Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY , BANGALORE-90

COURSE PLAN

Academic Year 2019-20

Program:	B E – Civil Engineering
Semester :	7
Course Code:	15CV73
Course Title:	Hydrology and Irrigation Engineering
Credit / L-T-P:	4 / 4-0-0
Total Contact Hours:	50
Course Plan Author:	Dr.K Satish

Academic Evaluation and Monitoring Cell

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Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	Civil Engineering	Program:	B.E
Semester:	7th	Academic Year:	2019-20
Course Title:	Hydrology and Irrigation Engineering	Course Code:	15CV73
Credit / L-T-P:	4 / 4-0-0	SEE Duration:	180 Minutes
Total Contact Hours:	50 Hours	SEE Marks:	80 Marks
CIA Marks:	20 Marks	Assignment	1 / Module
Course Plan Author:	Dr. K Satish	Sign ..	Dt:
Checked By:	MOHAN K T	Sign ..	Dt:
CO Targets	CIA Target : 85%	SEE Target:	80 %

Note: Define CIA and SEE % targets based on previous performance.

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	HYDROLOGY: Introduction To Hydrology. Importance of hydrology. Global and Indian water availability. Practical application of hydrology. Hydro logic cycle (Horton's) qualitative and engineering representation. PRECIPITATION: Definition, Forms and types of precipitation, measurement of rain fall using Symon's and Syphon type of rain gauges, optimum number of rain gauge stations, consistency of rainfall data (double mass curve method), computation of mean rainfall, estimation of missing data, presentation of precipitation data, moving average curve, mass curve, rainfall hyetographs.	10	Hydrology & Precipitation	L3
2	LOSSES : Evaporation Introduction, Process, factors affecting evaporation, measurement using IS class-A Pan, estimation using empirical formulae (Meyer's and Rohwer's equations) Reservoir evaporation and control EVAPO-TRANSPIRATION: Introduction, Consumptive use, AET, PET, Factors affecting, Measurement, Estimation by Blaney-Criddle equation. INFILTRATION: Introduction, factors affecting infiltration capacity, measurement by double ring infiltrometer, Horton's infiltration equation, infiltration indices.	10	Evaporation, Evapo-transpiration and Infiltration	L3
3	RUNOFF: Definition, concept of catchment, factors affecting runoff, rainfall – runoff relationship using regression analysis. HYDRO-GRAPHS: Definition, components of hydrograph, base flow separation, unit hydrograph, assumption, application and limitations, derivation from simple storm hydro graphs, S curve and its computations, Conversion of UH of different duration.	10	Surface Runoff & Hydrographs	L4
4	IRRIGATION: Definition. Benefits and ill effects of irrigation. System of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation WATER REQUIREMENTS OF CROPS: Duty, delta and base period, relationship between them, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation	10	Systems of Irrigation & Water Requirement of Crops	L3
5	Canals: Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals.	10	Artificial Water Supply & Reservoir	L5

	Standard sections. Design of canals by Lacey's and Kennedy's method Reservoirs: Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.		Characteristics	
-	**Total**		-	-

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).
1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Modules	Details	Chapters in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2, 3, 4, 5	K. Subramanya, "Engineering Hydrology".	3, 4	In Lib / In Dept
1	Jayarami Reddy, "A Text Book of Hydrology".	2, 4	In Lib/ In dept
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2	H.M. Raghunath, "Hydrology"	?	In Lib
1, 2	Sharma R.K., "Irrigation Engineering and Hydraulics".	?	Not Available
3, 4, 5	Garg S.K., "Irridation Engineering and Hydraulic Structures"	?	In lib
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
C1	https://youtu.be/j9oBdmKgMT8 https://youtu.be/UglqCu1YLuE		
C2	https://youtu.be/m_ALjsA1Als		
C3	https://youtu.be/tSA18XoqMVQ		
C4	https://YouTube/72xBq70Svow		
C5	https://youtu.be/TRhA1KacJhE		
C6	https://youtu.be/2hHDRv80j5o		
C7	https://youtu.be/u6geM8j9a5U		
C8	https://youtu.be/e7pckUDQ9oI		
C9	https://youtu.be/9WCgppulFFI		
C10	https://youtu.be/UMTSNWEuTlU		
D	**Software Tools for Design**	**-**	**-**
E	**Recent Developments for Research**	**-**	**-**
F	**Others (Web, Video, Simulation, Notes etc.)**	**-**	**-**

4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

Modules	Course Code	Course Name	Topic / Description	Sem	Remarks	Blooms Level
1	15CV661	Water Resources Management	Hydrologic cycle	6th	-	L2
3						

3						
5						
-						
-						

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

Modules	Topic / Description	Area	Remarks	Blooms Level
1				
3				
3				
5				
-				
-				

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	15CV73.1	Student should be able to understand the importance of hydrology and its components.	05	Hydrological cycle	Lecture	Slip Test	L2
1	15CV73.2	Student should be able to measure precipitation by various techniques.	05	Rain guages	Lecture / Tutorial	Assignment	L2
2	15CV73.3	Student should be able to calculate the losses from evaporation.	05	Evaporimeters	Lecture	Assignment	L3
2	15CV73.4	Student should be able to calculate the losses from infiltration	05	infiltrometers	Lecture	Assignment	L3
3	15CV73.5	students will be able to compute the amount of runoff.	05	Surface runoff	Lecture	Slip Test	L3
3	15CV73.6	students will be able to plot the runoff data through hydrographs	05	Hydrographs	Lecture	Slip test	L3
4	15CV73.7	Student should be able to find the benefits and illeffects of irrigation.	05	System of Irrigation	Lecture /Tutorial	Assignment	L2
4	15CV73.8	Student should be able to measure the quantity of irrigation water and frequency of irrigation for various crops	05	Duty,delta & base period	Lecture /Tutorial	Assignment	L2
5	15CV73.9	Students should be able to design the canals	05	Hydraulic structures	Lecture /Tutorial	Assignment	L5
5	15CV73.10	Students should be able to understand reservoir planning and compute useful life of a reservoir.	05	Reservoir Characteristics	Lecture	Assignment	L2
					Lecture	Assignment	
-	**-**	**Total**	**50**	**-**	**-**	**-**	**L2-L4**

2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Hydrology is used for city water supply design which is based on catchments area, amount of rainfall, dry period, storage capacity, runoff evaporation and transpiration,	CO1	L2
1	Used for the estimation of rainfall data.	CO2	L3
2	Used for the measuring the water level in reservoirs.	CO3	L3
2	Environmental research field	CO4	L3
3	Used in the analysis of surface runoff.	CO5	L3
3	They are useful in planning for flood situations and in times of drought.	CO6	L3
4	Irrigation is most commonly used in the field of agriculture	CO7	L2
4	Used in the field of horticulture.	CO8	L2
5	Urban water supply, hydroelectric power generation	CO9	L3
5	Used to calculate the reservoir capacity.	CO10	L2

