Kandula Srinivasa Reddy Memorial College of Engineering (Autonomous)

Kadapa-516003. AP

(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)

(An ISO 9001-2008 Certified Institution)

Department of Civil Engineering

Certification Course

on

Computing software for water resources engineering and management

Course Instructor:

Prof. T. Kiran Kumar,

Professor, Civil Engg. Dept., KSRMCE

Course Coordinators:

Sri V. Maddileti Rangadu and Sri S. Sandhya Rani,

Assistant Professor, Civil Engg. Dept., KSRMCE

Date: 05/12/20 to 21/12/20

Lr./KSRMCE/CE/2020-21/ Date: 01-12-2020

From
Sri V. Maddileti Rangadu and Miss. S. Sandhya Rani,
Asst. Professor,
Course Coordinator,
Dept. of Civil Engineering,
KSRMCE,
Kadapa.

To
The Principal,
KSRMCE,
Kadapa.

Sub: Permission to Conduct Certificate Course – Reg.

Respected Sir,

The Department of Civil Engineering is planning to offer a certification course on "Computing software for water resources engineering and management" for B. Tech. students of Civil Engineering. The course will start on 5th Dec. 2020 and the course will run for a total number of 30 hours. In this regard, I am requesting you to accept the proposal to conduct certificate course.

Thanking you

Yours faithfully

V. Madd [signature] [signature]

(Sri V. Maddileti Rangadu and Miss. S. Sandhya Rani)

Permitted
V. S. S. Murthy

Cr./KSRMCE/CE/2020-21/

Date: 01/12/2020

Circular

The Department of Civil Engineering is offering a certification course on Computing software for water resources engineering and management. The course will start on 05-12-2020 and the course will run for a total number of 30 hours. In this regard, interested students of Civil Engineering are required to register for the Certification Course. The registration link is given below.

https://docs.google.com/forms/f/g/MIsskSdsfAJkJAleShHAAdsQkwQiSjI36serlsrYiSAdn6GsR2GfNdT79w/viewform

For any information regarding the workshop contact,

The Course Coordinators
Sri V. Maddileti Rangadu and Miss. S. Sandhya Rani,
Assistant Professor,
Dept. of Civil Engg.-KSRMCE.

V. S. S. Murthy

Principal

PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)

Cc to:

The Director, KSRMCE

The HoD-Civil, KSRMCE

IQAC-KSRMCE

K.S.R.M. COLLEGE OF ENGINEERING

(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India– 516 003

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An ISO 14001:2004 & 9001: 2015 Certified Institution

Department of Civil Engineering

Registration list of Certification course
on
Computing software for water resources engineering and management

Sl. No.	Student Roll No.	Student Name	Sec.	Mail ID
1	179Y1A0106	Nikhil Kumar Reddy Bhavanasi	A	179Y1A0106@ksrmce.ac.in
2	179Y1A0113	Venkatesh Naik Bukke	A	179Y1A0113@ksrmce.ac.in
3	179Y1A0115	Pallavi Chatta	A	179Y1A0115@ksrmce.ac.in
4	179Y1A0119	Zaheer Dade	A	179Y1A0119@ksrmce.ac.in
5	179Y1A0122	Jayachandra Derangula	A	179Y1A0122@ksrmce.ac.in
6	179Y1A0123	Siddaiah Dollu	A	179Y1A0123@ksrmce.ac.in
7	179Y1A0124	Suresh Gowd Ediga	A	179Y1A0124@ksrmce.ac.in
8	179Y1A0126	Ashok Kumar Galeti	A	179Y1A0126@ksrmce.ac.in
9	179Y1A0129	Pullaiah Gokula	A	179Y1A0129@ksrmce.ac.in
10	179Y1A0130	Ramamanohar Reddy Gollapalle	A	179Y1A0130@ksrmce.ac.in
11	179Y1A0133	Dharani Jonnavaram	A	179Y1A0133@ksrmce.ac.in
12	179Y1A0134	Manasa Juturu	A	179Y1A0134@ksrmce.ac.in
13	179Y1A0136	Himaja Kancharla	A	179Y1A0136@ksrmce.ac.in
14	179Y1A0139	Vivekananda Reddy Kota	A	179Y1A0139@ksrmce.ac.in
15	179Y1A0155	Manjunatha Muttalahgari	A	179Y1A0155@ksrmce.ac.in
16	179Y1A0157	Prathima Nagooru	A	179Y1A0157@ksrmce.ac.in
17	179Y1A0158	Vijaya Kumari Nalla	A	179Y1A0158@ksrmce.ac.in
18	179Y1A0166	Venkata Sunil Kumar Reddy P	B	179Y1A0166@ksrmce.ac.in
19	179Y1A0174	Bhanu Prakash Peddaalankolla	B	179Y1A0174@ksrmce.ac.in

20	179Y1A0182	Susma Saraballa	B	179Y1A0182@ksrmce.ac.in
21	179Y1A0184	Abdul Rehaman Shaik	B	179Y1A0184@ksrmce.ac.in
22	179Y1A0197	Surya Thammisetty	B	179Y1A0197@ksrmce.ac.in
23	179Y1A0198	Rajesh Thotakanama	B	179Y1A0198@ksrmce.ac.in
24	179Y1A01A1	Maheswari Undela	B	179Y1A01A1@ksrmce.ac.in
25	179Y1A01A2	Siva Kumar Upparapalli	B	179Y1A01A2@ksrmce.ac.in
26	179Y1A01A5	Keerthana Vodiveeti	B	179Y1A01A5@ksrmce.ac.in
27	179Y1A01A6	Rekha Devi Yarasani	B	179Y1A01A6@ksrmce.ac.in
28	179Y1A01A7	Lokesh Yarragolla	B	179Y1A01A7@ksrmce.ac.in
29	179Y1A01A8	Venkata Lakshmi Yarraguntla	B	179Y1A01A8@ksrmce.ac.in
30	189Y5A0102	Siva Gangadhar Alavalapadu	B	189Y5A0102@ksrmce.ac.in
31	189Y5A0104	Dharani Kamalakara Rao Appalarajugari	B	189Y5A0104@ksrmce.ac.in
32	189Y5A0106	Niranjan Attinjery	B	189Y5A0106@ksrmce.ac.in
33	189Y5A0107	Suresh Banka	B	189Y5A0107@ksrmce.ac.in
34	189Y5A0109	Srinatha Reddy Bhumireddy	B	189Y5A0109@ksrmce.ac.in
35	189Y5A0110	Purushothamreddy Bijivemula	B	189Y5A0110@ksrmce.ac.in
36	189Y5A0113	Kiran Kumar Bolleddu	B	189Y5A0113@ksrmce.ac.in
37	189Y5A0120	Swetha Damsetty	C	189Y5A0120@ksrmce.ac.in
38	189Y5A0126	Shireesha Guramkonda	C	189Y5A0126@ksrmce.ac.in
39	189Y5A0127	Nikitha Jaladi	C	189Y5A0127@ksrmce.ac.in
40	189Y5A0128	Venkata Subbaiah Janapati	C	189Y5A0128@ksrmce.ac.in
41	189Y5A0132	Yaswanth Reddy Kambham	C	189Y5A0132@ksrmce.ac.in
42	189Y5A0134	Sree Hari Reddy Katthi	C	189Y5A0134@ksrmce.ac.in
43	189Y5A0135	Nagesh Kolliboina	C	189Y5A0135@ksrmce.ac.in
44	189Y5A0139	Ganga Maheswara Reddy Kudumula	C	189Y5A0139@ksrmce.ac.in
45	189Y5A0140	Suresh Kuruva	C	189Y5A0140@ksrmce.ac.in
46	189Y5A0146	Venkata Ramana Reddy Nimmakayala	C	189Y5A0146@ksrmce.ac.in
47	189Y5A0159	Abilash Reddy Sajjala	C	189Y5A0159@ksrmce.ac.in
48	189Y5A0162	Naveen Kumar Sepuri	C	189Y5A0162@ksrmce.ac.in

49	189Y5A0169	Sham Babu Thallapaka	C	189Y5A0169@ksrmce.ac.in
50	189Y5A0170	Chandra Kanth Thatamsetty	C	189Y5A0170@ksrmce.ac.in
51	189Y5A0171	Divya Thonduru	C	189Y5A0171@ksrmce.ac.in
52	189Y5A0172	Parameswara Reddy Thummala	C	189Y5A0172@ksrmce.ac.in

V. Madhu

Coordinator

HoD-Civil Engg.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
KADAPA 516 003. (A.P.)

Syllabus of Certification Course

Course Name: Computing softwares for Water Resources Engineering and Management

Duration: 30 Hours

Module 1: Role of water Resources Department in the best utilization of water Resources of A.P

Module 2: Creating Irrigation potential through lift Irrigation Scheme

Module 3: Rational Design of Hydraulic structures in Water sheds

Module 4: An overview Application on water Resource Software

Module 5: EPANET software

TextBooks :

1. Basak P. 1997, "*Surangams* – A traditional water harvesting system in North Malabar". In: Dying Wisdom, Anil Agarwal and Sunita Narain (Eds.). Centre for science and Environment, Thomson Press Limited, Faridabad (India, pp.222-223.
2. Das, D.C 1988, "*Water harvesting for water conservation in catchment and* command area", Proc. Nat. Semi. Water conserve. In drought, II/WCM/1-32.

References :

1. Harris, D.G. 1923, *"Irrigation in India"*, Oxford Univ. Press, London, U.K.
2. Jha, Pt. Achyntan (Ed.) 1988. "Vrhat Sanhita (550 A.D.) by Varahmihira", Chow Khamba Vidyabhawan, Varanasi -221 001.
3. Madhawan Nair, E.P. 1978, Bhagirath, 25.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
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V. S. S. Murthy

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Department of Civil Engineering

Certification course on "Computing softwares for Water Resources Engineering and Management"

Date	Timing	Course Instructor	Topic to be covered
05-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Role of water Resources Department in the best utilization of water Resources of A.P
07-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Role of water Resources Department in the best utilization of water Resources of A.P
08-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Role of water Resources Department in the best utilization of water Resources of A.P
09-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Creating Irrigation potential through lift Irrigation Scheme
10-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Creating Irrigation potential through lift Irrigation Scheme
11-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Rational Design of Hydraulic structures in Water sheds
12-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	Rational Design of Hydraulic structures in Water sheds
14-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	An overview Application on water Resource Software
15-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	An overview Application on water Resource Software
16-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	An overview Application on water Resource Software
17-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	An overview Application on water Resource Software
18-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	EPANET software
19-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	EPANET software
20-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	EPANET software
21-12-20	4 PM to 6 PM	Prof. T. Kiran Kumar	EPANET software

V. S. S. Murthy

Principal

PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)

Instructor: T.K

Coordinators:

V. Madhu

K.S.R.M. COLLEGE OF ENGINEERING.

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ACTIVITY REPORT

A Certificate course

On

"Computing softwares for Water Resource Engineering and Management"

From 05/12/20 to 21/12/20

Target Group	:	**Students**
Details of Participants	:	**52 Students**
Co-coordinator(s)	:	**Sri V. Maddileti Rangadu and Miss. S. Sandhya Rani**
Organizing Department	:	**Civil Engineering**
Venue	:	**Online (google meet)**
		Link:-https://meet.google.com/lookup/jadf84ww

Description:

The Department of Civil Engineering organized a Certificate course We are very thankful to the management and principal for giving us the opportunity to organize the course. Dr. T Kiran Kumar along with Sri V. Maddileti Rangadu and Miss. S. Sandhya Rani, Co Ordinated the program. 52 students have registered and attended the Certification course. The course was inaugurated by Our Principal Sri. VSS Murthy Graced the dais with his valuable words, followed by our Head of the Department, Dr. G. Sreenivasa Reddy who has explained the importance of course and constant learning. Course Instructor Dr, T Kiran Kumar has said that the future of students depends on the learning. Speaking about th.e competitive world ahead, cautioned the students to learn new technologies and to keep up with the latest updates in the technical world.

