stress & velocity distribution in turbulent flow, Hydro-dynamically smooth and rough boundaries

Flow Through Pipes: Major and minor losses in pipe and H.G.L & T.E.L line, Pipe Networks, Water Hammer

Module 4 **Lecture Hr. 9**

Dimensional and Model Analysis: Rayleigh's Method and Buckinghum'sπ Theorem, Dimensionless numbers and Model analysis

Flow in Open Channels: Discharge through open channel by Chezy's formula, Most Economical sections for channels, Non-uniform flow through open channels- specific energy and condition of maximum discharge for a given value of specific energy, Hydraulic jump, Gradually varied flow

Impact of jets and jets propulsion: Drawing of velocity triangle**,** Force exerted by the jet on stationary and moving plate

Module 5 **Lecture Hr. 9**

Hydraulic Machines: Turbines-Working principle of Pelton Turbine, Francis Turbine & Kaplan Turbine, Draft Tube, Specific speed, Characteristics curves of turbines

Pumps: Centrifugal pumps, performance characteristic graph – design flow rate, Working principles of positive displacement pumps, Reciprocating and Vane pumps, Hydraulic Ram

Text Books:

1. R.K.Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications Ltd.
2. P.N.Modi, S.M.Seth, Hydraulics and Fluid Mechanics including Hydraulics Machines, Rajsons Publications Pvt. Ltd.

Reference Books:

1. Y.Nakayama, R.F.Boucher, Introduction to Fluid Mechanics, Butterworth- Heinemann
2. Philip J. Pritchard & John C. Leylegian, Robert W. Fox and John W. Mitchell, Fox and McDonald's Introduction to Fluid Mechanics, John Wiley & Sons
3. S.K.Som, Gautam Biswas, S. Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Mc Graw Hill Education

Journals:

1. https://www.researchgate.net/journal/Journal-of-Fluid-Mechanics-1469-7645
2. https://www.begellhouse.com/journals/fluid-mechanics-research.html

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

Faculty Individual Time Table

ADAMAS UNIVERSITY, KOLKATA								
SCHOOL OF ENGINEERING & TECHNOLOGY								
DEPARTMENT OF CIVIL ENGINEERING								
Programme: B. Tech (Civil Engineering)								
Course Code & Course: CEE11004; Fluid Mechanics and Hydraulic Machinery Faculty Coordinator: Bahnisikha Das								
Day & Time	**9:30-10:25**	**10:30-11:25**	**11:30-12:25**	**12:25-13:30**	**13:30-14:25**	**14:30-15:25**	**15:30-16:25**	**15:30-16:25**
Monday				LUNCH				
Tuesday								
Wednesday								
Thursday								
Friday								

Signature of HOD — **Signature of Class Coordinator**

Date: — **Date:**

Students Name List

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**

C: 3

Roll Number	Registration Number	Name of the Student
UG/02/BTCE/2020/002	AU/2020/0004463	Rohit Kumar Shit
UG/02/BTCE/2020/003	AU/2020/0004536	Arjya Das Krisnendu Das Raktim Dey Sk Nasim Akhtar

Signature of HOD/Dean

Date:

Signature of Class Coordinator

Date:

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

COURSE PLAN

Target	60% (marks)
Level-1	50% (population)
Level-2	60% (population)
Level-3	70% (population)

1. Method of Evaluation

UG
Internal Assessment (30%) (Quizzes/Tests, Assignments & Seminars etc.)
Mid Semester Examination (20%)
End Semester Examination (50%)

2. Passing Criteria

Scale	**UG**
Out of 10 Point Scale	CGPA – "5.00" Min. Individual Course Grade – "C" Passing Minimum – 40

3. Pedagogy

- **Direct Instruction**
- **Flipped Classroom**
- Differentiated Instruction
- Expeditionary Learning
- Inquiry Based Learning
- Personalized Learning

4. References:

Text Books	Web Resources	Journals	Reference Books
2	-	2	3

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course** : **Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program** : **B.Tech. Civil Engineering** **T: 0**
8. **Target** : **60%** **P: 0**

C: 3

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

GUIDELINES TO STUDY THE SUBJECT

Instructions to Students:

1. Go through the 'Syllabus' in the LMS in order to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your on-line lecture notes (Content, videos) at Lecture Notes section. These are our lecture notes. Make sure you use them during this course.
4. check your LMS regularly
5. go through study material
6. check mails and announcements on blackboard
7. keep updated with the posts, assignments and examinations which shall be conducted on the blackboard
8. Be regular, so that you do not suffer in any way
9. **Cell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.
11. **Attendance:** Students are required to have minimum attendance of 75% in each subject. Students with less than said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester! If you need us for anything, send your feedback through e-mail bahnisikha1.das@adamasuniversity.ac.in Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

RELATED OUTCOMES

1. **The expected outcomes of the Program are:**

PO1	**Engineering Knowledge:** Apply comprehensive knowledge of theories, concepts and principles for effective control and management of construction industry projects.
PO2	**Problem Analysis:** Identify and analyse the strategic importance of construction projects and its problems in the perspectives of client, context and constraints and obtain solution using mathematics, engineering and management principles.
PO3	**Design/Development of Solutions:** Planning, scheduling, and control of construction projects by managing resources and constraints with appropriate consideration for the public health and safety, and the cultural, societal, and economic considerations.
PO4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern IT prediction and simulation tools for construction projects.
PO6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual or Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance:** Create comprehensive understanding of the techniques associated with the management of resources and finance, assessment and management of risk and subsequent corporate governance as appropriate to a project manager operating in the construction industry.
PO12	**Life Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2. **The expected outcomes of the Specific Program are: (up to 3)**

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

PSO1	Competitive Examination Preparation
PSO2	Technical Competency

3. **The expected outcomes of the Course are: (minimum 4 and maximum 6)**

CO1	Infer fundamental properties of fluid and its application on floating body
CO2	Analyze hydrostatic pressure and the discharge through pipes and over notches and weir
CO3	Determine characteristics of flow, various types of energy losses for the application in pipe network problem
CO4	Construct a model, solve open channel flow problems through the selection and use of appropriate equation and compute the force exerted by water jet on a moving body
CO5	Evaluate the performance characteristics of different hydraulic machines.

4. **Co-Relationship Matrix**
Indicate the relationships by 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)

Program Outcomes / Course Outcomes	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO1 1	PO 12	PSO 1	PSO 2
CO1	3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	3	1	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	1	-	-	-	-	-	-	1	-	-
Average	**3**	**3**	**3**	**1**	**1**	-	-	-	-	-	-	1	-	-

5. **Course Outcomes Assessment Plan (COA):**

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

Course Outcomes	Internal Assessment* (30 Marks)		Mid Term Exam (20 Marks)	End Term Exam (50 Marks)	Total (100 Marks)
	Before Mid Term	After Mid Term			
CO1	6	NA	7	7	20
CO2	6	NA	7	7	20
CO3	6	NA	6	8	20
CO4	NA	6	NA	14	20
CO5	NA	6	NA	14	20
Total	18	12	20	50	100

* Internal Assessment – Tools Used: Assignment, Class Test, Quiz etc.

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

OVERVIEW OF COURSE PLAN OF COURSE COVERAGE

Course Activities:

S. No.	Description	Planned			Actual			Remarks
		From	To	No. of Session	From	To	No. of Session	
1.	Introduction, Pressure and its Measurement, Buoyancy and Flotation	01.09.2021	20.09.2021	9				
2	Hydrostatics Forces on Surfaces, Kinematics of Flow, Dynamics of Fluid Flow, Notches and Weirs	22.09.2021	11.10.2021	9				
3.	Viscous Flow, Turbulent Flow, & Flow Through Pipes	18.10.2021	8.11.2021	9				
4.	Dimensional and Model Analysis, Flow in Open Channels, Impact of jets and jets propulsion	10.11.2021	29.11.2021	9				
5.	Hydraulic Machines (Turbines & Pumps)	01.12.2021	20.12.2021	9				

Total No. of Instructional periods available for the course: 45 Sessions

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course** : **Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program** : **B.Tech. Civil Engineering** **T: 0**
8. **Target** : **60%** **P: 0**