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Modules	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	-	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	-
1	CO1	PO1	1	Hydrologic cycle is the explanation of water circulation in the earth in all forms and Importance of hydrology and its components is required in the designing of hydraulic structures	L2
1	CO1	PO6	1	Supplying of potable water to people is one of the important duty of engineer.	L2
1	CO1	PO7	1	During natural calamities environment will be under imbalance. Hydrologists with professional engineering solutions has to control the natural calamities.	L2
1	CO2	PO2	2	Analyzing the data of precipitation using the principles of natural sciences. A lot of importance is provided to the knowledge of storm runoff and its measurement.	L4
2	CO3	PO5	1	Proper techniques and equipments are required for estimation of evaporation.	L2
2	CO4	PO5	2	Proper techniques and equipments are required for estimation of evaporation.	L3
3	CO5	PO1	2	A lot of importance is provided to the knowledge of storm runoff and its measurement.	L3
3	CO6	PO4	2	A storm is always a complex phenomenon, often overlapping each other. The knowledge to analyze by conducting investigations of such complex phenomena is important.	L2
4	CO7	PO6	1	Knowledge of irrigation benefits which deals with food production which is in turn related with society	L2
4	CO8	PO1	1	Frequency of irrigation is required in the designing of water storage structures and systems of irrigation. Agriculture being the primary occupation of the nation, engineering knowledge regarding the water requirement of crops is important.	L2
5	CO9	PO3	3	Design of canals for supply of water for growing crops and for industries	L5
5	CO9	PO6	1	By constructing the hydraulic structures water can be supplied to domestic, industrial and agriculture purposes which is again interrelated with enginer and society	L2
5	CO10	PO1	1	Nowadays, reservoir planning knowledge is required for uniform distribution of water to all regions for different purposes	L2
				.	

4. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

-	-	Course Outcomes	Program Outcomes															-
Modules	CO.#	**At the end of the course student should be able to . . .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	15CV73.1	Student should be able to understand the importance of hydrology and its components.	2.12	-	-	-	-	1.83	1	-	-	-	-	-	-	-	-	-
1	15CV73.2	Student should be able to measure precipitation by various techniques.	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	15CV73.3	Student should be able to calculate the losses from evaporation.	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-
2	15CV73.4	Student should be able to calculate the losses from infiltration	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-
3	15CV73.5	students will be able to compute the amount of runoff.	2.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	15CV73.6	students will be able to plot the runoff data through hydrographs	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
4	15CV73.7	Student should be able to find the benefits and illeffects of irrigation.	-	-	-	-	-	1.83	-	-	-	-	-	-	-	-	-	-
4	15CV73.8	Student should be able to measure the quantity of irrigation water and frequency of irrigation for various crops	2.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	15CV73.9	Students should be able to design the canals	-	-	2	-	-	1.83	-	-	-	-	-	-	-	-	-	-
5	15CV73.10	Students should be able to understand reservoir planning and compute useful life of a reservoir.	2.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-		**Average attainment (1, 2, or 3)**	2.12	1	2	1.5	1.5	1.83	1	-	-	-	-	-	-	-	-	-
-	*PO, PSO*	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*																

5. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

Modules	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1						
1						
2						
2						
3						
3						
4						
4						
5						
5						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Hydrology & Irrigation	10	2	-	-	1	1	2	CO1,CO2	L3
2	Losses	10	2	-	-	1	1	2	CO3,CO4	L3
3	Runoff & Hydrograohs	10	-	2	-	1	1	2	CO5,CO6	L4
4	Irrigation & Water Requirements of Crops	10	-	2	-	1	1	2	CO7,CO8	L3
5	Canals & Reservoirs	10	-	-	4	1	1	2	CO9,C010	L5
-	**Total**	**50**	**4**	**4**	**4**	**5**	**5**	**10**	**-**	**-**

2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

Modules	Evaluation	Weightage in Marks	CO	Levels
1, 2	CIA Exam – 1	15	CO1, CO2, CO3, CO4	L2,L3
3, 4	CIA Exam – 2	15	CO5, CO6, CO7, C08	L2, L3, L4
5	CIA Exam – 3	15	CO9, CO10	L5
1, 2	Assignment - 1	05	CO1, CO2, CO3, CO4	L3,L5
3, 4	Assignment - 2	05	CO5, CO6, CO7, CO8	L2, L3, L4
5	Assignment - 3	05	CO9, CO10	L3, L5
1, 2	Seminar - 1		-	-
3, 4	Seminar - 2		-	-
5	Seminar - 3		-	-
1, 2	Quiz - 1		-	-
3, 4	Quiz - 2		-	-
5	Quiz - 3		-	-
1 - 5	Other Activities – Mini Project	-	CO9, CO10	L2,L2
	Final CIA Marks	**20**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Hydrology and Precipitation	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Interpret the application of hydrology by representation of hydological cycle.		
2	Estimate precipitation data by double mass curve method.		
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
1	Introduction To Hydrology. Importance of hydrology.	CO1	L2
2	Global and Indian water availability.	CO1	L2
3	Practical application of hydrology.	CO1	L2
4	Hydrologic cycle (Horton's) qualitative and engineering representation.	CO1	L2
5	Precipitation: Definition, Forms and types of precipitation,	CO2	L2
6	Measurement of rain fall using Symon's and Syphon type of rain gauges.	CO2	L3
7	Optimum number of rain gauge stations	CO2	L2
8	Consistency of rainfall data (double mass curve method),	CO2	L2
9	Computation of mean rainfall, Estimation of missing data,	CO2	L3
10	Presentation of precipitation data, moving average curve, mass curve, rainfall hyetographs.	CO2	L3
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Hydrology is used for city water supply design which is based on catchments area, amount of rainfall, dry period, storage capacity, runoff evaporation and transpiration,	CO1	L2
2	Used for the estimation of rainfall data.	CO2	L3
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	Define Rain gauge. Describe with neat sketch the principle of working of Symon's non-recording gauge and its demerits ?	CO1	L2
2	Define Hydrology and Explain briefly the typical applications of Hydrology?	CO1	L2
3	Define precipitation? Explain different forms of precipitation?	CO2	L2
4	Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	CO1	L2
5	Briefly explain optimum number of rain gauge stations in a catchment?	CO1	L3
6	During a month, a rain gauge went out of order while the other four gauges in the basin reported rainfalls of 110, 90, 120 and 115mm. If the normal annual rainfall for these four gauges are 115, 95, 125 and 120mm respectively and the normal rainfall for the broken gauge is 98cm, estimate the monthly rainfall at the broken gauge?	CO1	L3
7	A Lake had a water surface elevation of 103.200m above datum at the beginning of certain month. In that month the lake reserved an average inflow of 6.0cumecs from surface runoff sources. In the same period outflow from the lake have an average value of 6.5 cumecs. Further in that month the lake received a rainfall of 145mm and evaporation from lake surface was estimated at 6.10 cm. Write the water budget equation for lake & calculate the water surface elevation of the lake at end of month. The average lake surface area may be taken as 5000 hectares. Assume that there is no contribution to or from ground water storage	CO1	L3
8	A small catchment area of 150hectare received a rainfall of 10.5cm in 90 min due to a storm at a the outlet of catchment draining the catchment was dry	CO2	L3