Photo:

(Course Instructor) (HoD, Civil Engg.) V.S.S. Murthy Principal

Head
Department of Civil Engineering
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DEPARTMENT OF CIVIL ENGINEERING

Certificate Course

on

"Computing software for water resources engineering and management"

Resource Person

Prof. T. Kiran kumar

Department of Civil Engineering

05-12-2020

21-12-2020

Coordinators: Sri V. Maddileti Rangadu, Miss. S. Sandhya Rani

Assistant. Professor

Department of Civil Engineering

Attendance sheet of Certification course on Computing softwares for Water Resources Engineering and Management

Sl. No.	Student Roll No.	Student Name	05/12	07/12	08/12	09/12	10/12	11/12	12/12	14/12	15/12	16/12	17/12	18/12	19/12	20/12	21/12
1	179Y1A0106	Nikhil Kumar Reddy Bhavanasi	✓	✓	✓	✓	A	✓	✓	✓	✓	A	✓	✓	A	✓	✓
2	179Y1A0113	Venkatesh Naik Bukke	A	✓	✓	✓	✓	✓	A	✓	✓	A	✓	✓	✓	✓	✓
3	179Y1A0115	Pallavi Chatta	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
4	179Y1A0119	Zaheer Dade	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓	✓
5	179Y1A0122	Jayachandra Derangula	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓
6	179Y1A0123	Siddaiah Dollu	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓
7	179Y1A0124	Suresh Gowd Ediga	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	179Y1A0126	Ashok Kumar Galeti	✓	✓	A	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓	✓
9	179Y1A0129	Pullaiah Gokula	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	A	✓
10	179Y1A0130	Ramamanohar Reddy Gollapalle	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
11	179Y1A0133	Dharani Jonnavaram	A	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	A	✓
12	179Y1A0134	Manasa Juturu	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	A
13	179Y1A0136	Himaja Kancharla	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓
14	179Y1A0139	Vivekananda Reddy Kota	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓

15	179Y1A0155	Manjunatha Muttalahgari	✓	✓	A	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
16	179Y1A0157	Prathima Nagooru	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	A	✓	✓
17	179Y1A0158	Vijaya Kumari Nalla	✓	A	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
18	179Y1A0166	Venkata Sunil Kumar Reddy P	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	A	✓
19	179Y1A0174	Bhanu Prakash Peddaalankolla	✓	✓	✓	✓	A	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
20	179Y1A0182	Susma Saraballa	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓
21	179Y1A0184	Abdul Rehaman Shaik	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓
22	179Y1A0197	Surya Thammisetty	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓
23	179Y1A0198	Rajesh Thotakanama	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓
24	179Y1A01A1	Maheswari Undela	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓
25	179Y1A01A2	Siva Kumar Upparapalli	✓	✓	✓	A	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓
26	179Y1A01A5	Keerthana Vodiveeti	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
27	179Y1A01A6	Rekha Devi Yarasani	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓
28	179Y1A01A7	Lokesh Yarragolla	A	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	A	✓	✓
29	179Y1A01A8	Venkata Lakshmi Yarraguntla	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓
30	189Y5A0102	Siva Gangadhar Alavalapadu	✓	✓	A	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

31	189Y5A0104	Dharani Kamalakara Rao Appalarajugari	✓	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓	✓	✓	✓
32	189Y5A0106	Niranjan Attinjery	✓	A	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓
33	189Y5A0107	Suresh Banka	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓
34	189Y5A0109	Srinatha Reddy Bhumireddy	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	A	✓	✓	✓	✓
35	189Y5A0110	Purushothamreddy Bijivemula	✓	A	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓
36	189Y5A0113	Kiran Kumar Bolleddu	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
37	189Y5A0120	Swetha Damsetty	✓	✓	A	✓	✓	✓	✓	✓	A	✓	✓	✓	A	✓	✓
38	189Y5A0126	Shireesha Guramkonda	✓	✓	✓	A	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	A
39	189Y5A0127	Nikitha Jaladi	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	A	✓	✓
40	189Y5A0128	Venkata Subbaiah Janapati	✓	✓	✓	A	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓
41	189Y5A0132	Yaswanth Reddy Kambham	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓	✓	A	✓
42	189Y5A0134	Sree Hari Reddy Katthi	✓	✓	✓	✓	A	✓	✓	A	✓	✓	✓	✓	✓	✓	A
43	189Y5A0135	Nagesh Kolliboina	✓	A	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	A	✓
44	189Y5A0139	Ganga Maheswara Reddy Kudumula	✓	✓	✓	A	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
45	189Y5A0140	Suresh Kuruva	✓	A	✓	✓	A	✓	✓	A	✓	✓	✓	A	✓	✓	✓
46	189Y5A0146	Venkata Ramana Reddy Nimmakayala	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

47	189Y5A0159	Abilash Reddy Sajjala	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	A	✓	✓	A	✓
48	189Y5A0162	Naveen Kumar Sepuri	✓	A	✓	A	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓
49	189Y5A0169	Sham Babu Thallapaka	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	A
50	189Y5A0170	Chandra Kanth Thatamsetty	✓	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓	✓
51	189Y5A0171	Divya Thonduru	✓	✓	✓	A	✓	✓	✓	✓	✓	A	✓	✓	✓	✓	✓
52	189Y5A0172	Parameswara Reddy Thummala	A	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	✓

SR V. Madhu

Coordinators

HoD-Civil Engg.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
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Course material for

Computing softwares for Water Resources Engineering and Management

ROLE OF WATER RESOURCES DEPARTMENT, (A.P)IN THE BEST UTILIZATIONOFWATER RESOURCESOF ANDHRA PRADESH

Almost all the available water in all the water bodies of the state like major rivers,minor rivers, lakes, streams, tanks, wells and bore wells……. used forirrigation, drinking,industrialandmanyotherusagesofwaterissolelymaintainedbythewaterresourcesdepart mentof AndhraPradesh.

As such, the Water Resources Department is treated as one of the most crucial andvital department in the state working for the welfare of the people at gross root level havingreinforced by the skilled and eminent engineering staff at all levels with a vision to selfsustainability in both conservation and effective utilization of water resources there by gettinghighagriculturalyield thatfinallypromotingthe GDP ofthestateaswell asthe country.

As the residual Andhra Pradesh state is having 40 major and minor rivers flowingwithin its periphery, of which Godavari, Krishna and Penna Rivers contributing the majorshare of surface waters and also having 40,000 minor irrigation sources spread over the entire13 districts. The geographical area of the state is about 403 lakh acresof which 199 lakhacres is cultivable area theand irrigation potential is created for 103 lakh acres through theexisting major, medium and minor irrigation sources. This clearly shows that the irrigationpotential created is just 50%of the cultivable land and the balance is yet to be a task for theWaterResourcesDepartmentinwhichthedepartmentisexperiencingtheHerculeantask.

As the state is laying on three major irrigation basins namely Godavari Krishna andPennarandthestateisexposingforaversatileatmosphericconditionseveryyear.Thespanof the rainy season is getting compressed year after year and the rainfall is short, erratic anddrastic and at the same time the water demand is raising day by day and hence the WaterResources Department Andhra Pradesh is working on the dependable water sources to meetthehigh degreeof demand.

1) The Godavari basin is self sufficient and having surplus waters to meet all the current andanticipatedneeds of AndhraPradesh.
2) The Krishna basin is also self sufficient but no surplus wateras all the Krishna basin statesareconcentrating onthedependablewater sourcesinKrishnariver, there by buildinghugepressureon the utilization ofavailablewaterin Krishna basin.
3) The most problematic and high degree of concentration is supposed to be drawnby theWRDAPisonthePennarbasin,whereintheavailablewaterisminimalwhencomparingwithit shugedemand.Scantyrainfalloverdecadesandconstructionofnumber of medium and minor projects on its catchment leads the project into emptyvessels and people of this area are starving for water both for drinking, irrigation and fortheir cattle needs. Drought is a common phenomenon in this particular area which leadsmigrationandfractionisum in the area.

Next**primerole**ofWaterResourcesDepartmentistheeffectivemanagementoftheavailablewater, for which let us takeacasestudyof ourKadapadistrict it self.

- KadapadistrictislyinginPennar basinandisoneamongthe rainshadow districts.
- The annual average rainfall is700mm varyingfrom 950 mm on the eastern sideto600mm on the western side.
- The net geographical area is 15.35 lakh Hectares of which nearly 5.00 lakhs Hectaresis forest land, 5.85 lakh Hectares is cultivable area of which nearly 2.54 lakh Hectaresis having I.P created through the major, medium and minor irrigation sources. Thisshows a clear gap of more than 50% of cultivable land for which irrigation potential istobe created.

- The important rivers in the district are Pennar, Kunderu, Sagileru Cheyyeru, Papagni,Chitravathiand Gunjaneru.
- Thereare7 minorbasins, 101subbasins and131 cascadesin Kadapadistrict.
- The water demand in Kadapa district

  is.a). Domestic water demand – 5.28

  TMC.b). Irrigation water demand - 68.02

  TMC.c). Live stock water demand – 0.87

  TMC.d).Industrialwaterdemand-

  3.93TMC

  78.10TMC

- Theavailable

  reservoircapacitiesinKadapadistrict.a).MajorIrrigatio

  nprojects – 74.56 TMC

  b).Medium IrrigationProjects– 8.35

  TMCc).Minor Irrigationandtanks- 7.00 TMC.

  89.91TMC.

CREATING IRRIGATION POTENTIAL THROUGH LIFT IRRIGATION SCHEMEABRIEFSTUDY

INTRODUCTION

Irrigationfacilitytotheuplandscan be created byutlisingthreekinds ofwaterresources:
1. GroundWaterthroughdugwells, borewells,tubewells
2. SubsurfaceWaterbyconstructinginfiltrationwellsand
3. SurfaceWaterbyconstructingliftirrigationschemes

In all these methods, water will be pumped from lower level to an elevated level andfrom there water will be distributed to the desired ayacut through pumping mains and gravitymains.

Ground water is valuable naturalresourceand over exploitation of ground water isone of the major environmental concerns. Till now, the ground water is being exploitedwithout any monitoring system in our state. Due to overexplitation of the ground water, thewatertableis beinglowerd considerablyeveryyear.

For some places ground water is the only source for drinking water supply. But it isnotadvisable to useground waterfor irrigation purpose.

Using surface water for upland irrigation by constructing lift irrigation schemes is agoodoption, if theconstruction oflift irrigationscheme is viable.

SmallLiftIrrigationschemesaremoreadvantageousthanMajorprojectswhichinvolve high cost of construction, long period for construction, high operational expenditures,maintenanceproblems and land acquisition problems.