C: 3

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

SESSION PLAN
UNIT-I

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	01.09.2021	Fluid Property, Viscosity,	CO1				
2	02.09.2021	Surface tension, Capillarity	CO1				
3	06.09.2021	Numericals on fluid properties	CO1				
4	08.09.2021	Pascal's Law	CO1				
5	09.09.2021	Different types of pressure- Absolute, Gauge, Atmospheric and Vacuum	CO1				
6	13.09.2021	Pressure measuring instruments	CO1				
7	15.09.2021	Buoyancy	CO1				
8	16.09.2021	Meta-center and Meta-centric height	CO1				
9	20.09.2021	Conditions of equilibrium of floating body	CO1				

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course** : **Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program** : **B.Tech. Civil Engineering** **T: 0**
8. **Target** : **60%** **P: 0**

C: 3

Remarks:

Signature of Faculty

Date:

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

SESSION PLAN
UNIT-II

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	22.09.2021	Determination of Total pressure and center of pressure on vertical plane surface	CO2				
2	23.09.2021	Determination of Total pressure and center of pressure on inclined plane surface submerged in liquid	CO2				
3	27.09.2021	Forces on curved surface submerged in liquid	CO2				
4	29.09.2021	Types of fluid flow, Continuity equation,	CO2				
5	30.09.2021	Velocity potential function and Stream function,	CO2				
6	04.10.2021	Euler's and Bernoulli's equation of motion	CO2				
7	06.10.2021	Flow through orifice and mouthpieces, Practical application of Bernoulli's equation- Venturimeter, Orificemeter& Pitot tube	CO2				
8	07.10.2021	Classification of notches and weir	CO2				

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

9	11.10.2021	Discharge through different types of notches and weirs	CO2				

Remarks:

Signature of Faculty

Date:

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

SESSION PLAN
UNIT-III

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	18.10.2021	Flow of viscous liquid through circular pipe and between two parallel plates	CO3				
2	20.10.2021	Kinetic and momentum correction factors	CO3				
3	21.10.2021	Loss of head due to friction in viscous flow	CO3				
4	25.10.2021	Friction loss in turbulent flow through pipe	CO3				
5	27.10.2021	Shear stress & velocity distribution in turbulent flow	CO3				
6	28.10.2021	Hydro-dynamically smooth and rough boundaries	CO3				
7	01.11.2021	Major and minor losses in pipe and H.G.L & T.E.L line	CO3				
8	03.11.2021	Pipe Networks	CO3				
9	8.11.2021	Water Hammer	CO3				

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**

C: 3

Remarks:

Signature of Faculty

Date:

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

SESSION PLAN
UNIT-IV

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	10.11.2021	Rayleigh's Method and Buckinghum'sπ Theorem	CO4				
2	11.11.2021	Dimensionless numbers and Model analysis	CO4				
3	15.11.2021	Discharge through open channel by Chezy's formula, ,	CO4				
4	17.11.2021	Most Economical sections for channels	CO4				
5	18.11.2021	Non-uniform flow through open channels- specific energy	CO4				
6	22.11.2021	Condition of maximum discharge for a given value of specific energy,	CO4				
7	24.11.2021	Hydraulic jump, Gradually varied flow	CO4				
8	25.11.2021	Drawing of velocity triangle,	CO4				

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**

C: 3

9	29.11.2021	Force exerted by the jet on stationary and moving plate	CO4				

Remarks:

Signature of Faculty

Date:

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

SESSION PLAN
UNIT-V

Session Plan				Actual Delivery			
Lect.	Date	Topics to be Covered	CO Mapped	Lect.	Date	Topics Covered	CO Achieved
1	01.12.2021	Working principle of-Pelton Turbine, Francis Turbine& Kaplan Turbine	CO5				
2	02.12.2021	Draft Tube, Specific speed,	CO5				
3	06.12.2021	Characteristics curves of turbines	CO5				
4	08.12.2021	Centrifugal pumps	CO5				
5	09.12.2021	performance characteristic graph – design flow rate	CO5				
6	13.12.2021	Working principles of positive displacement pumps	CO5				
7	15.12.2021	Reciprocating and Vane pumps	CO5				
8	16.12.2021	Reciprocating and Vane pumps	CO5				
9	20.12.2021	Hydraulic Ram	CO5				

