

SYLLABUS

OF

M. TECH

(Hydraulics and Water Resources Engineering)

II YEAR

(CBCS)

**DEPARTMENT OF CIVIL
ENGINEERING**

**INTEGRAL UNIVERSITY
LUCKNOW**

SYLLABI AND EVALUATION SCHEME

M.Tech. (Hydraulics and Water Resources Engineering)

(w.e.f. Batch 2020-21)

Semester – III

S. No.	Course Category	Code No	Name of Subject	Periods			Credits C	Evaluation Scheme			Subject Total	
				L	T	P		Continuous Assessment (CA)				Exam ESE
							UE	TA	Total			
1	DE		Elective - II	3	1	-	4	40	20	60	40	100
2	DE		Elective - III	3	1	-	4	40	20	60	40	100
3	DE		Elective - IV	3	1	-	4	40	20	60	40	100
4	DC	CE675	Directed Study	-	-	-	4	-	-	-	100	100
5	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
Total							20				500	

Semester – IV

S. No.	Course Category	Code No	Name of Subject	Periods			Credits C	Evaluation Scheme			Subject Total	
				L	T	P		Continuous Assessment (CA)				EXAM ESE
							UE	TA	Total			
1	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
2	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
3	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
4	DC	CE699	M.Tech Dissertation	-	-	-	4	-	-	60	40	100
Total							16				400	

TA- Teacher Assessment; **ESE** – End Semester Examination; **CT-** Cumulative Test.

Note: Duration of ESE shall be 03 (Three) hours per subject

M. Tech (Hydraulics and Water Resources Engineering)

List of the Elective Paper:

Elective – I

- CE555 Mathematics and Statistics for Hydraulic Engineering
- CE558 Modeling Simulation and Optimization
- CE560 Advanced Numerical Analysis
- CE561 Flood and Drought

Elective – II

- CE660 Remote Sensing and GIS in Water Resources Engineering
- CE661 Hydro Power Engineering
- CE662 Advanced Irrigation Engineering

Elective – III

- CE664 Fluvial Hydraulics
- CE665 Application of Soft Computing Technique in Hydrology
- CE666 River Engineering

Elective – IV

- CE668 Hydraulic Structures
- CE669 Watershed Management
- CE670 Earth and Rock Fill Dams

TA- Teacher Assessment; ESE- End Semester Examination; CT- Cumulative Test

Note: Duration of ESE shall be 03 (Three) hours per subject.



Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE662	Title of the Course	Advanced Irrigation Engineering	L	T	P	C
Year	2 nd	Semester	3 rd	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To introduce the water resources in India, need of irrigation, advantages and Criteria for good Irrigation management. To learn about the classification of soil water, soil water plant relationship and soil moisture measurement. To introduce the basic Water requirement of crops, Evapotranspiration and consumptive use of water To introduce the Surface irrigation methods, types and canal design To learn the sprinkler and drip irrigation and components design. 						

Course Outcomes	
CO1	To understand the water resources in India and their needs and criteria for good irrigation management.
CO2	To understand the basic concept of soil water and plant relationship and soil moisture measurement.
CO3	To understand the basic concept of requirement of water for a crops and consumptive use of water.
CO4	To understand the methods of surface irrigation, types and canal design.
CO5	To understand the sprinkler and drip irrigation and criteria of adopting the method of irrigation and design of the components

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Development of Irrigation	Water Resources of India, Irrigation Need, Advantages and Disadvantages, National Water Policy and Inadequacy of Irrigation Management, Criteria for good Irrigation management.	08hrs	CO1
2	Soil Water Plant Relationship	Soil physical properties influencing Soil-water relationship-Forms and occurrence of Soil Water- Classification of Soil Water- Soil Water Constants- Energy concept of Soil Water-Forces acting on Soil Water- Soil Water Potential concept- Soil Water retention- Soil Moisture Measurement.	08hrs	CO2
3	Crop Water Requirement	Water requirement of crops- Evapotranspiration and Consumptive use- Methods of estimating Evapotranspiration- Effective Rainfall- Irrigation Requirement-Duty of Water- Irrigation Efficiencies- Irrigation Scheduling- Irrigation measurement.	08hrs	CO3
4	Surface Irrigation Methods	Canal network and canal design- Surface irrigation methods- Types- Border irrigation, Furrow irrigation and Strip irrigation- Specifications, Hydraulics and Design.	08hrs	CO4
5	Drip and Sprinkler Irrigation Method	Sprinkler and Drip- History and development, Types, Components, Design and Layout, Performance Evaluation, Operation and Maintenance.	08hrs	CO5

Reference Books:

- Majumdar D.P., "Irrigation Water Management Principles and Practices", Prentice Hall of India, New Delhi, 2004.
 Michael A. M., "Irrigation Theory and Practice", Vikas Publishing House, New Delhi, 2009.
 Sharma R.K and Sharma T.K., "Irrigation Engineering", S. Chand, New Delhi, 2008.