NECESSITYOFA LIFTIRRIGATION SCHEME

The objective of construction of a lift irrigation scheme is to provide irrigation facilityto the uplands which are located near by a stream, River, Irrigation Canals, Reservoirs etc.,Such Lift irrigation will be source ofsocio economic development of the farming communityand therebyimproving their living condition. Lift irrigation schemes can also be used forsupplementationofwatertolocalIrrigationTankswhichreceiveslesswaterfromthecatchement area and meager rain fall.Indirect benefit of alift irrigation is improvement ofgroundwaterthroughpercolationofsurpluswaterfromtheirrigatedfieldsandalsofromlocaltanks

IMPORTANTASPECTSOFALIFTIRRIGATIONSCHEME

Themajorcriteriaforselection ofaliftirrigationscheme are:

1. Availabilityof watersource
2. Availabilityofpowersupply
3. Costbenefitratio

Thevariouscomponents ofaliftirrigationschemeare:

1. Intakewelltodrawwater fromthesource.
2. IntakePipeline tosupplyfromtheIntakeWell toaSumpwell
3. Sump Well or Jack well depending on type of pumps to be used such as Open WellsubmesiblePumps, HorizontalCentrifugal Pumps, VerticalTurbinePumps
4. PumpHousetoaccommodatePumpsets,Panels,Valvesetc.,
5. PumpingMaintodeliverthewaterinaDistributionChamber.Differentkindsofpipes used for pumping main are: Prestressed Cement Pipes, Reinoforced CementPipes,Mild Steel Pipes,HDPV pipes, DIpipes, PVC Pipes etc.,
6. Distribution Chamber at the end of pumping main from where the water will bedistributedto theayacut
7. Distributionpipe lines/GravityMains
8. MincroIrrigationsystem,ifopted
9. ElectricalSubstation&ExtensionofPower Lines

DESIGNCRETERIA

Theimportantparametersinvolvedindesigningofdifferentcomponentsofalifrirrigationscheme are:

1. Discharge:Thedischargetobeconsideredfordesigningaliftirrigationschemedepends on the water availability at the source and the total water requirement. Waterrequirement for a lift irrigation schemedepends on the extent ayacut, duty ofwater.The duty of water depends on the type of crops and cropping pattern, crop-waterrequirementetc.

2. Total pumping head. The total pumping head is the difference between the low waterlevel and the delivery level plus the head loss due to friction in the pumping mainbendsand valvesetc.,.

ECONOMICSOFALIFT IRRIGATIONSCHEME

Estimation and costing of a Lift Irrigation scheme will be prepared with the StandardScheduled Rates published by State Government. The elements like takes, tender publicationcharges,evaluationandmonitoringchargesetc.,willbeaddedtothetotalconstructioncostofthe scheme.

Viability of a lift irrigation will be decided by cost per hectare and benefit cost ratio.The various sources of funding for construction of a lift irrigation scheme are:State PlanBudget,NABARD RIDFund,DistrictDevelopment funds etc.,

RATIONALDESIGNOFHYDRAULICSTRUCTURESINWATERSHEDS

Hydraulic structures are constructed in a watershed to conserve the water and to prevent thesoil erosion.Such structures also facilitate ground water recharge in the watershed.Quite often thesites for these structures are identified based on considerations other than hydrological and drainagefactors.The designs of these structures are based on thumb rules and generalities.One of the reasonsfor this is lack of proper guidelines and standards or non-adherence to the same if they are availabledue to various reasons.In such situations the structures will not be effective to conserve the water andsoil resources in a watershed.In this paper various rational design procedures for hydraulic structuresinawatershedareproposedandstandardizedforpossibleadoptioninthefield.Thefactorsinfluencingselection ofa type ofdesign arealso discussed.

INTRODUCTION .

Watershedmanagementis notmerely anti-erosional andanti-runoffapproach butalso acomprehensive integrated approach (or) land and water resources management.The basic objectivesof watershed management programme are (i) conserving the soil and water (ii) Improving ability ofland to hold the water (ii) Rainwater harvesting and Recharging.To active the above objectivesengineering structures have to be constructed in watersheds.In actual practice selection of hydraulicstructures are not site specific and also not depend on geography and hydrological data.Most of thehydraulicstructuresdesignandconstructioninwatershedsarenotrational.Thelocalpeoplerepresentatives decision and land lards judgments are soel criteria for selection of hydraulic structuresandlocationofhydraulicstructures.Thehydraulicstructuresforrunoffmanagementrequiresengineering skill to design and construction.The construction of these structures requires additionallands more expensive.So hydraulic structures require very careful planning, meticulous designconstruction and maintenance.The failure of these structures can leads to damage to soil and waterconservation practices.In this context an attempt has been made to discuss the rational designproceduresforvarioushydraulicstructuresandstandardguidelinesfortheirlocationandselection.

HYDRAULICSTRUCTURES

Various hydraulic structures are constructed in watersheds to control the erosion, improve thesoilmoistureholdingcapacityandenhancetheartificialrechargeofgroundwater.Twotypestreatment worksareadoptedinwatershednamelyareatreatment,drainagetreatment.Forimplementingthesetreatmentsvarioushydraulicstructuresareconstructedinwatersheds.Thepurposeandeffectsof areatreatmentis given table 1.

Table1: PurposeandEffectsofAreaTreatment

TREATMENT.MEASURE	PURPOSE	EFFECT
Developvegetativecoveonthe non-arableland	Reduce impact of raindropsonsoil	Minimum disturbance and displacementofsoilparticles
Applywaterinfiltrationmeasures on thearea	Infiltration of water whereitfalls	In-situsoilandmoistureconservation

Storethesurplusrainwaterbyconstructingbunds,pondsinthe Area	Minimum surface runoff	Increased soil/moisture in area;groundwater recharging
Treat the upper catchment first andthen proceed towards the outlet ofwatershed	Ridge to valleysequencing	Economicdesigns,lessriskofdamage and longer lives of structuresoflowercatchmentsifupperhasbeen treatedbefore

AN OVERVIEW APPLICATION ONWATERRESOURCESOFTWARES

(i) Introduction

Freshwater is a resource crucial to man's existence, affecting all human life. Humanneed for freshwater resources includes basic consumption such as drinking and sanitation forgood health and combating disease; assisting in the production of food and goods humansconsume;providingafoundationforculturalservicessuchascommunityconnectivity,s pirituality, and recreation; and supporting the ecosystems upon which humans rely. Despitetheimportanceofwater,freshwaterresourcesareonthedecline.TheUNMillenniumAss essment reports about 5-25 % of global freshwater use exceeds long-term accessiblesupply and that freshwater availability is declining due to severe, anthropogenic pollution. Anestimated 50 percent of inland waterways have been degraded in the 20th century, and thedecline of inland waterways has led to a decrease in the ecosystem goods and services (EGS)for supporting human wellbeing. This decline in the availability and access to freshwaterresourceswill"leadtoproblemswithfoodproduction,humanhealth,andeconomicde velopment".

(ii)

(iii) Wise management of water resources must take into account hydrologic conditions aswell as how the flow and storage of water affects the ecological, social, and economicsystems.Due tothe complexity of the hydrologic cycle itsinteractionwith socioeconomicand ecological systems in a basin, using numerical model technologies to assist managers inunderstanding risks and developing water management alternatives greatly adds to the abilityto develop and implement water management decisions. Water resources software (WRS)such as hydrologic, hydraulic, hydro-geologic, and water quality simulation and optimizationmodel provide a means to quantitatively test and evaluate the concepts and managementstrategiesaddressingwaterresourceissues.Specifically,WRSsupportwaterresou rcemanagementin thefollowingmanner:

(iv) Il!stratingthefundamentalfunctionandoperationofsystems;Identifyi ng nddisplayingdataavailabilityanddeficiencies;

(v) Identifyingandquantifyingthefunctionalandoperationallimitationsinsystems(whatis the problem);

(vi) Determiningtheoptimaldesignforsystems;

(vii) Providingwatermanagersameansoftestingdesign,policy,andmanagementstrategies

(viii) priortoimplementation;and

(ix) C nmunicatingresultsforbetterunderstandingofwatermanagers,interestedstakeholders,andthe general public.

(x) Thus,theuseofWRStounderstandthesystems,organizedata,predictfutureconditions,andcom municateinformationisapowerfultoolwhenmanagingwaterresources.

(xi) Important elements of effective water resource management include the ability toaddress specific water resource issues, provide a relevant representation of the systems beingevaluated, output simulation results related to key indicators in management decisions, and becapableofevaluatingarangeofdecisions(fromsimpletocomplex).

WhatisEPANET

EPANETisacomputerprogramthatperformsextendedperiodsimulationofhydraulic and water quality behavior within pressurized pipe networks. A networkconsistsofpipes,nodes(pipejunctions),pumps,valvesandstoragetanksorreservoirs.EPANET tracks the flow of water in each pipe, the pressure at each node,theheightofwaterineachtank,andtheconcentrationofachemicalspeciesthroughout the network during a simulation period comprised of multiple time steps.Inadditiontochemicalspecies,waterageandsourcetracingcanalsobesimulated.

EPANET is designed to be a research tool for improving our understanding of themovement and fate of drinking water constituents within distribution systems. It canbe used for many different kinds of applications in distribution systems analysis.Samplingprogramdesign,hydraulicmodelcalibration,chlorineresidualanalysis,and consumer exposure assessment are some examples. EPANET can help assessalternative management strategies for improving water quality throughout a system.These can include:

- alteringsourceutilizationwithinmultiplesourcesystems,
- alteringpumpingandtankfilling/emptyingschedules,
- useofsatellitetreatment,suchasre-chlorinationatstoragetanks,
- targetedpipecleaningandreplacement.

Running under Windows, EPANET provides an integrated environment for editingnetwork input data, running hydraulic and water quality simulations, and viewing theresults in a variety of formats. These include color-coded network maps, data tables,time series graphs, and contour plots.

OUTPUTFILESANDGRAPHICALPLOTS

The design of output modules is based on the following principles:a) The resultspresentedshouldbesoastofacilitatethedesignprocessforsurgeprotectionsystem.
b) Results which are of an uncertain nature and do not directly help in the designprocessneednotbedocumented.Withregardtothedesignofsurgeprotectionsystem,thefirstprincipleabovestressestheimportanceofgraphicalplots.Theresultsareavailableintwotextfiles.Besides,severalfilesareprepared withaspecificviewtoobtainresults ina graphicalform.

The basic output file is SAP2.RES and for opening the file, “view result” icon onthetoolbarmaybeclicked.Alternately,thefilemaybeopenedthroughanytexteditor.Inthisf ile,thesystemdataisprovided,alongwithsummaryofresultsrelatingtothepumpsandminimumandmaximumpizeometricheadsatthelocationsspecifiedbytheuser.Insteadoftheexactchainage,resultsareavailableatthenearest nodal chainage as per the discretisation of the pipe Thereferencequantitiesfornon-dimensionalisationaregiveninthetable.Thedimensionaltimeisobtainedbymultiplyingthenon-dimensionaltimesbythereferencetime.Thedimensionalvelocityisobtainedbymultiplyingthenon-dimensional velocity by the reference velocity. The dimensional piezometric head isobtainedbymultiplyingthenon-dimensionalheadbythereferenceheadandaddingthevalueof datum.

In addition to the presentation of the results in the two files, SAP2.RES andTABLE.RES, more importantly, results can be obtained in graphical form which arevery helpful in the design process.For viewing the results in graphical form, "viewgraph"icononthetoolbarmaybeclicked.Oncethiscommandbuttonisclickedforthefirstexecution,accesstographicalplotsisavailableaslongasEXCELapplication is not closed. Once the EXCEL application is opened, the graphical plotscanbeobtainedbyusingdifferentshort-cutkeys,asfollows:

(1) ctrl+g: PlotofminimumandmaximumpiezometricheadsalongwithlongitudinalalignmentofthepipelineforPath1.