	before the storm & experienced a runoff lasting for 10 hrs with average discharge of 1.5 m3/s the stream was dry again after runoff event. a) What is amount of water which was not available to runoff due to combine effect of infiltration evaporation? b) What is the ratio of runoff to precipitation		
e	**Experiences**	-	-
1			
2			
3			
4			
5			

Module – 2

Title:	LOSSES :: Evaporation, Evapo-transpiration, Infiltration	Appr Time:	7 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Calculate the losses of evaporation by Class A pan method.	CO3	L3
2	Interpret rainfall data by double ring infiltrometer.	C04	L3
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
11	Losses; Evaporation; Introduction	CO3	L2
12	Process, factors affecting evaporation,	CO3	L2
13.	Measurement using IS class-A Pan,	CO3	L3
14.	Estimation using empirical formulae (Meyer's and Rohwer's equations) Reservoir evaporation and control.	CO3	L3
15.	Evapo-transpiration: Introduction,	CO3	L2
16.	Consumptive use, AET, PET, Factors affecting.	CO3	L2,L3
17.	Measurement, Estimation by Blaney-Criddle equation.	CO3	L3
18.	Infiltration: Introduction, factors affecting infiltration capacity.	CO4	L2
19.	Measurement by double ring infiltrometer.	CO4	L3
20.	Horton's infiltration equation, infiltration indices.	C04	L3
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Used for the measuring the water level in reservoirs.		
2	Environmental research field		
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
1	With a neat sketch, explain the working of double ring infiltrometer?	CO3	L2
2	Define the term infiltration capacity of a soil. Explain Horton's infiltration capacity curve, with a neat sketch	CO3	L2
3	Definei) evaporation ii) potential Evapo-transpiration iii) Actual evapo transpiration iv) Pan coefficient.	CO3	L2
4	Define evaporation. With a neat sketch, Explain the measurement of evaporation using IS class A pan	CO3	L2
5	Define Evaporation and Evapo-transpiration and list out the factors affecting the evaporation	CO3	L2
6	Briefly explain the estimation of evapo-transpiration by Blaney-Criddle method	CO3	L2
e	**Experiences**	-	-

1			
2			
3			
4			
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	15CV73	Sem:	VII	Marks:	30	Time:	75 minutes		
Course:	HYDROLOGY & IRRIGATION ENGINEERING								
-	**-**	**Note: Answer all questions, each carry equal marks. Module : 1, 2**					**Marks**	**CO**	**Level**
1	a	Define Hydrology and Explain briefly the typical applications of Hydrology?					7.5	CO1	L2
	b	Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?					7.5	CO1	L2
		OR							
1	a	Define Rain gauge. Describe with neat sketch the principle of working of Symon's non-recording gauge and its demerits ?					7.5	CO2	L2
	b	Briefly explain optimum number of rain gauge stations in a catchment?					7.5	CO2	L2
2	a	Definei) evaporation ii) potential Evapo-transpiration iii) Actual evapo transpiration iv) Pan coefficient.					05	CO3	L2
	b	Define evaporation. With a neat sketch, Explain the measurement of evaporation using IS class A pan					10	CO3	L3
		OR							
2	a	Define Evaporation and Evapo-transpiration and list out the factors affecting the evaporation					7.5	CO3	L2
	b	Briefly explain the estimation of evapo-transpiration by Blaney-Criddle method					7.5	CO3	L2

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions									
Crs Code:	15CV73	Sem:	VII	Marks:	5	Time:	90 – 120 minutes		
Course:	HYDROLOGY & IRRIGATION ENGINEERING				Module : 1, 2				
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.									
SNo	**USN**	**Assignment Description**					**Marks**	**CO**	**Level**
1		Define Rain gauge. Describe with neat sketch the principle of working of Symon's non-recording gauge and its demerits ?					6	CO1	L2
2		Define Hydrology and Explain briefly the typical applications of Hydrology?					7	CO1	L2
3		Define precipitation? Explain different forms of precipitation?					7	CO2	L2
4		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?					8	CO1	L2
5		Briefly explain optimum number of rain gauge stations in a catchment?					6	CO1	L3
6		Briefly explain the estimation of evapo-transpiration by Blaney-Criddle method					7	CO3	L3
7		Define Evaporation and Evapo-transpiration and list out the factors affecting the evaporation					7	CO3	L3
8		Define evaporation. With a neat sketch, Explain the measurement of evaporation using IS class A pan					7	CO3	L3
9		Definei) evaporation ii) potential Evapo-transpiration iii) Actual evapo transpiration iv) Pan coefficient.					6	CO3	L2
10		Define the term infiltration capacity of a soil. Explain Horton's infiltration capacity curve, with a neat sketch					8	CO3	L3
11		With a neat sketch, explain the working of double ring					8	CO3	L2