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**

C: 3

Remarks:

Signature of Faculty

Date:

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

PERIODIC MONITORING

Actual date of completion and remarks, if any

Components		From	To	From	To
Duration (Mention from and to Dates)		01.09.2021	06.01.2022	17.01.2021	24.02.2022
Percentage of Syllabus covered		80%		20%	
Lectures	Planned	1	36	37	45
	Taken				
Tutorials	Planned	NA			
	Taken				
Test /Quizzes / Mid Semester/ End Semester	Planned	2	1 (Mid)	1	1 (End)
	Taken				
	CO's Addressed	CO1, CO2	CO1, CO2, CO3	CO4	CO1, CO2, CO3, CO4, CO5
	CO's Achieved				
Assignments	Planned	2	1		1
	Taken				
	CO's Addressed	CO1, CO2	CO3, CO4		CO5
	CO's Achieved				
Signature of Faculty					
Head of the Department					
OBE Coordinator					

Signature of HOD/ Dean

Date

Signature of Faculty

Date:

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

PERIODIC MONITORING

Attainment of the Course (Learning) Outcomes:

Components	Attainment level	Action Plan	Remarks
Assignment	CO1:	Submission Target: 29.09.2021	
	CO2:	Submission Target: 25.10.2021	
	CO3:	Submission Target: 08.12.2021	
	CO4:		
	CO5:	Submission Target: 21.01.2021	
Test	CO1:	Class test I: 30.09.2021	
	CO2:	Class test II: 28.10.2021	
	CO3:	--	
	CO4:	Class test III: 09.12.2021	
	CO5:	--	
Mid Semester	CO1:	Exam Date:	
	CO2:		
	CO3:		
	CO4:		
	CO5:		
End Semester	CO1:	Exam Date:	
	CO2:		
	CO3:		
	CO4:		
	CO5:		

Signature of HOD/ Dean

Date

Signature of Faculty

Date: 09.08.2021

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

Previous Year Question Paper

ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END-SEMESTER EXAMINATION : JANUARY 2021** (Academic Session: 2020 – 21)		
Name of the Program: (Example: B. Sc./BBA/MA/B.Tech.)	B. Tech.	**Semester:** (I/III/ V/ VII/IX)	III
Paper Title :	Fluid Mechanics and Hydraulic Machinery	**Paper Code:**	ECE4210 5
Maximum Marks :	40	**Time duration:**	3 Hours
Total No of questions:	10	**Total No of Pages:**	2
(Any other information for the student may be mentioned here)			

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1.

a) Explain the surface tension on liquid droplet with diagram.

b) A rectangular floating body 20 m long and 5 m wide. The water line is at 1.5 m and the C.G. is at 1.8 m above the bottom line. So, what will be the metacentric height of the body?

c) Show the Bernoulli's equation from Bernoulli's theorem.

d) State Chezy's formula for discharge through open channel. Also describe each parameters of the equation.

e) Differentiate Laminar flow from Turbulent flow according to Reynold number.

GROUP –B

Answer *any three* of the following $3 \times 5 = 15$

2. A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and height of fluid in the left from the center of pipe is 15 cm below.
3. A 2m X 3m rectangular plane submerged in water in such manner that it makes an angle of 30 with free surface water. Determine the total pressure and position of center of pressure when the upper edge of the plane is 1.5 m below the free water surface.
4. Define the Co-efficient of Contraction (C_c) and state its values. Also show its relation with the Co-efficient of Discharge. [4 + 1]

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

5. A flow of water through a pipe with 20 cm of diameter at section 1 and will be of 10 cm diameter at section 2. If the velocity of water at section 1 is 4 m/sec. Find the velocity at sections 1 and 2.