(2) ctrl+h: PlotofminimumandmaximumpiezometricheadsalongwithlongitudinalalignmentofthepipelineforPath2.

(3) ctrl+i: PlotofminimumandmaximumpiezometricheadsalongwithlongitudinalalignmentofthepipelineforPath3.

(4) ctrl+j: PlotofminimumandmaximumpiezometricheadsalongwithlongitudinalalignmentofthepipelineforPath4.

(5) ctrl+k: PlotofminimumandmaximumpiezometricheadsalongwithlongitudinalalignmentofthepipelineforPath5.

(6) ctrl+l: PlotofminimumandmaximumpiezometricheadsalongwithlongitudinalalignmentofthepipelineforPath6.

(7) ctrl+r: Plotofpressurewithtimeatthethreeidentifiedlocations

(8) ctrl+s: Plotofpumpspeedwithtimeforthespecifiedpump

(9) ctrl+v: Plotofvelocitythroughairvesselconnectingpipewithtime(forType2airvessel,reverseflowvelocitycorrespondstovelocitythroughthebypasspipe)

(10) ctrl+a: Plotofvelocitythroughconnectingpipetofirstonewaysurgetank,withtime

(11) ctrl+b: Plotofvelocitythroughconnectingpipetosecondonewaytank, with time

(12) ctrl+c: Plotofvelocitythroughconnectingpipetothirdonewaytank, with time

(13) ctrl+d: Plotofvelocitythroughconnectingpipetofourthonewaytank, with time

Thescales and titles of theplots areautomatically set in thesoftware itself, butthe user can modify these as per his requirements based on options available underEXCELchartoption.Inparticular,hemayeditthetitletodescribethecasecompletelybeforesavingorprinting thegraph.Similarly, for pressuredrop rateplots, he may enlargeasmallpartto highlightthe rate ofpressure reduction in thefirst cycleofdownsurge.

ExamplesofdifferenttypesofplotsarepresentedintheAppendix.

3. GUIDELINESONMODELING

In using the software SAP2 with Type B project option, use of simple ideas basedon hydraulic principles may be beneficial. Several such situations are briefly outlinedhere.

1. Inasystemwithidenticalparallelpipelines,thetwoparallellinesmaybemodeled as asinglepipe, without loss ofaccuracy. An example is the systemshown in Fig. 4a. The two condenser inlet pipes may be modeled as a singleequivalent pipe of diameter □2 times the diameter of the twin pipes
2. If the focus of application is on the surge in the transmission main, identical pumps in parallel operation in a pump house may be lumped together as a single pump node. In the data for pump nodes, the number of pumps would be the number of working pumps.
3. Ifinacondensercoolingwatersystem,itisdesiredtostudytheeffectofaccidentalclosureof butterflyvalveononeoftheoutletlines,thetwinoutletpipes may be modeled as two separate pipes
4. The situation of shutdown of flow in a gravity main with closure of valve at thedelivery endmay bemodeled either through consideration ofclosureof valveatthe delivery reservoir (in data entry form titled wave velocity and trip code

LIMITATIONSOFANALYSIS

Like in any theoretical analysis, the results of the analysis should be interpretedwithanunderstandingofthelimitationsoftheanalysis.Theprincipallimitationsoft he analysis are related to the occurrence of sub-atmospheric pressure and vapourpressure in the system.There will be several practical cases for which surge analysiswithoutprotectionmayindicateextensiveoccurrenceofvapourpressure(approximately - 9 m)overthelength ofthe transmission main.In suchsituations,there is no well established method of analysis and different software may handle thesituation differently.

17. CONCLUSION

This manual provides guidance for the use of the second version SAP2, for surgeanalysisinpumpingmainsandgravitymains.Themanualcoversthefollowingaspects: a) background to the software, including governing principles used in thesoftwaredesignb)briefdescriptionofthesurgephenomenonc)briefdescriptionofthe principles of surge control and surge protection devices d) brief description of themethod of analysis e) details of the scope of the software covering all the optionsavailable f) guidelines for data input g) options of output files and graphical plots h)check list for trouble free usage i) guidelines on modeling techniques j) examples ofapplicationsk)limitationsofanalysisandl)limitationsofthesoftware.Thisisessentially an user manual, intended to help the user in completing the surge analysisforthecasechosenforanalysis.This shouldbedistinguishedfromamanualondesign guidelines.Such a manual, which will form a companion manual to this usermanual, will besupplied to theparticipants who attend thetraining program on theuse of SAP2. The manual on design guidelines will provide assistance in the designprocessforvarioustypesofsurgeprotectiondevices,usingthepresentsoftware.

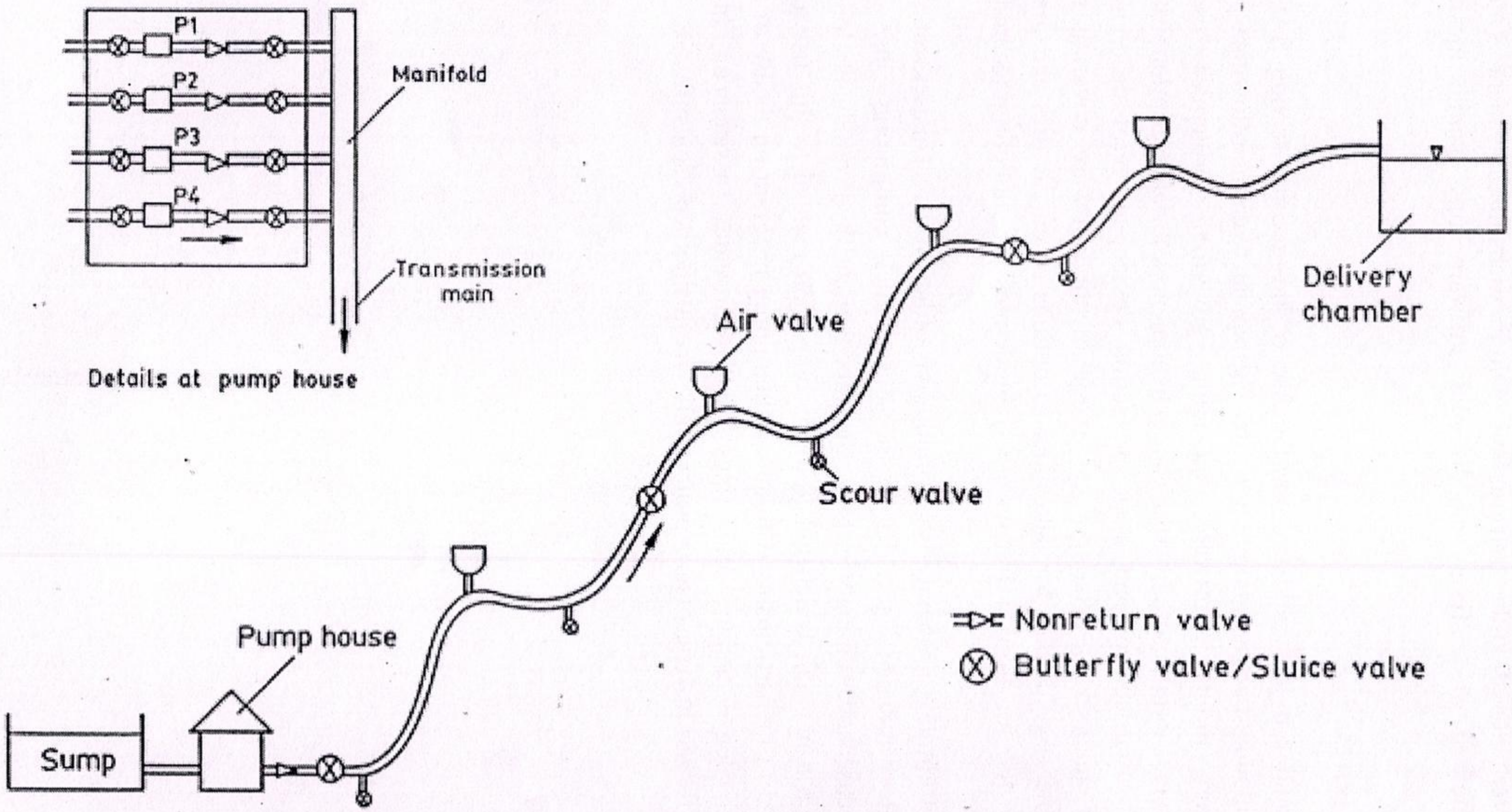


Fig.1:SchematicDiagramofaCrossCountryPumpingMain

ExampleStudyArea

In this tutorial we will model the drainage system serving a 12-acre residential area. The systemlayout is shown in Figure 2-1 and consists of subcatchment areas[3] *S1* through *S3*, storm sewerconduits*C1*through*C4*,andconduitjunctions*J1*through*J4*.Thesystemdischargestoacre ekat the point labeled *Out1*. We will first go through the steps of creating the objects shown in thisdiagram on SWMM's study area map and setting the various properties of these objects. Then wewill simulate the water quantity and quality response to a 3-inch, 6-hour rainfall event, as well as acontinuous,multi-year rainfall record.

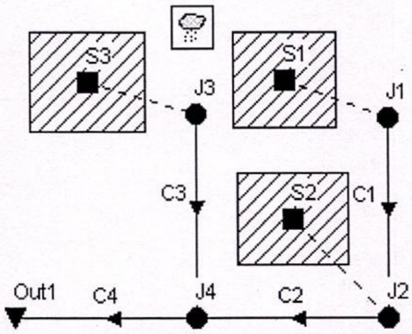


Figure2-1Examplestudyarea

ProjectSetup

Our first task is to create a new SWMM project and make sure that certain default options areselected.Usingthesedefaultswillsimplifythedataentrytasks later on.

1. LaunchEPASWMMifitisnotalreadyrunningandselect**File**>>**New**fromtheMainMen u bar tocreateanewproject.
2. Select**Project**>>**Defaults**toopentheProjectDefaultsdialog.

---

[3] A subcatchment is an area of land containing a mix of pervious and impervious surfaces whoserunoff drains to a common outlet point, which could be either a node of the drainage network oranothersubcatchment.

3. On the ID Labels page of the dialog, set the ID Prefixes as shown in Figure 2-2. This willmake SWMM automatically label new objects with consecutive numbers following thedesignatedprefix.