		infiltrometer?			
12		Define Hydrology and Explain briefly the typical applications of Hydrology?	7	CO1	L2
13		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	8	CO1	L2
14		Define Rain gauge. Describe with neat sketch the principle of working of Symon's non-recording gauge and its demerits ?	7	CO2	L2
15		Briefly explain optimum number of rain gauge stations in a catchment?	7	CO1	L3
16		Define Evaporation and Evapo-transpiration and list out the factors affecting the evaporation	7	CO3	L2
17		Briefly explain the estimation of evapo-transpiration by Blaney-Criddle method	7	CO1	L2
18		Definei) evaporation ii) potential Evapo-transpiration iii) Actual evapo transpiration iv) Pan coefficient.	6	CO3	L2
19		Define evaporation. With a neat sketch, Explain the measurement of evaporation using IS class A pan	6	CO1	L3
20		Define Hydrology and Explain briefly the typical applications of Hydrology?	7	CO1	L2
21		Define precipitation? Explain different forms of precipitation?	7	CO2	L2
22		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	8	CO1	L2
23		Define precipitation? Explain different forms of precipitation?	7	CO2	L2
24		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	7	CO1	L2
25		Briefly explain optimum number of rain gauge stations in a catchment?	7	CO1	L3
26		Explain double mass curve method?	8	CO3	L3
27		Explain the applications of hydrology?	7	CO1	L2
28		Define precipitation, Hydrology?	7	CO2	L2
29		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	8	CO1	L2
30		Explain different forms of precipitation?	7	CO2	L2
31		Describe with neat sketch the principle of working of Symon's non-recording gauge and its demerits ?	8	CO2	L2
32		Explain briefly the typical applications of Hydrology?	7	CO1	L2
33		Briefly explain the estimation of evapo-transpiration by Blaney-Criddle method	7	CO3	L3
34		Define Evaporation and Evapo-transpiration and list out the factors affecting the evaporation	7	CO3	L2
35		Define evaporation. With a neat sketch, Explain the measurement of evaporation using IS class A pan	8	CO3	L2
36		Definei) evaporation ii) potential Evapo-transpiration iii) Actual evapo transpiration iv) Pan coefficient.	7	CO3	L2
37		Define the term infiltration capacity of a soil. Explain Horton's infiltration capacity curve, with a neat sketch	8	CO3	L2
38		With a neat sketch, explain the working of double ring infiltrometer?	8	CO3	L3
39		Define Hydrology and Explain briefly the typical applications of Hydrology?	7	CO1	L2
40		Explain double mass curve method?	8	CO3	L2
41		Explain the applications of hydrology?	6	CO1	L2
42		Define precipitation, Hydrology?	6	CO2	L2
43		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	8	CO1	L2
44		Explain different forms of precipitation?	6	CO2	L2
45		Define Hydrology and Explain briefly the typical applications of Hydrology?	7	CO1	L2
46		Define precipitation? Explain different forms of precipitation?	7	CO2	L2

47		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	8	CO1	L2
48		Define precipitation? Explain different forms of precipitation?	7	CO2	L2
49		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	7	CO1	L2
50		Briefly explain optimum number of rain gauge stations in a catchment?	7	CO1	L3
51		Explain double mass curve method?	8	CO3	L3
52		Explain the applications of hydrology?	7	CO1	L2
53		Define precipitation, Hydrology?	7	CO2	L2
54		Define hydrology. With a neat sketch, explain the Horton's qualitative representation of the hydrologic cycle?	8	CO1	L2
55		Explain different forms of precipitation?	7	CO2	L2
56		Describe with neat sketch the principle of working of Symon's non-recording gauge and its demerits ?	8	CO2	L2
57		Explain briefly the typical applications of Hydrology?	7	CO1	L2
58		Briefly explain the estimation of evapo-transpiration by Blaney-Criddle method	7	CO3	L3
59		Define Evaporation and Evapo-transpiration and list out the factors affecting the evaporation	7	CO3	L2
60		Define evaporation. With a neat sketch, Explain the measurement of evaporation using IS class A pan	8	CO3	L2
61		Definei) evaporation ii) potential Evapo-transpiration iii) Actual evapo transpiration iv) Pan coefficient.	7	CO3	L2
62		Define the term infiltration capacity of a soil. Explain Horton's infiltration capacity curve, with a neat sketch	8	CO3	L2
63		With a neat sketch, explain the working of double ring infiltrometer?	8	CO3	L3
64		Define Hydrology and Explain briefly the typical applications of Hydrology?	7	CO1	L2
65		Explain double mass curve method?	8	CO3	L2
66		Explain the applications of hydrology?	6	CO1	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Runoff and Hydrographs	Appr Time:	12 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Analyze the catchment characteristics by regression analysis		
2	Analyaze the graphical data of rainfall through S curve analysis.		
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
21.	Runoff: Definition, concept of catchment,	CO5	L2
22.	Factors affecting runoff,	CO5	L2
23.	Rainfall – runoff relationship using regression analysis.	CO5	L3
24.	Hydrographs: Definition.	CO6	L2
25.	Components of hydrograph.	CO6	L2
26.	Base flow separation,	CO6	L2
27.	Unit hydrograph, assumption, application and limitations,	CO6	L2
28.	Derivation from simple storm hydrographs	CO6	L2
29.	S curve and its computations	CO6	L3
30.	Conversion of UH of different durations	CO6	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-

1	Used in the analysis of surface runoff.		
2	They are useful in planning for flood situations and in times of drought.		
d	**Review Questions**	-	-
-	The attainment of the module learning assessed through following questions	-	-
18	Briefly explain 'schematic representation of runoff components.	CO3	L2
19	What are the components of unit hydrograph? Write a note on its applications.	CO3	L2
20	What are the factors affecting the runoff from a catchment? Explain any one of them.	CO3	L2
21	With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	CO3	L3
22	What is unit hydrograph? Discuss its use and limitations	CO3	L2
23	Explain the concept of catchment?	CO3	L2
e	**Experiences**	-	-
1			
2			
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4			
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Module – 4

Title:	Irrigation and Water requirements of crops	Appr Time:	13 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Summarize the water requirement of crops through different system of irrigation.	CO7	L2
2	Illustrate the water requirement for different crops and seasons.	CO8	L3
b	***Course Schedule***		
Class No	**Portion covered per hour**	**-**	**-**
31.	Irrigation: Introduction and Definition.	CO7	L2
32.	Benefits and ill effects of irrigation.	CO7	L2
33.	System of irrigation.	CO7	L2
34.	surface and ground water, flow irrigation, lift irrigation,Bandhara irrigation.	CO7	L2
35.	Water Requirements of Crops.	CO8	L3
36.	Duty, delta and base period.	CO8	L3
37	Relationship between Duty, delta and base period.	CO8	L3
38.	Factors affecting duty of water crops and crop seasons in India.	CO8	L2
39.	Irrigation efficiency.	CO8	L2
40.	Frequency of irrigation.	CO8	L3
c	**Application Areas**	**-**	**-**
-	Irrigation is most commonly used in the field of agriculture	-	-
1	Used in the field of horticulture.		
2			
d	**Review Questions**	-	-
-		-	-
32	Define Irrigation. What are the types of flow irrigation? Explain any two flow irrigation systems.	CO5	L2
33	What are the benefits and ill effects of irrigation?	CO5	L2
34	Explain Flow irrigation with the help of neat sketches	CO5	L3
35	List the methods of irrigation and explain any three methods	CO5	L2
36	What are the primary objectives of an irrigation method? List the various	CO5	L2