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS **Course Code: CEE11004**

6. Course : Fluid Mechanics and Hydraulic Machinery **L: 3**

7. Program : B.Tech. Civil Engineering **T: 0**

8. Target : 60% **P: 0**

C: 3

6. State the Mechanical efficiency (η_m) and Overall efficiency (η_o) of a Centrifugal pump. Also show the relationship in between these efficiencies. [4 + 1]

GROUP –C

Answer *any two* of the following 2 × 10 = 20

7. **(a)** A square plate of 1m X 1m size, weighing 350 N slides down over an oil film of 1 mm thickness, spread on an inclined plane with uniform velocity of 1.5 m/sec. The inclined plane is laid on a slope of 5 vertical to 12 horizontal. Calculate the Dynamic viscosity of the oil.

   (b) Define Compressibility and Bulk Modulus of fluid. Draw necessary diagram. [6 + 4]

8. **(a)** State Continuity equation for a flow of water. [2]

   (b) A rate of water flow through a horizontal pipe is 0.25 m^3/sec. The pipe diameter which is 200 mm, is suddenly enlarged to 400 mm. The pressure intensity of the smaller diameter pipe is 11.772 N/cm^2. Then, determine the head loss due to sudden enlargement and the pressure intensity in larger section of the pipe. [4 + 4]

9. Derive the equation for the discharge over a triangular notch. Draw necessary diagram.

10. **(a)** Find the bed slope of a trapezoidal channel of bed width 4 m, depth of water 3 m and side slope of 2 horizontal to 3 vertical, when discharge through the channel is 20 m^3/sec. Take, Manning's constant is equal to 0.03.

    (b) Define Rapidly Varied Flow and Gradually Varied Flow. Use necessary diagram. [8 + 2]

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

Question Bank Sample

School:School of Engineering & Technology — Department:Civil Engineering.
Course Code: CEE11004
Course Name: Fluid Mechanics and Hydraulic Machinery
Program: B.Tech (CE) — Semester: III

UNIT NUMBER: — UNIT NAME:

Sl. No.	Question	Level of Difficulty (Easy/ Medium / Difficult)	Knowledge Level (Bloom's Taxonomy)	Course Outcome (CO)
	Part A (Multiple Choice Questions) (1 mark each)			
1.		Easy	Remember	
2.		Medium	Remember	
3.		Difficult	Remember	
	Part B (Definition/Naming Questions) (2 marks each)			
1.		Easy	Understand	
2.		Medium	Understand	
3.		Difficult	Remember	
	Part C (Short Questions) (3-4 marks each)			

Year: II

Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

1.		**Easy**	**Remember**	
2.		**Medium**	**Understand**	
3.		**Difficult**	**Understand**	

Internal Assesment

Evaluation Sheet – Internal Assessment

Roll Number	**Registration Number**	**Name of the Student**	**Internal Assessment (30)**				

Signature of HOD/Dean — **Signature of Faculty**

Date: — **Date:**

Mid-Sem answer script

Year: II

Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

Evaluation Sheet – Mid Semester

Roll Number	Registration Number	Name of the Student	Marks (20)

Signature of HOD/Dean

Date:

Signature of Faculty

Date:

Planning for Remedial Classes – Mid Semester

Year: II

Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

Sl. No.	Name of Student	Roll No.	Reg. No.	Mid Sem Marks	Remedial Classes Held							Class test on the basis of Remedial Classes	End Sem Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.														
2.														

Signature of HOD/ Dean

Date:

Signature of Faculty

Date:

COURSE END SURVEY

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

INDIRECT ASSESSMENT

Sample format for Indirect Assessment of Course outcomes:

NAME:
ROLL NO.:
REG. NO..:
COURSE:
PROGRAM:

Please rate the following aspects of course outcomes of

Use the scale 1-5 (Poor – Excellent)

Course Outcomes	Statement	1	2	3	4	5
CO1						
CO2						
CO3						
CO4						
CO5						

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

INDIRECT ASSESSMENT CONSOLIDATION

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING
CO Indirect Assessment

Programme: **Academic Year:2020-21** **Batch: 2020-22**

Course Code & Name:

Course Outcome	Students Feed Back (5)	Attainment (100)
CO1		
CO2		
CO3		
CO4		
CO5		

Signature of HOD/Dean
Date:

Signature of Faculty
Date:

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

End-sem Answer Script Sample

Evaluation Sheet (End Semester)

Roll Number	Registration Number	Name of the Student	Marks (50)

Signature of HOD/Dean **Signature of Faculty**

Date: **Date:**

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

Planning for Remedial Classes – End Semester

Sl. No.	Name of Student	Roll No.	Reg. No.	End Sem Marks	Remedial Classes Held							Class test on the basis of Remedial Classes	Supple Exam Marks	Improvement (Y/N)
					Date									
					Venue									
					Time									
1.	Nil													

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

2.														

Signature of HOD/ Dean

Date

Signature of Faculty

Date: 13.08.2021

Consolidated Mark Statement

Roll Number	Registration Number	Name of the Student	Total Marks			
			Mid-Sem (20)	Internal Assessment (30)	End Semester (50)	Total (100)

Signature of Dean/HOD

Date:

Signature of Faculty

Date:

Year: II

Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course** : **Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program** : **B.Tech. Civil Engineering** **T: 0**
8. **Target** : **60%** **P: 0**

C: 3

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

CO ATTAINMENT – GAP ANALYSIS & REMEDIAL MEASURES

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING
CO ATTAINMENT - GAP ANALYSIS & REMEDIAL MEASURES

Batch: 2020-22					Academic Year: 2020-21		
Course Code & Name			Name of the Coordinator		Year & Semester		
			Bahnisikha Das				
CO	Direct Assessment	Indirect Assessment	CO Attainment	Target	CO Attainment Gaps	Action for Bridge the Gap	Target Modification
CO1							
CO2							
CO3							
CO4							

Signature of HOD/Dean

Date:

Signature of Faculty

Date:

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

CO-PO ATTAINMENT

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF CIVIL ENGINEERING
CO-PO ATTAINMENT

Programme:	Year & Sem:	Academic Year: 2020-21	Batch:2020-22

Course Code	Course Name	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ENV21010	Biological Process for Environmental Engineering	Relationship															
		Mapping Value															
		Attainment															

Signature of HOD/Dean

Signature of Faculty

Year: II
Semester:III

5. Name of the Faculty: BAHNISIKHA DAS — Course Code: CEE11004
6. Course : Fluid Mechanics and Hydraulic Machinery — L: 3
7. Program : B.Tech. Civil Engineering — T: 0
8. Target : 60% — P: 0
C: 3

Date: Date:

PO ATTAINMENT OF THE COURSE

Signature of HOD/Dean Signature of Faculty

Date: Date:

Year: II
Semester:III

5. **Name of the Faculty: BAHNISIKHA DAS** **Course Code: CEE11004**
6. **Course : Fluid Mechanics and Hydraulic Machinery** **L: 3**
7. **Program : B.Tech. Civil Engineering** **T: 0**
8. **Target : 60%** **P: 0**
C: 3

INSTRUCTIONS FOR FACULTY

Instructions for Faculty

- Faculty should keep track of the students with low attendance and counsel them regularly.
- Course coordinator will arrange to communicate the short attendance (as per University policy) cases to the students and their parents monthly.
- Topics covered in each class should be recorded in the table of RECORD OF CLASS TEACHING (Suggested Format).
- Internal assessment marks should be communicated to the students twice in a semester.
- The file will be audited by respective Academic Monitoring and Review Committee (AMRC) members for theory as well as for lab as per AMRC schedule.
- The faculty is required to maintain these files for a period of at least three years.
- This register should be handed over to the head of department, whenever the faculty member goes on long leave or leaves the Colleges/University.
- For labs, continuous evaluation format (break-up given in the guidelines for result preparation in the same file) should be followed.
- Department should monitor the actual execution of the components of continuous lab evaluation regularly.
- Instructor should maintain record of experiments conducted by the students in the lab weekly.
- Instructor should promote students for self-study and to make concept diary, due weightage in the internal should be given under faculty assessment for the same.
- Course outcome assessment: To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.
- **Submission Targets of Course Contents:**
  - **S. No. 1 to 8 : Before Starting the Course**
  - **S. No. 9 & 10 : After Mid Semester Examination**
  - **S. No. 11 to 18 : Immediately After End Semester Examination**
  - **S. No. 19 to 22 : After Declaration of Result of the Course**