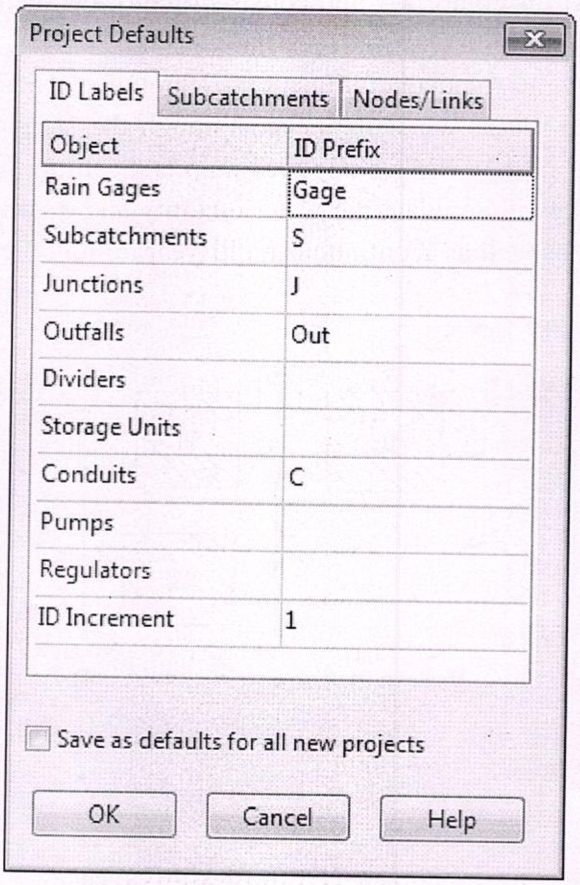


Figure2-2DefaultIDlabelingfortutorialexample

4. OntheSubcatchmentspageofthedialogsetthefollowingdefaultvalues:

Area	4
Width	400
%Slope	0.5
%Imperv.	50
N-Imperv.	0.01
N-Perv.	0.10
Dstore-Imperv.	0.05
Dstore-Perv	0.05
%Zero-Imperv.	25
Infil.Model	<click toedit>

5. OntheNodes/Linkspagesetthefollowingdefaultvalues

:NodeInvert	0
NodeMax.Depth	4
NodePondedArea	0
ConduitLength	400
ConduitGeometry	<clicktoedit>
- Barrels	1
- Shape	Circular
- Max.Depth	1.0
ConduitRoughness	0.01
FlowUnits	CFS
Link Offsets	DEPTH
RoutingModel	KinematicWave

6. Click **OK** to accept these choices and close the dialog. If you wanted to save thesechoices for all future new projects you could check the Save box at the bottom of the formbeforeacceptingit.

NextwewillsetsomemapdisplayoptionssothatIDlabelsandsymbolswillbedisplayedasweadd objectstothestudyareamap,and linkswillhave directionarrows.

1. Select **Tools** >>**Map Display Options** to bring up the Map Options dialog (see Figure 2-3).
2. SelecttheSubcatchmentspage,settheFillStyletoDiagonalandtheSymbolSizeto5.
3. ThenselecttheNodespageandsettheNode Sizeto5.
4. SelecttheAnnotationpageandcheckofftheboxesthatwilldisplayIDlabelsforSubcatchments,Nodes,andLinks.Leave theothersun-checked.
5. Finally, select the Flow Arrows page, select the Filled arrow style, and set the arrow sizeto7.
6. Click the**OK**buttontoacceptthesechoicesandclosethedialog.

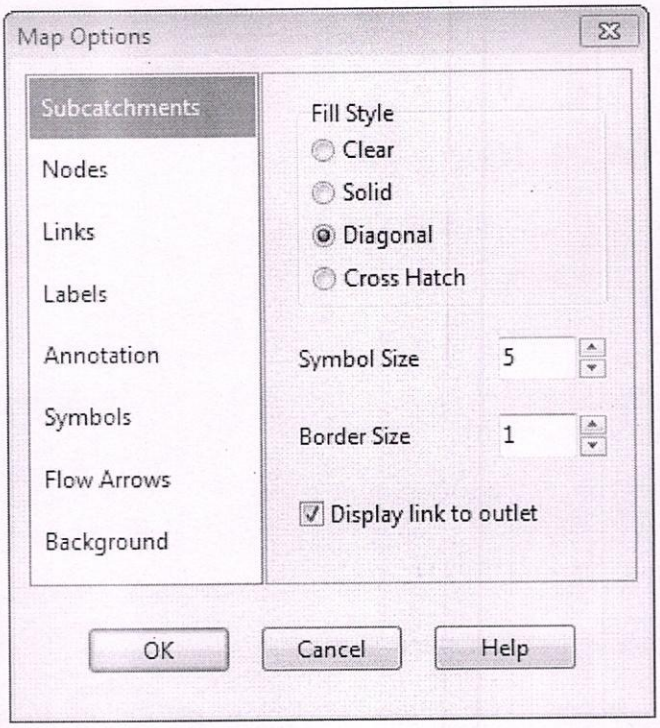


Figure2-3Mapoptionsdialog

Beforeplacingobjectsonthemapweshould setitsdimensions.

1. Select**View** >>**Dimensions**tobringuptheMapDimensionsdialog.
2. Youcanleavethedimensionsattheirdefaultvaluesforthisexample.

Finally,lookinthestatusbaratthebottomofthemainwindowandcheckthatthe**Auto-Length** featureisoff.

SettingObjectProperties

As visual objects are added to our project, SWMM assigns them a default set of properties. Tochange the value of a specific property for an object we must select the object into the PropertyEditor (see Figure 2-5). There are several different ways to do this. If the Editor is already visible,then you can simply click on the object or select it from the Project Browser. If the Editor is notvisiblethenyou canmakeitappear byoneof thefollowing actions:

- double-click theobjectonthemap,
- orright-click ontheobjectandselect**Properties**fromthepop-upmenuthatappears,
- orselecttheobjectfromtheProjectBrowserandthenclick theBrowser's button.

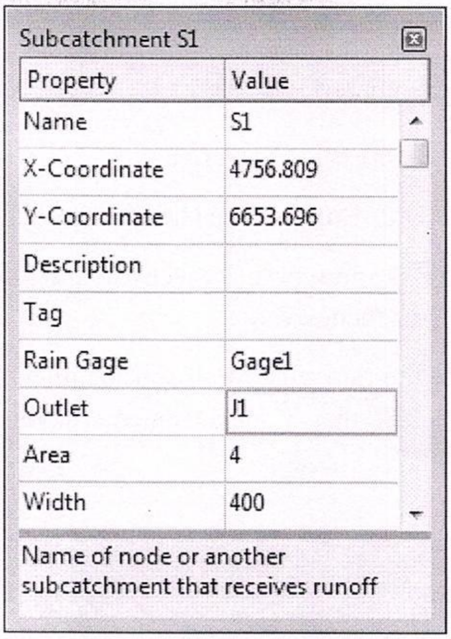


Figure2-5Propertyeditorwindow

WhenevertheProperty Editorhasthefocusyoucanpressthe **F1** keytoobtainamoredetaileddescription oftheproperties listed.

Twokeypropertiesofoursubcatchmentsthatneedtobesetaretheraingagethatsuppliesrainfallda tatothesubcatchmentandthenodeofthedrainagesystemthatreceivesrunofffrom the subcatchment.Sinceall ofoursubcatchmentsutilizethesameraingage,*Gage1*,wecanuseashortcutmethodtosetthis propertyfor all subcatchmentsatonce:

1. From themainmenuselect**Edit>>SelectAll**.
2. Thenselect **Edit>>GroupEdit**tomakeaGroupEditordialogappear(seeFigure2-6).
3. Select *Subcatchment* as the type of object to edit, *Rain Gage* as the property to edit, andtypein*Gage1*as thenewvalue.
4. Click **OK** to change the rain gage of all subcatchments to *Gage1*. A confirmation dialogwill appear noting that 3 subcatchments have changed.Select "**No**" when asked tocontinue editing.

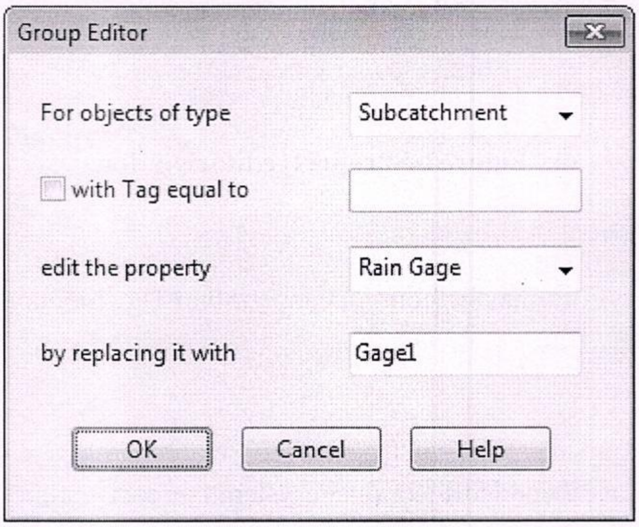


Figure2-6Groupeditordialog

Tosettheoutletnodeofoursubcatchmentswehavetoproceedonebyone,sincethesevarybysubcatchment:

1. Doubleclickonsubcatchment*S1*orselectitfromtheProjectBrowserandclicktheBrowser's button tobringupthe PropertyEditor.
2. Type*J1*intheOutletfieldandpress**Enter**.Notehowadottedlineisdrawnbetweenthesubcatchmentandthenode.
3. Clickonsubcatchment*S2*andenter*J2*asitsOutlet.
4. Clickonsubcatchment*S3*andenter*J3*asitsOutlet.

We also wish to representarea *S3* asbeing lessdeveloped than the others. Select*S3*into thePropertyEditor andset its% Imperviousness to25.

The junctions and outfall of our drainage system need to have invert elevations assigned to them.As we did with the subcatchments, select each junction individually into the Property Editor andsetits InvertElevationtothevalueshownbelow.

Havingcompletedtheinitialdesignofourexampleprojectitisagoodideatogiveitatitleandsave ourworktoafileatthispoint.Todothis:

1. Selectthe *Title/Notes* categoryfromtheProjectBrowserandclick the button.
2. IntheProjectTitle/Notesdialogthatappears(seeFigure2-8),enter"TutorialExample"asthetitleof ourprojectandclicktheOKbuttontoclosethedialog.
3. Fromthe **File** menuselectthe **SaveAs** option.
4. In the Save As dialog that appears, select a folder and file name under which to save thisproject.Wesuggestnamingthefile **tutorial.inp**.(Anextensionof.inpwillbeaddedto thefilenameifoneisnotsupplied.)
5. Click **Save** tosavetheprojecttofile.

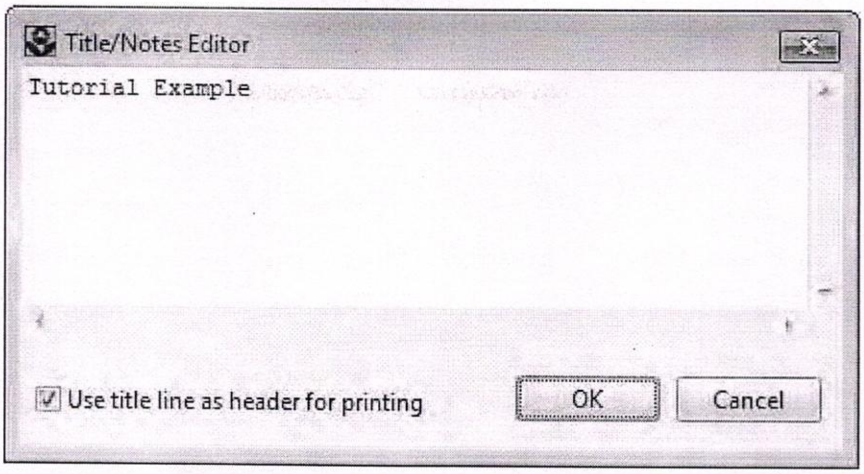


Figure2-8Title/Noteseditor

The project data are saved to the file in a readable text format. You can view what the file lookslike by selecting **Project** >>**Details** from the main menu. To open our project at some later time,youwouldselectthe**Open**commandfromthe**File**menu.

settingSimulationOptions

Beforeanalyzingtheperformanceofourexampledrainagesystemweneedtosetsomeoptionstha t determinehowtheanalysiswillbecarriedout.Todothis:

5. From theProjectBrowser,selectthe**Options**categoryandclick the button.
6. On the **General** page of the Simulation Options dialog that appears (see Figure 2-9),select**KinematicWave**astheflowroutingmethod.Theinfiltrationmethodshouldalr eadybesetto**ModifiedGreen-Ampt**.The**AllowPonding**optionshouldbeunchecked.
7. Onthe**Dates**pageofthedialog,setthe**EndAnalysis**timeto12:00:00.
8. Onthe**TimeSteps**page,setthe**RoutingTimeStep**to60seconds.
9. Click **OK**toclosetheSimulationOptions dialog.