e-Learning Source:

- <https://nptel.ac.in/courses/105102159/>
<https://nptel.ac.in/courses/105105110/>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	0	0	0	1	2	0	0	0	2	0	0	0
CO2	3	1	1	0	0	1	2	0	0	0	0	0	0	0
CO3	2	2	1	0	0	2	2	0	0	0	0	0	0	0
CO4	2	0	3	0	0	2	1	1	1	2	1	1	0	0
CO5	2	1	3	0	0	2	2	1	1	2	1	1	0	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE666	Title of the Course	River Engineering	L	T	P	C
Year	2 nd	Semester	3 rd	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To understand theoretical concepts of water and sediment movements in rivers and also to inculcate the benefits of fluvial system to the society. 						

Course Outcomes	
CO1	To understand the Primary function of River, Water and Sediment loads of river, Rivers in India.
CO2	To understand the Physical Properties of river and Equations of different types of flow in rivers, velocity profile, uniform and non-uniform, turbulence, Diffusion and Dispersion
CO3	To understand about the Stability of Channel, hydraulic geometry of downstream, meandering, River dynamics, degradation and aggradations of river bed.
CO4	To understand about Mapping, Stage, Discharge Measurements in river, Sediments, Bed and suspended load, Rigid and mobile bed, Water Quality and ecological model
CO5	To understand the river training work and river regulation work, flood plain measurement and river stabilization

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	River Functions	Primary function of a river – River uses and measures – Water and Sediment loads of river – Rivers in India, Himalaya and Peninsular	08hrs	CO1
2	River Hydraulics	Physical Properties and Equations – Steady flow in rivers – uniform and non-uniform – Turbulence and velocity profiles – resistance coefficient, Boundary conditions and back waters, Transitions, Rating Curve, Unsteady flow in rivers: Propagative of surface waves – Characteristics, flood waves – kinematic and diffusion analogy – velocity of propagation of flood waves – Flood wave – Maximum Fundamental relationships for flow and transport, Diffusion and Dispersion	08hrs	CO2
3	River Mechanics	River Equilibrium : Stability of Channel – regime relations – river bend equilibrium – hydraulic geometry of downstream – Bars and meandering - River dynamics – degradation and aggradation of river bed – Confluences and branches – River Data base.	08hrs	CO3
4	River Surveys and Model	Mapping, Stage and Discharge Measurements, Sediments, Bed and suspended load, Physical hydraulic Similitude, Rigid and mobile bed, Mathematical – Finite one dimensional, multi – dimensional – Water Quality and ecological model	08hrs	CO4
5	River Management	River training works and river regulation works – Flood plain management – waves and tides in Estuaries – Interlinking of rivers – River Stabilization	08hrs	CO5

Reference Books:	
Janson PL.Ph., Lvan Bendegam Jvanden Berg, Mdevries A. Zanen (Editors), Principles of River Engineering – The non-tidal alluvial rivers – Pitman, 1979.	
Pierre Y. Julien., River Mechanics, Cambridge University Press, 2002	
K.L Rao , INDIA’S WATER WEALTH – Orient Longman Ltd., 1979	
RangaRaju – New Age Int.Publications	
e-Learning Source:	
https://nptel.ac.in/content/storage2/courses/105105110/pdf/m6l01.pdf	

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	0	0	0	2	2	0	0	1	1	0	1	1
CO2	2	2	1	2	0	2	2	0	0	0	1	1	2	2
CO3	3	2	3	1	0	1	1	0	0	0	1	1	2	2
CO4	3	2	1	1	0	1	3	0	0	0	1	0	2	2
CO5	2	3	2	1	0	1	1	0	0	2	1	1	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE668	Title of the Course	Hydraulic Structure	L	T	P	C
Year	2 nd	Semester	3 rd	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To understand the basic concept of site selection of dam and Types of dam, To understand the Design criteria, Elementary profile of gravity dam and stability of dam To know the safety criteria, force acting on the gravity dam, function of spillway and energy dissipaters. 						