	methods of irrigation adopted for distribution of water in the field.		
37	What are the methods of applying water to crops? Explain any two surface irrigation methods	CO5	L2
38	What do you mean by Duty and Delta? How are they expressed?	CO6	L3
39	Define duty, delta and base period. Obtain the relationship between them	CO6	L3
40	What are the factors affecting duty	CO6	L2
41	The gross commanded area for a distributory is 20000 hectares,75% of which can be irrigated. The intensity of irrigation for Rabi season is 40% that for Kharif season is 10%. If kor period is 4 weeks for rabi and 2.5 weeks for rice, determine he outlet discharge . Outlet factors for rabi and rice may be assumed as 1800 hectares/ cumec and 775 hectares/ cumec. Also calculate delta for each crop.	CO6	L3
	The base period, duty at the field of difference crops, and area under each crop in the command area are given below. Find the required reservoir capacity to cater to the needs of the crops.	CO6	L3

Crops	Base period (days)	Duty @ field (Ha/cumec)	Intensity of irrigation (%)
Wheat	120	1800	20
Sugar cane	360	1700	20
Cotton	180	1400	10
Rice	120	800	15
Vegetables	120	700	15

e	**Experiences**		
1			
2			
3			
4			
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	15EC71	Sem:	VII	Marks:	30	Time:	75 minutes
Course:	HYDROLOGY & IRRIGATION ENGINEERING						

-	-	**Note: Answer all questions, each carry equal marks. Module : 3, 4**	**Marks**	**CO**	**Level**
1	a	What are the components of unit hydrograph? Write a note on its applications.	5	CO4	L2
	b	What is unit hydrograph? Discuss its use and limitations	6	CO4	L2
		Explain the concept of catchment?	4	CO4	L2
		OR			
1	a	With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	5	CO4	L2
	b	Briefly explain 'schematic representation of runoff components.	5	CO4	L3
		What is unit hydrograph? Discuss its use and limitations.	5	CO4	L2
2	a	Define Irrigation. What are the types of flow irrigation? Explain any two flow irrigation systems.	5	CO5	L2
	b	What are the benefits and ill effects of irrigation?	5	CO5	L2
		What are the primary objectives of an irrigation method? List the various methods of irrigation adopted for distribution of water in the field.	5	CO5	L2
		OR			
2	a	Define duty, delta and base period. Obtain the relationship between them.	6	CO6	L3

	b	What are the factors affecting duty?	5	CO6	L2
		The gross commanded area for a distributory is 20000 hectares,75% of which can be irrigated. The intensity of irrigation for Rabi season is 40% that for Kharif season is 10%. If kor period is 4 weeks for rabi and 2.5 weeks for rice, determine he outlet discharge . Outlet factors for rabi and rice may be assumed as 1800 hectares/ cumec and 775 hectares/ cumec. Also calculate delta for each crop.	4	CO6	L4

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15CV73	Sem:	VII	Marks:	5	Time:	90 – 120 minutes
Course:	HYDROLOGY AND IRRIGATION				Module : 3, 4		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Briefly explain 'schematic representation of runoff components.	7	CO4	L2
2		What are the components of unit hydrograph? Write a note on its applications.	7	CO4	L2
3		What are the factors affecting the runoff from a catchment? Explain any one of them.	5	CO4	L2
4		With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	8	CO4	L2
5		What is unit hydrograph? Discuss its use and limitations	7	CO4	L2
6		Explain the concept of catchment?	7	CO4	L3
7		Define Irrigation. What are the types of flow irrigation? Explain any two flow irrigation systems.	8	CO5	L2
8		What are the benefits and ill effects of irrigation?	7	CO5	L2
9		Explain Flow irrigation with the help of neat sketches	7	CO5	L2
10		List the methods of irrigation and explain any three methods	8	CO5	L2
11		What are the primary objectives of an irrigation method? List the various methods of irrigation adopted for distribution of water in the field.	7	CO5	L2
12		What are the methods of applying water to crops? Explain any two surface irrigation methods	6	CO5	L2
13		What do you mean by Duty and Delta? How are they expressed?	7	CO5	L3
14		Define duty, delta and base period. Obtain the relationship between them	8	CO6	L3
15		What are the factors affecting duty	7	CO6	L2
16		Explain the concept of catchment?	7	CO4	L2
17		What is unit hydrograph? Discuss its use and limitations	6	CO4	L2
18		With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	7	CO4	L2
19		What are the factors affecting the runoff from a catchment? Explain any one of them.	7	CO4	L2
20		What are the components of unit hydrograph? Write a note on its applications.	8	CO4	L2
21		Briefly explain 'schematic representation of runoff components.	8	CO5	L2
22		What are the factors affecting duty	6	CO6	L2
23		Define duty, delta and base period. Obtain the relationship between them	8	CO6	L3
24		What do you mean by Duty and Delta? How are they expressed?	8	CO6	L3

25		What are the methods of applying water to crops? Explain any two surface irrigation methods	7	CO6	L2
26		What are the primary objectives of an irrigation method? List the various methods of irrigation adopted for distribution of water in the field.	7	CO6	L2
27		List the methods of irrigation and explain any three methods	8	CO6	L2
28		Explain Flow irrigation with the help of neat sketches	8	CO5	L2
29		What are the benefits and ill effects of irrigation?	7	CO5	L2
30		Define Irrigation. What are the types of flow irrigation? Explain any two flow irrigation systems.	7	CO5	L2
31		Briefly explain 'schematic representation of runoff components.	8	CO4	L2
32		What are the components of unit hydrograph? Write a note on its applications.	7	CO4	L2
33		What are the factors affecting the runoff from a catchment? Explain any one of them.	7	CO4	L2
34		With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	7	CO4	L4
35		What is unit hydrograph? Discuss its use and limitations	7	CO4	L2
36		Explain the concept of catchment?	7	CO4	L2
37		Define Irrigation. What are the types of flow irrigation? Explain any two flow irrigation systems.	8	CO5	L2
38		What are the benefits and ill effects of irrigation?	5	CO5	L2
39		Explain Flow irrigation with the help of neat sketches	5	CO5	L3
40		List the methods of irrigation and explain any three methods	5	CO5	L2
41		What do you mean by Duty and Delta? How are they expressed?	8	CO6	L2
42		Define duty, delta and base period. Obtain the relationship between them	8	CO6	L4
43		What are the factors affecting duty	7	CO6	L2
44		Explain the concept of catchment?	6	CO4	L2
45		What is unit hydrograph? Discuss its use and limitations	7	CO4	L2
46		With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	7	CO4	L4
47		What is unit hydrograph? Discuss its use and limitations	7	CO6	L2
48		What is unit hydrograph? Discuss its use and limitations	6	CO4	L2
49		With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	7	CO4	L2
50		What are the factors affecting the runoff from a catchment? Explain any one of them.	7	CO4	L2
51		What are the components of unit hydrograph? Write a note on its applications.	8	CO4	L2
52		Briefly explain 'schematic representation of runoff components.	8	CO5	L2
53		What are the factors affecting duty	6	CO6	L2
54		Define duty, delta and base period. Obtain the relationship between them	8	CO6	L3
55		What do you mean by Duty and Delta? How are they expressed?	8	CO6	L3
56		What are the methods of applying water to crops? Explain any two surface irrigation methods	7	CO6	L2
57		What are the primary objectives of an irrigation method? List the various methods of irrigation adopted for distribution of water in the field.	7	CO6	L2
58		List the methods of irrigation and explain any three methods	8	CO6	L2
59		Explain Flow irrigation with the help of neat sketches	8	CO5	L2