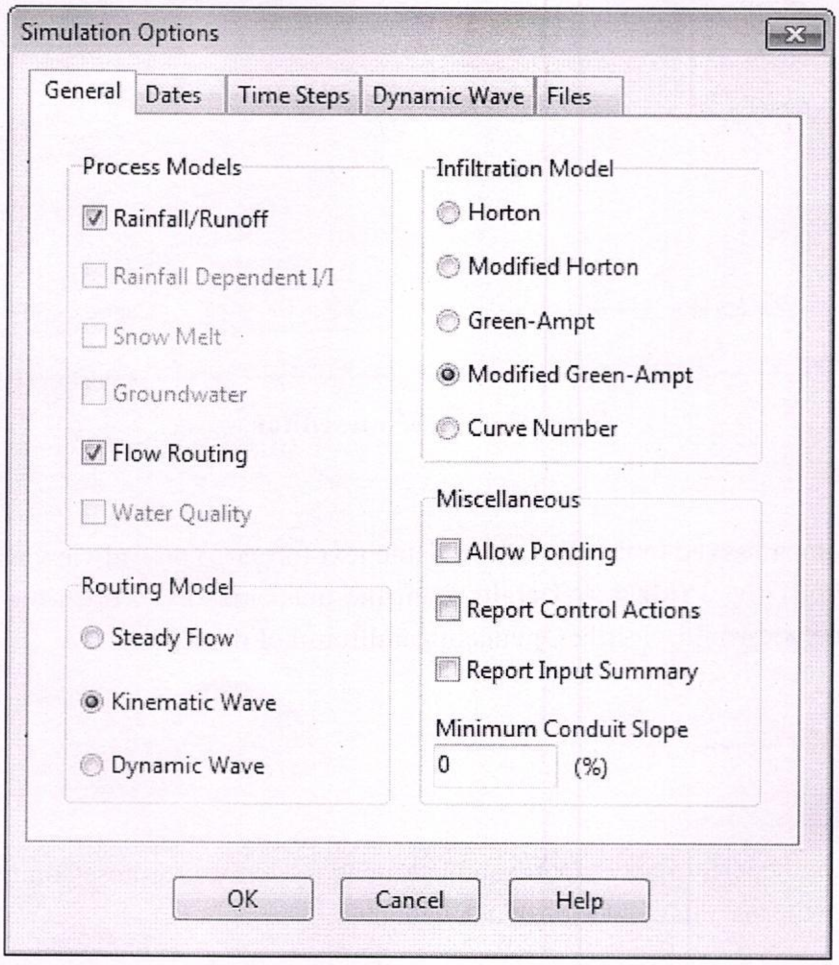


Figure2-9Simulationoptionsdialog

StartingaSimulation

Wearenowreadytorun thesimulation. Todoso,select**Project>>RunSimulation**(orclickthe button). If there was a problemwith the simulation, a Status Report will appear describingwhat errors occurred. Upon successfully completing a run, there are numerous ways in which toviewtheresultsofthesimulation.Wewill illustratejust afewhere.

ViewingtheStatusReport

The Status Report contains useful information about the quality of a simulation run, including amass balance on rainfall, infiltration, evaporation, runoff, and inflow/outflow for the conveyancesystem. To view the report select **Report** >>**Status** (or click the button on the StandardToolbar and then select **Status Report** from the drop down menu). A portion of the report for thesystemjustanalyzedis showninFigure2-10.

```
EPASTORMWATERMANAGEMENTMODEL-VERSION5.1(Build5.1.010)
--------------------------------------------------------------------------------

TutorialExample

*********************************************************
NOTE: The summary statistics displayed in this report
arebased on results found at every computational time
step,notjustonresultsfromeachreportingtimestep.
*********************************************************

****************
AnalysisOptions
****************
FlowUnits................. CFS
.......................... YES
RDII...................... NO
.......................... NO
Groundwater............... NO
FlowRouting............... YES

************************** Volume        Depth
RunoffQuantityContinuity   acre-feet     inches
************************** ---------     -------
TotalPrecipitation......   3.000         3.000
EvaporationLoss.........   0.000         0.000
InfiltrationLoss........   1.750         1.750
SurfaceRunoff...........   1.246         1.246
FinalStorage............   0.016         0.016
ContinuityError(%).....    -0.386

************************** Volume        Volume
FlowRoutingContinuity      acre-feet     10^6gal
************************** ---------     ---------
DryWeatherInflow.......    0.000         0.000
WetWeatherInflow.......    1.246         0.406
GroundwaterInflow.......   0.000         0.000
```

Figure2-10PortionofaStatusReport

For the systemwe justanalyzed the report indicatesthe quality ofthe simulation isquite good,withnegligiblemassbalancecontinuityerrorsforbothrunoffandrouting(-0.39%and0.03%, respectively,ifalldatawereenteredcorrectly).Also,ofthe3inchesofrainthatfellonthestudyarea ,1.75 infiltratedintotheground and essentiallytheremainderbecamerunoff.

ViewingtheSummaryReport

The Summary Report contains tables listing summary results for each subcatchment, node andlink in the drainage system. Total rainfall, total runoff, and peak runoff for each subcatchment,peak depth and hours flooded for each node, and peak flow, velocity, and depth for each conduitarejustsomeof theoutcomes included inthesummaryreport.

ToviewtheSummaryReportselect**Report|Summary**fromthemainmenu(orclickthe button on the Standard Toolbar and then select **Summary Report** from the drop down menu).Thereport'swindowhasadropdownlistfromwhichyouselectaparticularreporttoview.F orourexample,theNodeFloodingSummary table(Figure2-11)indicatestherewasinternalflooding in the system at node J2. Note. The Conduit Surcharge Summary table (Figure 2-12)shows that Conduit C2, just downstream of node J2, was at full capacity and therefore appears tobeslightlyundersized.

In SWMM flooding will occur whenever the water surface at a node exceeds the maximumassigned depth. Normally such water will be lost from the system. The option also exists to havethiswaterpondatopthenodeandbere-introducedintothedrainagesystemwhencapacityexiststodoso.

Summary Results

Topic: Node Flooding — Click a column header to sort the column.

Node	Hours Flooded	Maximum Rate CFS	Day of Maximum Flooding	Hour of Maximum Flooding	Total Flood Volume 10^6 gal	Maximum Ponded Volume 1000 ft3
J2	1.05	0.77	0	03:01	0.018	0.000

Figure2-11Nodefloodingsummarytable

Summary Results

Topic: Conduit Surcharge — Click a column header to sort the column.

Conduit	Hours Both Ends Full	Hours Upstream Full	Hours Dnstream Full	Hours Above Normal Flow	Hours Capacity Limited
C2	1.03	1.03	1.03	1.05	1.03

Figure2-12Conduitsurchargesummarytable

ViewingaProfilePlot

SWMM can generate profile plots showing how water surface depth varies across a path ofconnected nodes and links. Let's create such a plot for the conduits connecting junction *J1* to theoutfall *Out1*ofourexampledrainagesystem.Todothis:

1. Select **Report** >>**Graph** >>**Profile** on the main menu or simply click on the StandardToolbar.
2. Either enter *J1* in the **Start Node** field of the Profile Plot Selection dialog that appears(seeFigure2-16)orselectitonthemaporfromtheProjectBrowserandclickthe buttonnexttothefield.

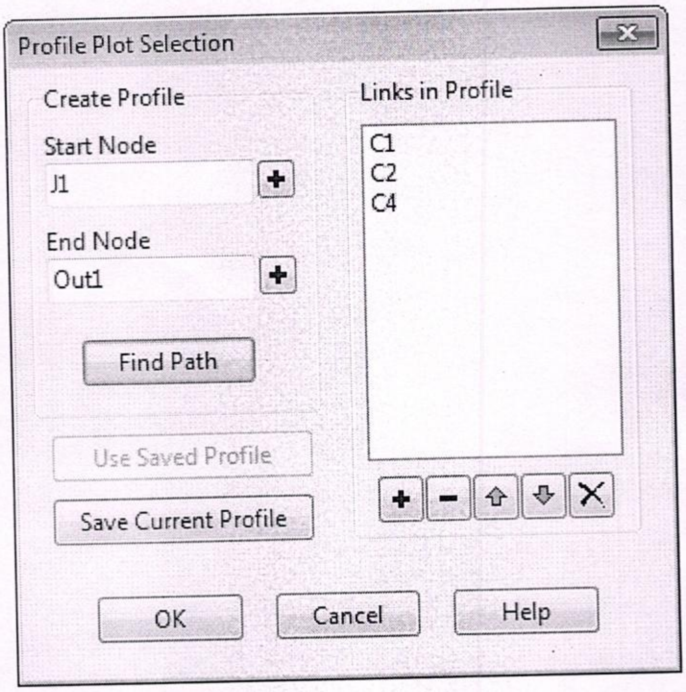


Figure2-16Profileplotdialog

3. Dothesamefornode*Out1*inthe**EndNode**fieldof thedialog.

4. Click the **Find Path** button. An ordered list of the links forming a connected path betweenthe specified Start and End nodes will be displayed in the **Links in Profile** box. You canedit theentries inthis boxifneedbe.
5. Click the **OK** button to create the plot, showing the water surface profile as it exists at thesimulationtimecurrentlyselectedintheMapBrowser(seeFigure2-17forhour 02:45).

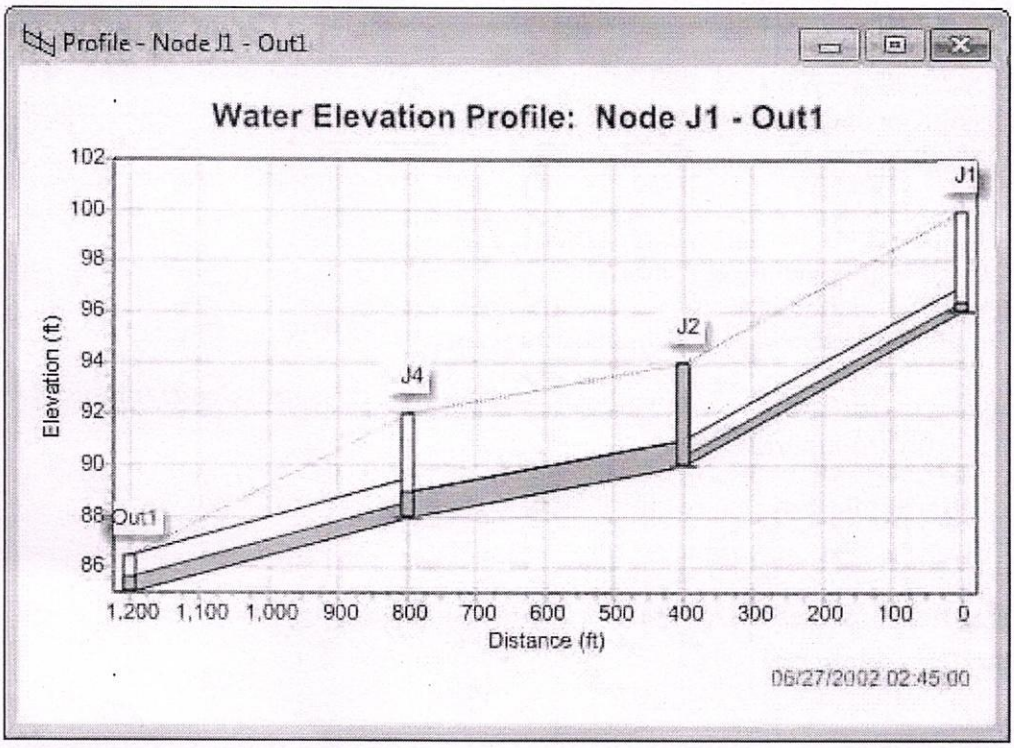


Figure2-17Exampleprofileplot

As you move through time using the Map Browser or with the Animator control, the water depthprofileontheplotwillbeupdated.Observehownode*J2*becomesfloodedbetweenhours2 and3 of the storm event. A Profile Plot's appearance can be customized and it can be copied orprintedusingthesameprocedures asfor aTimeSeries Plot.