Course Outcomes	
CO1	Students will be able to understand the criteria of site Selection of dam, Forces acting on darns, Elementary profile of a gravity dam, Stability analysis and methods of determination of shear stress.
CO2	Students will be able to understand the Arch dam, Types of arch dams, Design of arch dam, Valleys suited for arch darns, Thin cylinder theory, Most economical central angle and Effects of foundation elasticity on arch dam.
CO3	Students will be able to understand the Buttress dam, Types of buttress dam, Design principles, Buttress design by Unit column theory and Basic shape of buttress.
CO4	Students will be able to understand the Spillways, Types of spillways, Design principles of spillway, Hydraulic design of spillways and Energy dissipation below spillways.
CO5	Students will be able to understand Theory of similarity, dimensional analysis, Basic concepts, Froude law, Reynolds law, Mach law, Cavitations number and Modeling technique.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Gravity Dams	Introduction, Selection of dam sites, Forces acting on darns, Elementary profile of a gravity dam, Stability analysis and Safety criteria, Graphical determination of shear stress, Galleries. Difference between weirs & barrages.	08hrs	CO1
2	Arch Dam	Definition, Types of arch dams, Design of arch dam, Valleys suited for arch darns, Thin cylinder theory, Most economical central angle, Effects of foundation elasticity on arch dam.	08hrs	CO2
3	Buttress Dam	Types of buttress darn, Selection of buttress dam, Most economical profile having no tension, Design principles, Buttress design by Unit column theory, Basic shape of buttress.	08hrs	CO3
4	Spillways and Energy Dissipaters	Spillways, Types of spillways, Design principles of spillway, Hydraulic design of spillways, Energy dissipation below spillways, Bucket type energy dissipaters, Design of various types of stilling basins.	08hrs	CO4
5	Hydraulic Models	Theory of similarity, dimensional analysis, Basic concepts, Froude law, Reynolds law, Mach law, Cavitation number, Modeling technique.	08hrs	CO5

Reference Books:	
Engineering for Dams by Creager, Justin & Hinds, Willey Eastern Pvt. Ltd., Delhi.	
Concrete Dams by R.S. Varshney, Oxford & IBH Pub. Co. Delhi.	
Dams-Part I Gravity Dams by K.B. Khushalani, Oxford & MN, Delhi.	
Design of Weirs on Permeable Foundations, CBIP Pub. No 20, Delhi.	
Garg, S.K., "Irrigation Engineering and Hydraulic Structures," Khanna Publishers.	
e-Learning Source:	
https://nptel.ac.in/content/storage2/courses/105105110/pdf/m4106.pdf	
https://nptel.ac.in/content/storage2/courses/105105110/pdf/m4104.pdf	

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	CO1	2	1	1	1	0	0	1	0	2	2	0	1	0
CO2	2	1	3	1	0	0	2	0	1	0	2	1	0	0
CO3	2	1	3	0	0	0	2	0	1	1	2	0	0	0
CO4	2	0	3	0	0	0	2	0	2	0	1	2	0	0
CO5	2	1	3	2	0	0	2	0	0	0	1	2	0	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE675	Title of the Course	Directed Study	L	T	P	C
Year	2 nd	Semester	3 rd	0	0	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To make learner aware about the latest technology and engineering practices in industries. 						

Course Outcomes	
CO1	Awareness regarding the latest technology, engineering methodology and practices being used in industries.

Unit No.	Content of Unit	Contact Hrs.	Mapped CO
1	Undergo industrial training in any respective industry in order to get familiar with the latest technology, engineering techniques and practices being used in the industry. Have to absorb some skill from the training identifying the area of improvement. The concepts/skills must be clearly understood and presented by the student. A hard copy of the report should be submitted to the Department after the completion of directed study.	03hrs	CO1 and CO2

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	0	0	3	3	3	0	0	3	3	0	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE699	Title of the Course	M Tech dissertation	L	T	P	C
Year	2 nd	Semester	3 rd and 4 th	0	0	0	20
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To develop individuality and problem analysis skill. To nurture ability to perform literature review. To improve critical thinking ability for formulation of plan. To develop skill to use various engineering and technological tools. To develop skill to think critically on research results. To enhance the writing skill for research paper and dissertation. 						

Course Outcomes	
CO1	Capability to work independently on a research-based problem.
CO2	Skill to perform review of available literature effectively to present research gap.
CO3	Aptitude to plan methodology for the attainment of various research objectives.
CO4	Competency to apply of various engineering and technological tools to carry research.
CO5	Ability to conclude work using critical thinking.
CO6	Proficiency in preparing presentation and report.

Unit No.	Content of Unit	Contact Hrs.	Mapped CO
1	Undergo industrial training in any respective industry in order to get familiar with the latest technology, engineering techniques and practices being used in the industry. Have to absorb some skill from the training identifying the area of improvement. The concepts/skills must be clearly understood and presented by the student. A hard copy of the report should be submitted to the Department after the completion of directed study.	03hrs	CO1, CO2, CO3, CO4, CO5 and CO6

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	0	0	0	3	3	0	0	3	3	3	0	3	0	3
CO2	0	0	0	3	3	0	0	3	3	3	0	3	0	3
CO3	0	0	0	0	3	0	0	0	3	3	0	3	0	3
CO4	0	0	0	3	3	0	0	0	3	0	0	3	0	3
CO5	0	0	0	3	3	0	0	3	3	3	0	3	0	3
CO6	0	0	0	0	3	0	0	3	3	3	0	3	0	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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