60		What are the benefits and ill effects of irrigation?	7	CO5	L2
61		Define Irrigation. What are the types of flow irrigation? Explain any two flow irrigation systems.	7	CO5	L2
62		Briefly explain 'schematic representation of runoff components.	8	CO4	L2
63		What are the components of unit hydrograph? Write a note on its applications.	7	CO4	L2
64		What are the factors affecting the runoff from a catchment? Explain any one of them.	7	CO4	L2
65		With a neat sketch, explain the various components of a flood hydrograph. Also explain anyone method of base flow separation.	7	CO4	L4
66		What is unit hydrograph? Discuss its use and limitations	7	CO4	L2

D3. TEACHING PLAN - 3

Module – 5

Title:	Canals and Reservoirs	Appr Time:	10 Hrs
a	***Course Outcomes***	**CO**	**Blooms**
-	At the end of the topic the student should be able to . . .	-	**Level**
1	Design canals with the help of flow of water characteristics.	CO9	L5
2	Calculate rainfall data by mass curve method.	c010	L4
b	***Course Schedule***	-	-
Class No	**Portion covered per hour**	**-**	**-**
41.	Canals: Introduction ,Types of canals.	CO9	L2
42.	Alignment of canals.	CO9	L2
43.	Definition of gross command area, cultural command area,	CO9	L2
44.	Intensity of irrigation, Time factor, Crop factor.	CO9	L2
45.	Unlined and lined canals. Standard sections.	CO9	L2
46.	Design of canals by Lacey's and Kennedy's method.	CO9	L5
47.	Reservoirs: Introduction and Definition,	CO10	L2
48.	Investigation for reservoir site,	CO10	L2
49.	Storage zones determination of storage capacity using mass curves	CO10	L2
50.	Economical height of dam.	CO10	L2
c	**Application Areas**	**-**	**-**
-	Students should be able employ / apply the Module learnings to . . .	-	-
1	Urban water supply, hydroelectric power generation		
2	Used to calculate the reservoir capacity.		
d	**Review Questions**	-	-
	The attainment of the module learning assessed through following questions	-	-
	Explain i) Gross command area ii) Culturable command area iii) Consumptive use	CO9	L2
	Explain various considerations for alignment of a canal?	CO9	L2
	Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	CO9	L5
	Determine the dimensions of the irrigation canal for the following data B/D	CO9	L5

	ratio = 3.7, N= 0.0225, m=1.0 and S= 1/ 4000 side slopes of the channel is ½ H : 1V. Also determine the discharge which will be flowing in the channel		
	Give the classification of canals. Explain salient features of each of them	CO9	L2
	What are the factors to be considered in alignment of an irrigation canal?	CO10	L2
	Explain mass curves?	CO10	L2
	Explain Economical height of dam?	CO10	L2
	Define Reservoirs?	CO10	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	15CV73	Sem:	VII	Marks:	30	Time:	75 minutes
Course:	HYDROLOGY & IRRIGATION ENGINEERING						

-	-	**Note: Answer all questions, each carry equal marks. Module : 5**	**Marks**	**CO**	**Level**
1	a	Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO9	L2
	b	Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	5	CO9	L5
	c	Give the classification of canals. Explain salient features of each of them	5	CO9	L2
		OR			
1	a	What are the factors to be considered in alignment of an irrigation canal?	4	CO9	L2
	b	Define Reservoirs. Explain Economical height of dam?	4	CO10	L2
	c	Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	7	CO9	L5
2	a	Design an irrigation canal in alluvial soil according to Lacey's silt theory for the following data I) full supply discharge = 10 cumecs ii) silt factor = 0.9 iii) channel side slope = 0.5H: 1V	8	CO9	L5
	b	Define Reservoirs? Briefly explain the steps involved in Lacey's and Kennedy's method	7	CO10	L2
		OR			
2	a	Determine the dimensions of the irrigation canal for the following data B/D ratio = 3.7, N= 0.0225, m=1.0 and S= 1/ 4000 side slopes of the channel is ½ H : 1V. Also determine the discharge which will be flowing in the channel.	8	CO7	
	b	BrieflyExplain alignment of canals?	7	CO7	

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15CV73	Sem:	VII	Marks:	5	Time:	90 – 120 minutes
Course:	Hydrology and Irrigation Engineering				Module : 5		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	4	CO6	L2
2		Explain various considerations for alignment of a canal?	6	CO7	L2
3		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
4		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
5		What are the factors to be considered in alignment of an irrigation canal?	5	CO7	L2
6		Explain mass curves?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO6	L2
7		Explain Economical height of dam?	5	CO7	L2
8		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
9		What are the factors to be considered in alignment of an irrigation canal?	7	CO7	L2
10		Define Reservoirs. Explain Economical height of dam?	7	CO7	L2
11		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
12		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
13		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
14		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
15		Define Reservoirs? Briefly explain the steps involved in Lacey's and Kennedy's method	7	CO7	L3
16		BrieflyExplain alignment of canals?	6	CO7	L2
17		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
18		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
19		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
20		Define Reservoirs? Briefly explain the steps involved in Lacey's and Kennedy's method	6	CO7	L2
21		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
22		What are the factors to be considered in alignment of an irrigation canal?	5	CO7	L2
23		Explain mass curves?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO7	L2
24		Explain Economical height of dam?	5	CO7	L3
25		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
26		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
27		Explain various considerations for alignment of a canal?	6	CO7	L2
28		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	7	CO7	L6
29		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
30		Give the classification of canals. Explain salient features of	6	CO7	L2

		each of them			
31		What are the factors to be considered in alignment of an irrigation canal?	6	CO7	L2
32		Explain mass curves?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
33		Explain Economical height of dam?	5	CO7	L2
34		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO7	L2
35		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO7	L2
36		What are the factors to be considered in alignment of an irrigation canal?	7	CO7	L2
37		Define Reservoirs. Explain Economical height of dam?	7	CO7	L2
38		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
39		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
40		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
41		Give the classification of canals. Explain salient features of each of them	6	CO7	L3
42		Define Reservoirs? Briefly explain the steps involved in Lacey's and Kennedy's method	7	CO7	L2
43		BrieflyExplain alignment of canals?	7	CO7	L2
44		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
45		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
46		Give the classification of canals. Explain salient features of each of them	7	CO7	L2
47		Define Reservoirs? Briefly explain the steps involved in Lacey's and Kennedy's method	6	CO7	L2
48		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
49		What are the factors to be considered in alignment of an irrigation canal?	5	CO7	L2
50		Explain mass curves?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO7	L2
51		Explain Economical height of dam?	5	CO7	L3
52		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
53		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
54		Explain various considerations for alignment of a canal?	6	CO7	L2
55		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	7	CO7	L6
56		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
57		Give the classification of canals. Explain salient features of each of them	6	CO7	L2
58		What are the factors to be considered in alignment of an irrigation canal?	6	CO7	L2
59		Explain mass curves?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2
60		Explain Economical height of dam?	5	CO7	L2

61		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO7	L2
62		Define Reservoirs?Explain i) Gross command area ii) Culturable command area iii) Consumptive use	5	CO7	L2
63		What are the factors to be considered in alignment of an irrigation canal?	7	CO7	L2
64		Define Reservoirs. Explain Economical height of dam?	7	CO7	L2
65		Design and sketch an irrigation channel to carry 5 cumec. The channel is to be laid on a slope of 0.2m per kilometer. Assume N=0.025 and m=1	8	CO7	L6
66		Explain i) Gross command area ii) Culturable command area iii) Consumptive use	6	CO7	L2

F. EXAM PREPARATION

1. University Model Question Paper

Course:	HYDROLOGY & IRRIGATION ENGINEERING					Month / Year	May /2018
Crs Code:	15CV73	Sem:	VII	Marks:	80	Time:	180 minutes

Module	Note	Answer all FIVE full questions. All questions carry equal marks.	Marks	CO	Level
1	a	Explain the different methods of determining the average rainfall over a catchment due to storm. Discuss with merits and demerits of the method	6	CO1	L2
	b	The normal annual rainfall at rain gauge stations A, B, C and D in a basin are 80.97 ,67.59 , 76.28 and 92.01 cm respectively. In the year 1985 the station D was in operative and the stations A, B and .0 recorded annual precipitation of 91.11, 72.23 , 79.89cm respectively. Estimate the rainfall at station 'D' in that year.	6	CO2	L3
	c	List out the applications of Hydrology in Engineering	4	CO1	L2
		OR			
1	a	Explain different types of precipitation	4	CO2	L2
	b	Analysis of a storm yielded the following information regarding isohyets. Calculate average depth of rainfall.	6	CO2	L3
	c	The average annual rainfall at lave existing rain gauge stations in a watershed are 1000mm, 995mm, 800mm, 825mm and 750mm. If the average depth of rainfall should be estimated within 6% error, determine the optimal number of rain gauges for the water shed	6	CO2	L3
2	a	Discuss the factors that affect the evaporation from a water body	4	CO2	L2
	b	Describe ISI standard evaporation pan, with a neat sketch	6	CO2	L2
	c	The total observed runoff volume during a 6 hour storm with a uniform intensity of 1.5cm/hour is 21.6×10^6 m3. If the area of the basin is 300km2. Find the average infiltration rate of the basin.	6	CO4	L3
		OR			
2	a	Differentiate between i) Evaporation and Evapo-Transpiration ii) W — index iii) AET and PET iv) Infiltrometer and Lysimeter	6	CO2	L2
	b	What are the measures taken to reduce the evaporation?	4	CO2	L2
	c	A twelve hour storm rainfall with the following depths in cm occurred over a basin : 2, 2.5, 7.6, 3.8, 10.6, 5, 7, 10, 6.4, 3.8, 1.4 and 1.4. The surface runoff resulting from the above storm is equivalent to 25.5cm of depth over the basin. Estimate the average infiltration index	6	CO4	L3

Isohyetal interval (mm)	70 – 80	80 - 90	90 - 100	100 - 110	110 - 120	120 - 130
Area (km2)	20	96	125	80	100	89

3	a	Define Hydrograph and Unit Hydro-graph and describe the step by step procedure of the derivation of a unit hydro graph from an isolated storm	10	CO6	L2
	b	Explain step by step derivation of unit hydro graph	6	CO6	L4
		OR			
3	a	Explain a typical single peaked hydro graph components with a neat sketch	10	CO6	L2
	b	What are the assumptions made in unit hydro graph theory	6	CO6	L2
4	a	What is the necessity of Irrigation? Discuss in brief the merits and demerits of Irrigation.	6	CO7	L2
	b	Compare Surface and Subsurface irrigation.	4	CO7	L2
	c	Write a note on Border strip method of irrigation, with neat sketch. demerits of Irrigation	6	CO7	L2
		OR			
4	a	Differentiate between : i) Agriculture and Irrigation ii) Sewage irrigation and supplemental irrigation iii) Explain Well irrigation method.	6	CO7	L2
	b	Explain Environmental impacts of irrigation	4	CO7	L2
	c	Explain advantages and disadvantages of irrigation	6	CO7	L2
5	a	Define Canal. explain various types of canals classified	8	CO9	L2
	b	Explain how would you design the channel using Kennedy's theory for a channel of given discharge (Q),Rugosity (N), CVR (m) and bed width — depth ratio (B/D)	8	CO9	L4
		OR			
5	a	a. What are the consideration for alignment of canals'?	6	CO9	L2
	b	Design the canal for the discharge of 30 cumecs with silt factor 1.0. Side slope — 0.5H : 1V.	10	CO9	L6

2. SEE Important Questions

Course:	HYDROLOGY & IRRIGATION ENGINEERING					Month / Year	May /2018
Crs Code:	15CV73	Sem:	7	Marks:	80	Time:	180 minutes

	Note	Answer all FIVE full questions. All questions carry equal marks.	-	-	
Module	Qno.	Important Question	**Marks**	**CO**	**Year**
1	a	Explain Horton's qualitative representation of hydrologic cycle, with a neat sketch	08	CO1	2017
	b	Explain with a neat sketch, Simon's rain gauge	06	CO2	2017
	c	Explain the different methods of determing the average rainfall over a catchment due to strom. Discuss with merits and demerits of the methods	10	CO2	2018
	d	List out the applications of Hydrology in Engineering.	08	CO1	2017
	e	Explain different types of precipitation	08	CO2	2017
2	a	Discuss the factors that affect the evaporation from a water body.	06	CO3	2018
	b	Describe ISI standard evaporation pan, with a neat sketch	08	CO3	2018
	c	Describe the method of determining infiltration capacity using a double ring Infiltrometer	06	CO4	2017
	d	Differentiate between : i) Evaporation and Evapo-Transpiration ii) W — index and. iii) AET and PET iv) Infiltrometer and Lysimeter	08	CO2	2017
	e	Define Evaporation. With neat sketch, explain measurement of evaporation using IS class A pan	06	CO2	2017
3	a	Define Flood hydrograph and explain the different components of flood hydrograph.	06	CO6	2017

	b	Explain a typical single peaked hydrograph components with a neat sketch	06	CO6	2017
	c	What are the assumptions made in unit hydrograph theory?	06	CO6	2017
	d	Define Hydrograph and Unit Hydrograph and describe the step by step procedure of the derivation of a unit hydrograph from an isolated storm		CO6	
4	a	What is the necessity of Irrigation? Discuss in brief the merits and demerits of irrigation.	06	CO7	2017
	b	Explain the terms 'Duty', 'Delta' and Base period of a crop and derive a relationship between them.	06	CO8	2018
	c	What are the advantages and disadvantages of irrigation ?	08	CO7	2017
	d	Enlist the various factors affecting the choice of method of irrigation ?	04	CO7	2017
	e	List out the advantages of sprinkler irrigation and drip irrigation.	08	CO7	2017
		What are the different methods adopted to improve duty of water?	06	CO8	2017
5	a	Write a note on canal classification.	06	CO9	2017
	b	What are the considerations made during alignment of canals	06	CO9	2017
	c	Define Can 'explain various types of canals classified	10	CO9	2018
	d	Explain would you design the channel using Kennedy's theory for a channel of given discharge (Q), Rugosity(N), CVR (m) and bed width — depth ratio (B/D).	10	CO9	2018
	e	Design the canal for the discharge of 30 cumec with silt factor 1.0. Side slope — 0.5H : 1V	10	CO9	2017

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Module-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Introduction To Hydrology.Importance of hydrology.Global and Indian water availability. Practical application of hydrology. Hydrologic cycle (Horton's) qualitative and engineering representation.	05	1	L2	Understand /	- Lecture - -	- Slip Test - -
1	Definition, Forms and types of precipitation, measurement of rain fall using Symon's and Syphon type of rain gauges, optimum number of rain gauge stations, consistency of rainfall data (double mass curve method), computation of mean rainfall, estimation of missing data, presentation of precipitation data, moving average curve, mass curve, rainfall hyetographs.	05	1	L2	Understand /	- Lecture - Tutorial -	- Assignment - -
2	Introduction, Process, factors affecting evaporation, measurement using IS class-A Pan, estimation using empirical formulae (Meyer's and Rohwer's equations) Reservoir evaporation and control Introduction, Consumptive use, AET, PET, Factors affecting, Measurement, Estimation by Blaney-Criddle equation.	05	2	L3	Apply/	- Lecture -	- Assignment -
2	Introduction, factors affecting infiltration capacity, measurement by double ring	05	2	L3	Apply/	- Lecture	- Slip Test -

	infiltrometer, Horton's infiltration equation, infiltration indices.					-	
3	Definition, concept of catchment, factors affecting runoff, rainfall – runoff relationship using regression analysis.	05	2	L3	Apply/	- Lecture -	- Slip Test -
3	Definition, components of hydrograph, base flow separation, unit hydrograph, assumption, application and limitations, derivation from simple storm hydrographs, S curve and its computations, Conversion of UH of different duration.	05	2	L3	Apply/	- Lecture - Tutorial -	- Assignment - -
4	Definition. Benefits and ill effects of irrigation. System of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation	05	1	L2	Understand /	- Lecture - Tutorial -	- Assignment - -
4	Duty, delta and base period, relationship between them, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation	05	1	L2	Understand /	- Lecture - Tutorial -	- Assignment - -
5	Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals. Standard sections. Design of canals by Lacey's and Kennedy's method	05	3	L5	Create/	- Lecture - -	- Assignment - -
5	Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.	05	1	L2	Understand /	- Lecture - -	- Assignment - -

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Example Course

Module-#	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome **Student Should be able to ...**
A	*I*	*J*	*K*	*L*	*M*	*N*
1	Student should be able to understand the importance of hydrology and its components.	Hydrological cycle	Hydrology & Precipitation	Hydrology & Precipitation	Understand /	Student should be able to understand the importance of hydrology and its components.
1	Student should be able to measure precipitation by various techniques.	Rain guages		Measurement of Rainfall, Rain guages	Understand /	Student should be able to measure precipitation by various techniques.

2	Student should be able to calculate the losses from evaporation.	Evaporimeters	Evaporation, Evapo-transpiration and Infiltratio	Losses of water from surface water bodies	Apply/	Student should be able to calculate the losses from evaporation.
2	Student should be able to calculate the losses from infiltration	infiltrometers		Infiltration	Apply/	Student should be able to calculate the losses from infiltration
3	students will be able to compute the amount of runoff.	Surface runoff	Surface Runoff & Hydrographs	Surface Runoff & Hydrographs	Apply/	students will be able to compute the amount of runoff.
3	students will be able to plot the runoff data through hydrographs	Hydrographs		Hydrographs	Apply/	students will be able to plot the runoff data through hydrographs
4	Student should be able to find the benefits and illeffects of irrigation.	System of Irrigation	Systems of Irrigation & Water Requirement of Crops	Systems of Irrigation & Water Requirement of Crops	Understand /	Student should be able to find the benefits and illeffects of irrigation.
4	Student should be able to measure the quantity of irrigation water and frequency of irrigation for various crops	Duty,delta & base period			Understand /	Student should be able to measure the quantity of irrigation water and frequency of irrigation for various crops
5	Students should be able to design the canals	Hydraulic structures	Artificial Water Supply & Reservoir Characteristics	Canals characteristics	Create/	Students should be able to design the canals
5	Students should be able to understand reservoir planning and compute useful life of a reservoir.	Reservoir Characteristics		Reservoir Characteristics	Understand /	Students should be able to understand reservoir planning and compute useful life of a reservoir.