RunningaFullDynamicWaveAnalysis

In the analysis just run we chose to use the Kinematic Wave method of routing flows through ourdrainagesystem.Thisisanefficientbutsimplifiedapproachthatcannotdealwithsuchphenomena as backwater effects, pressurized flow, flow reversal, and non-dendritic layouts.SWMM also includes a Dynamic Wave routing procedure that can represent these conditions.This procedure, however, requires more computation time, due to the need for smaller time stepstomaintainnumericalstability.

Most of the effects mentioned above would not apply to our example. However we had oneconduit,*C2*,whichflowedfullandcauseditsupstreamjunctiontoflood.Itcouldbethatthispipeis actually being pressurized and could therefore convey more flow than was computed usingKinematic Wave routing. We would now like to seewhatwould happen ifwe apply DynamicWaveroutinginstead.

Toruntheanalysis withDynamicWaverouting:

1. From theProjectBrowser,selecttheOptionscategoryandclick the button.
2. OntheGeneralpageoftheSimulationOptionsdialogthatappears,select**DynamicWave**as theflowroutingmethod.
3. Onthe **DynamicWave**pageof the dialog, usethesettingsshown inFigure2-18

   Click**OK**toclosetheformandselect**Project>>RunSimulation**(orclickthe button)tore-runtheanalysis.

If you look at the Summary Report for this run, you will see that there is no longer any junctionflooding and that the peak flow carried by conduit *C2* has been increased from 3.52 cfs to 4.04cfs.

Before we simulate the runoff quantities of TSS and Lead from our study area, an initial buildup ofTSS should be defined so it can be washed off during our single rainfall event. We can eitherspecify the number of antecedent dry days prior to the simulation or directly specify the initialbuildupmass oneachsubcatchment.Wewillusetheformermethod:

1. From the **Options** category of the Project Browser, select the **Dates** sub-category andclickthe button.
2. IntheSimulationOptionsdialogthatappears,enter5intothe**AntecedentDryDays** field.

3. Leave the other simulation options the same as they were for the dynamic wave flowrouting wejustcompleted.

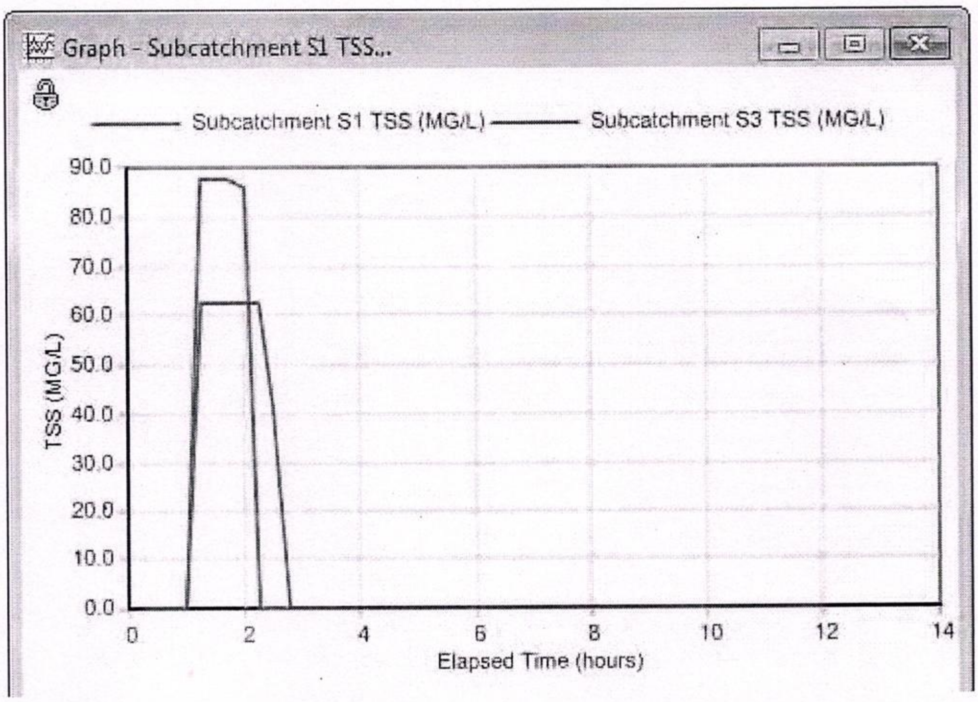
4. Click the**OK**buttontoclosethedialog.

Now run the simulationby selecting**Project>>Run Simulation**or by clicking ontheStandardToolbar.

When the run is completed, view its Status Report. Note that two new sections have been addedfor**RunoffQualityContinuity**and**QualityRoutingContinuity**.FromtheRunoffQualityContinuity table we see that there was an initial buildup of 47.5 lbs of TSS on the study area andanadditional2.2lbsofbuildupaddedduringthedryperiodsofthesimulation.About47.9lbs were washed off during the rainfall event. The quantity of Lead washed off is a fixed percentage(25%times0.001toconvertfrommgtoug)of theTSS aswasspecified.

Ifyou plottherunoffconcentrationofTSS for subcatchment *S1* and*S3* together on the sametime series graph, as in Figure 2-23, you will see the difference in concentrations resulting fromthe different mix of land uses in these two areas. You can also see that the duration over whichpollutants are washed off is much shorter than the duration of the entire runoff hydrograph (i.e., 1hour versus about 6 hours). This results from having exhausted the available buildup of TSS overthisperiodoftime.

Figure2-23RunoffTSSfromselectedsubcatchments



RunningaContinuousSimulation

Asafinalexerciseinthistutorialwewilldemonstratehowtorunalong-termcontinuoussimulation using a historical rainfall record and how to perform a statistical frequency analysis onthe results. The rainfall record will come from a file named **sta310301.dat** that was included withthe example data sets provided with EPA SWMM. It contains several years of hourly rainfallbeginning in January 1998. The data are stored in the National Climatic Data Center's DSI 3240format,whichSWMMcanautomaticallyrecognize.

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Course Duration: 30 Hours;
From 05/12/20 to 21/12/20

Course Instructor:
Prof. T. Kiran Kumar,
Professor, CE, KSRMCE-Kadapa

V. Maddi

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Prof. T. Kiran Kumar,
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2	179Y1A0113	Venkatesh Naik Bukke	Yes	Yes	Excellent	Yes	5
3	179Y1A0115	Pallavi Chatta	Yes	Yes	Excellent	Yes	5
4	179Y1A0119	Zaheer Dade	Yes	Yes	Excellent	Yes	5
5	179Y1A0122	Jayachandra Derangula	Yes	Yes	Excellent	Yes	5
6	179Y1A0123	Siddaiah Dollu	Yes	Yes	Excellent	Yes	5
7	179Y1A0124	Suresh Gowd Ediga	Yes	Yes	Excellent	Yes	5
8	179Y1A0126	Ashok Kumar Galeti	Yes	Yes	Excellent	Yes	5
9	179Y1A0129	Pullaiah Gokula	Yes	Yes	Excellent	Yes	5
10	179Y1A0130	Ramamanohar Reddy Gollapalle	Yes	Yes	Excellent	Yes	5
11	179Y1A0133	Dharani Jonnavaram	Yes	Yes	Excellent	Yes	5
12	179Y1A0134	Manasa Juturu	Yes	No	Excellent	Yes	4
13	179Y1A0136	Himaja Kancharla	Yes	Yes	Excellent	Yes	5
14	179Y1A0139	Vivekananda Reddy Kota	Yes	Yes	Excellent	Yes	5
15	179Y1A0155	Manjunatha Muttalahgari	Yes	Yes	Excellent	Yes	5
16	179Y1A0157	Prathima Nagooru	Yes	Yes	Excellent	Yes	5
17	179Y1A0158	Vijaya Kumari Nalla	Yes	Yes	Excellent	Yes	5
18	179Y1A0166	Venkata Sunil Kumar Reddy P	Yes	Yes	Excellent	Yes	5

19	179Y1A0174	Bhanu Prakash Peddaalankolla	Yes	Yes	Excellent	May be	5
20	179Y1A0182	Susma Saraballa	Yes	Yes	Excellent	Yes	5
21	179Y1A0184	Abdul Rehaman Shaik	Yes	Yes	Excellent	Yes	4
22	179Y1A0197	Surya Thammisetty	Yes	Yes	Excellent	Yes	5
23	179Y1A0198	Rajesh Thotakanama	Yes	Yes	Good	Yes	5
24	179Y1A01A1	Maheswari Undela	Yes	Yes	Good	Yes	5
25	179Y1A01A2	Siva Kumar Upparapalli	Yes	Yes	Excellent	Yes	5
26	179Y1A01A5	Keerthana Vodiveeti	Yes	Yes	Excellent	Yes	5
27	179Y1A01A6	Rekha Devi Yarasani	Yes	Yes	Excellent	Yes	5
28	179Y1A01A7	Lokesh Yarragolla	Yes	Yes	Excellent	Yes	5
29	179Y1A01A8	Venkata Lakshmi Yarraguntla	Yes	Yes	Excellent	Yes	5
30	189Y5A0102	Siva Gangadhar Alavalapadu	Yes	Yes	Good	May be	4
31	189Y5A0104	Dharani Kamalakara Rao Appalarajugari	Yes	Yes	Excellent	Yes	3
32	189Y5A0106	Niranjan Attinjery	Yes	Yes	Excellent	Yes	5
33	189Y5A0107	Suresh Banka	Yes	Yes	Excellent	May be	5
34	189Y5A0109	Srinatha Reddy Bhumireddy	Yes	Yes	Excellent	Yes	5
35	189Y5A0110	Purushothamreddy Bijivemula	Yes	Yes	Excellent	Yes	4
36	189Y5A0113	Kiran Kumar Bolleddu	Yes	Yes	Excellent	Yes	5
37	189Y5A0120	Swetha Damsetty	Yes	Yes	Excellent	Yes	5
38	189Y5A0126	Shireesha Guramkonda	Yes	Yes	Excellent	Yes	5

39	189Y5A0127	Nikitha Jaladi	Yes	Yes	Excellent	Yes	5
40	189Y5A0128	Venkata Subbaiah Janapati	Yes	Yes	Excellent	May be	5
41	189Y5A0132	Yaswanth Reddy Kambham	Yes	Yes	Good	Yes	5
42	189Y5A0134	Sree Hari Reddy Katthi	Yes	Yes	Excellent	Yes	5
43	189Y5A0135	Nagesh Kolliboina	Yes	Yes	Excellent	Yes	5
44	189Y5A0139	Ganga Maheswara Reddy Kudumula	Yes	Yes	Excellent	Yes	5
45	189Y5A0140	Suresh Kuruva	Yes	Yes	Excellent	Yes	5
46	189Y5A0146	Venkata Ramana Reddy Nimmakayala	Yes	Yes	Excellent	Yes	5
47	189Y5A0159	Abilash Reddy Sajjala	Yes	Yes	Excellent	Yes	5
48	189Y5A0162	Naveen Kumar Sepuri	Yes	Yes	Excellent	Yes	5
49	189Y5A0169	Sham Babu Thallapaka	Yes	Yes	Excellent	Yes	5
50	189Y5A0170	Chandra Kanth Thatamsetty	Yes	Yes	Excellent	Yes	5
51	189Y5A0171	Divya Thonduru	Yes	Yes	Excellent	Yes	5
52	189Y5A0172	Parameswara Reddy Thummala	Yes	Yes	Excellent	Yes	5

V. Maddu

Coordinator

HoD-Civil Engg.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
KADAPA 516 003. (A.P.)

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(UGC-AUTONOMOUS)

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Sl. No.	Student Roll No.	Student Name	Mail ID	Class
1	189Y1A0104	Raghavendra Reddy Arikela	189Y1A0104@ksrmce.ac.in	A
2	189Y1A0108	Maheswari Bokkasam	189Y1A0108@ksrmce.ac.in	A
3	189Y1A0109	Rama Chandrareddy Bommireddy	189Y1A0109@ksrmce.ac.in	A
4	189Y1A0115	Satish Kumar Yadav Chennuboyina	189Y1A0115@ksrmce.ac.in	A
5	189Y1A0120	Anilkumar Chittiboyina	189Y1A0120@ksrmce.ac.in	A
6	189Y1A0126	Venkata Jithendhar Reddy Duddekunta	189Y1A0126@ksrmce.ac.in	A
7	189Y1A0130	Premkumar Gaddam	189Y1A0130@ksrmce.ac.in	A
8	189Y1A0132	Lakshmi Prasad Reddy Guddila	189Y1A0132@ksrmce.ac.in	A
9	189Y1A0134	Nitheesh Gunigari	189Y1A0134@ksrmce.ac.in	A
10	189Y1A0137	Gangaraju Jamalla	189Y1A0137@ksrmce.ac.in	A
11	189Y1A0141	Uday Kumar Kaipu	189Y1A0141@ksrmce.ac.in	A
12	189Y1A0144	Bhanumanikanta Reddy Kannapu	189Y1A0144@ksrmce.ac.in	A
13	189Y1A0146	Govardhan Kaveti	189Y1A0146@ksrmce.ac.in	A
14	189Y1A0160	Karthik Kumar Mangala	189Y1A0160@ksrmce.ac.in	A
15	189Y1A0161	Sai Karthik Maruboyana	189Y1A0161@ksrmce.ac.in	A
16	189Y1A0163	Sampath Kumar Meka	189Y1A0163@ksrmce.ac.in	B
17	189Y1A0165	Purushotham Reddy Mitta	189Y1A0165@ksrmce.ac.in	B
18	189Y1A0168	Mahammad Azeez Mulla	189Y1A0168@ksrmce.ac.in	B
19	189Y1A0171	Venkata Sai Poojith Nagalla Pati	189Y1A0171@ksrmce.ac.in	B

20	189Y1A0172	Venkatesh Nagirikanti	189Y1A0172@ksrmce.ac.in	B
21	189Y1A0175	Abhish Nanubala	189Y1A0175@ksrmce.ac.in	B
22	189Y1A0177	Ragasravani Pagati	189Y1A0177@ksrmce.ac.in	B
23	189Y1A0179	Jayachandra Sai Pandugolu	189Y1A0179@ksrmce.ac.in	B
24	189Y1A0181	Muni Kumar Parimisetti	189Y1A0181@ksrmce.ac.in	B
25	189Y1A0183	Siva Sai Pasupuleti	189Y1A0183@ksrmce.ac.in	B
26	189Y1A0187	Rakesh Prasanna Penubala	189Y1A0187@ksrmce.ac.in	B
27	189Y1A0193	Bindhu Rachamallu	189Y1A0193@ksrmce.ac.in	B
28	189Y1A0194	Neeraj Sale	189Y1A0194@ksrmce.ac.in	B
29	189Y1A0195	Swarna Latha Seelam	189Y1A0195@ksrmce.ac.in	B
30	189Y1A0198	Afroz Shaik	189Y1A0198@ksrmce.ac.in	B
31	189Y1A01A6	Zakke Hussain Shaik	189Y1A01A6@ksrmce.ac.in	B
32	189Y1A01A7	Pragathi (W) Somireddy	189Y1A01A7@ksrmce.ac.in	B
33	189Y1A01B0	Sateesh Kumar Reddy Thallapalle	189Y1A01B0@ksrmce.ac.in	B
34	189Y1A01B1	Sukumar Thati	189Y1A01B1@ksrmce.ac.in	B
35	189Y1A01B2	Siva Reddy Thatimakula	189Y1A01B2@ksrmce.ac.in	B
36	189Y1A01B4	Gayathri Thopudurthy	189Y1A01B4@ksrmce.ac.in	B
37	189Y1A01B8	Venkata Hemanth Usugari	189Y1A01B8@ksrmce.ac.in	B
38	189Y1A01B9	Nagarjun Utukuru	189Y1A01B9@ksrmce.ac.in	B
39	189Y1A01C3	Ganga Swetha Vennapusa	189Y1A01C3@ksrmce.ac.in	B
40	189Y1A01C8	Sivanatha Reddy Yeturu	189Y1A01C8@ksrmce.ac.in	B
41	199Y5A0102	Malik Akula	199Y5A0102@ksrmce.ac.in	C
42	199Y5A0105	Venugopal Reddy Atla	199Y5A0105@ksrmce.ac.in	C
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44	199Y5A0108	Sai Bonthalapalli	199Y5A0108@ksrmce.ac.in	C
45	199Y5A0109	Mahesh Naik Bukke	199Y5A0109@ksrmce.ac.in	C
46	199Y5A0111	Rohit Chinna Swami Gari	199Y5A0111@ksrmce.ac.in	C
47	199Y5A0112	Mahesh Babu Chinthakunta	199Y5A0112@ksrmce.ac.in	C
48	199Y5A0115	Sreenivasulu Dasari	199Y5A0115@ksrmce.ac.in	C

49	199Y5A0116	Pavan Kalyan Dokka	199Y5A0116@ksrmce.ac.in	C
50	199Y5A0117	Dastagiri Dudekula	199Y5A0117@ksrmce.ac.in	C
51	199Y5A0118	Premaraju Erapogu	199Y5A0118@ksrmce.ac.in	C
52	199Y5A0123	Ramu Gosetty	199Y5A0123@ksrmce.ac.in	C
53	199Y5A0127	Venkateswarlu Kashetty	199Y5A0127@ksrmce.ac.in	C
54	199Y5A0130	Vinodkumar Madhuranthakam	199Y5A0130@ksrmce.ac.in	C
55	199Y5A0131	Bharath Venkata Sai Malle Bharath	199Y5A0131@ksrmce.ac.in	C
56	199Y5A0132	Mahesh Mallepogu Budigi	199Y5A0132@ksrmce.ac.in	C
57	199Y5A0134	Sai Kumar Mannula	199Y5A0134@ksrmce.ac.in	C
58	199Y5A0135	Sai Kumar Reddy Masireddy	199Y5A0135@ksrmce.ac.in	C
59	199Y5A0138	Reddaiah Nagulugari	199Y5A0138@ksrmce.ac.in	C
60	199Y5A0159	Chandu Thoti	199Y5A0159@ksrmce.ac.in	C
61	199Y5A0160	Siva Sai Udayagiri	199Y5A0160@ksrmce.ac.in	C
62	199Y5A0161	Manjunatha Udumala	199Y5A0161@ksrmce.ac.in	C

Coordinator

HoD-Civil Engg.

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
KADAPA 516 003. (A.P.)

Syllabus of Certification Course

Course Name: Design of various structural elements of RCC Buildings

Duration: 30 Hours

Module I:

Moment resistance and Design of singly, doubly and T-beams, Design for shear and torsion

Module II:

Design of One-way slab, Continuous one-way slab and two-way slab

Module III:

Design of axially loaded column with lateral ties and circular columns with helical ties, Analysis and Design of uniaxial moment

Module IV:

Design of Isolated square and rectangular footings, Deflection calculations and design of dog-legged staircase.

Text Books:

1. N. Subramanian, Design of Reinforced Concrete Structures; Oxford University Press, 2014
2. S Unnikrishna Pillai & Devdas Menon, Reinforced Concrete Design, McGraw Hill, 2021

Head
Department of Civil Engineering
K.S.R.M. College of Engineering
(Autonomous)
KADAPA 516 003. (A.P.)

V. S. S. Murthy
PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)

K.S.R.M. COLLEGE OF ENGINEERING

(UGC-AUTONOMOUS)

Kadapa, Andhra Pradesh, India– 516 003

Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.

An ISO 14001:2004 & 9001: 2015 Certified Institution

Department of Civil Engineering

Certification course on Design of various structural elements of RCC buildings

Date	Timing	Course Instructor	Topics to be covered
13-11-20	3 PM to 6 PM	Prof. A. Mohan	Moment resistance and Design of singly, doubly and T-beams, Design for shear and torsion
16-11-20	3 PM to 6 PM	Prof. A. Mohan	Moment resistance and Design of singly, doubly and T-beams, Design for shear and torsion
17-11-20	4 PM to 6 PM	Prof. A. Mohan	Moment resistance and Design of singly, doubly and T-beams, Design for shear and torsion
18-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of One-way slab, Continuous one-way slab and two-way slab
19-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of One-way slab, Continuous one-way slab and two-way slab
20-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of One-way slab, Continuous one-way slab and two-way slab
21-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of axially loaded column with lateral ties and circular columns with helical ties, Analysis and Design of uniaxial moment
23-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of axially loaded column with lateral ties and circular columns with helical ties, Analysis and Design of uniaxial moment
24-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of axially loaded column with lateral ties and circular columns with helical ties, Analysis and Design of uniaxial moment
25-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of axially loaded column with lateral ties and circular columns with helical ties, Analysis and Design of uniaxial moment
26-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of Isolated square and rectangular footings, Deflection calculations and design of dog-legged staircase.
27-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of Isolated square and rectangular footings, Deflection calculations and design of dog-legged staircase.
28-11-20	4 PM to 6 PM	Prof. A. Mohan	Design of Isolated square and rectangular footings, Deflection calculations and design of dog-legged staircase.
30-11-20	3 PM to 6 PM	Prof. A. Mohan	Design of Isolated square and rectangular footings, Deflection calculations and design of dog-legged staircase.

V. S. S. Murthy

Principal

PRINCIPAL
K.S.R.M. COLLEGE OF ENGINEERING
KADAPA - 516 003. (A.P.)

Instructor:

Coordinators: