



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

All UG Programmes are Accredited by NBA

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

### CIVIL ENGINEERING

(Accredited by NBA)

#### SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

**IV/IV B.TECH**

**I-SEMESTER**

(With effect from **2019-2020** Admitted Batch onwards)

Course Code	Name of the Course	Category	Cr.	L	T	P	Internal Marks	External Marks	Total Marks
B19CE4101	Water Resources Engineering-I	PC	3	3	--	--	25	75	100
B19CE4102	Transportation Engineering-II	PC	3	3	--	--	25	75	100
#PE-III	Professional Elective-III	PE	3	3	--	--	25	75	100
#PE-IV	Professional Elective-IV	PE	3	3	--	--	25	75	100
#PE-V	Professional Elective-V	PE	3	3	--	--	25	75	100
#OE-II	Open Elective-II	OE	3	3	--	--	25	75	50
B19CE4115	Project Work-I	PR	3	--	--	6	20	30	50
B19CE4116	Internship or Seminar	PR	1	--	--	3	--	50	50
<b>TOTAL</b>			<b>22</b>	<b>18</b>	<b>--</b>	<b>9</b>	<b>170</b>	<b>530</b>	<b>700</b>

	Course Code	Course
#PE-III	B19CE4103	Advanced Structural Analysis
	B19CE4104	Solid Waste Management
	B19CE4105	Surface Hydrology
	B19CE4106	Traffic Management
#PE-IV	B19CE4107	Advanced Steel Structures
	B19CE4108	Expansive Soils
	B19CE4109	Remote Sensing and GIS Applications
	B19CE4110	Construction Technology & Management
#PE-V	B19CE4111	Design of Advanced Reinforced Concrete Structures
	B19CE4112	Disaster Management and Preparedness
	B19CE4113	Soil Dynamics and Machine Foundation
	B19CE4114	Intelligent Transport System
#OE-II	Student has to study one Open Elective offered by CSE or ECE or EEE or IT or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4101	PC	3	--	--	3	25	75	3hrs

## WATER RESOURCES ENGINEERING-I

(For CE)

### Course Objectives:

Student may know the Major hydrologic components & apply key concepts to several practical areas of engineering hydrology & related design aspects, aquifer parameters & yield of wells, surface & subsurface investigation to locate ground water, storage capacity & life of reservoirs, the irrigation needs of crops.

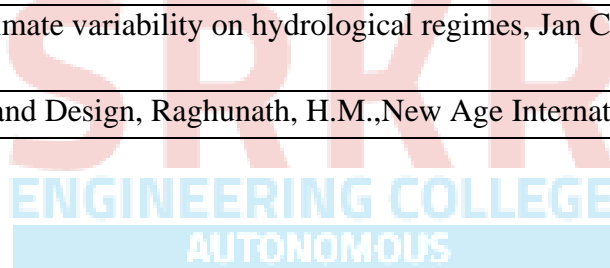
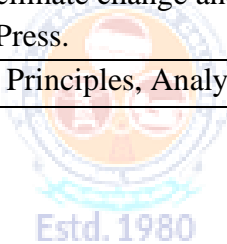
**Course Outcomes:** The Students will be able to

S.No	Outcomes	Knowledge Level
1.	Choose major hydrologic components & apply key concepts to several practical areas of engineering hydrology & related design aspects.	K3
2.	Determine aquifer parameters & yield of wells.	K3
3.	Determine storage capacity & life of reservoirs.	K3
4.	Assess the irrigation needs of crops.	K3

## SYLLABUS

<b>UNIT-I (12 Hrs)</b>	<p><b>Hydrology:</b> Hydrology in water resources development, Applications of Hydrology &amp; Hydrological cycle, Precipitation -Types, Measurement of rainfall; Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data – Consistency of rainfall record, Double mass curve. Infiltration – Factors affecting and its determination, Infiltrimeters; Evaporation and Evapo - transpiration – PanEvaporation.</p>
<b>UNIT-II (10Hrs)</b>	<p><b>Hydrological Aspects:</b> Runoff –Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, Applications of Unit Hydrograph; S-hydrograph.</p>
<b>UNIT-III (10 Hrs)</b>	<p><b>Ground Water Flow:</b> Definitions, subsurface distribution of water, ground water movement; Darcy's law; Permeability – Well hydraulics – Steady flow in different types of aquifers and wells; Determination of hydraulic properties of aquifer; Specific capacity of well; Well efficiency – Pumping tests –Introduction to tube wells and open wells.</p>
<b>UNIT-IV (10Hrs)</b>	<p><b>Reservoir Planning:</b> Types of developments – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, Yield</p>

	from a reservoir of given capacity; Apportionment of total cost of a Multi Purpose project, Reservoir Losses –Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation.
<b>UNIT-V (8Hrs)</b>	<b>Irrigation:</b> Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Irrigation efficiencies — Water requirements of crops, Duty, Delta and Base period Their relationship, Factors affecting duty and methods of improving duty, Consumptive use of water-Determination of evapo transpiration, Assessment of irrigation water charges.
<b>Text Books:</b>	
1.	Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2.	Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3.	Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.
<b>Reference Books:</b>	
1.	Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.
2.	Impacts of climate change and climate variability on hydrological regimes, Jan C. vanDam, Cambridge University Press.
3.	Hydrology: Principles, Analysis and Design, Raghunath, H.M.,New Age International.



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4102	PC	3	--	--	3	25	75	3 Hrs.

## TRANSPORTATION ENGINEERING-II

(For CE)

### Course Objectives:

1	To know various components and their functions in a railway track
2	To acquire design principles of geometrics in a railway track.
3	To know various techniques for the effective movement of trains.
4	To acquire design principles of airport runway geometrics and pavements.
5	To know the planning, construction and maintenance of Docks and Harbours.

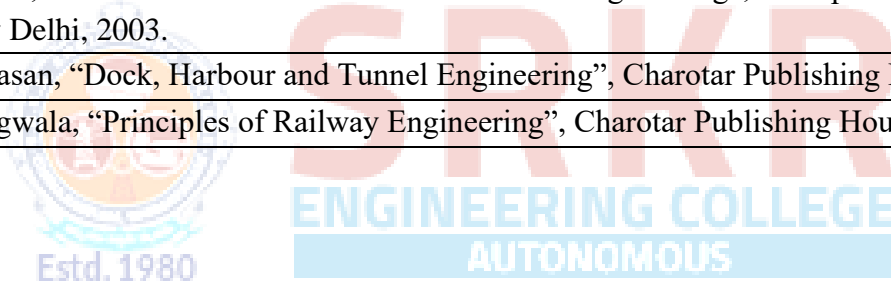
### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Illustrate the different types of Components of Railway Engineering.	K2
2	Plan the Geometric Design for a Railway Track.	K4
3	Characterize the concepts of railway Interlocking and signal systems.	K2
4	Identify the technical issues related to planning and design of airports.	K4
5	Distinguish the technical components of harbours.	K2

## SYLLABUS

<b>UNIT-I</b> ( 8Hrs)	<b>Components of Railway Engineering:</b> Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.
<b>UNIT-II</b> ( 8Hrs)	<b>Geometric Design of Railway Track:</b> Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves –Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.
<b>UNIT-III</b> (8Hrs)	<b>Turnouts &amp; Controllers:</b> Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling Train Movement – Interlocking – Modern signaling Installations.

<b>UNIT-IV (8Hrs)</b>	<b>Airport Planning &amp; Design:</b> Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.
<b>UNIT-V (8 Hrs)</b>	<b>Planning, Layout, Construction and Maintenance Of Docks and Harbours:</b> Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.
<b>Text Books:</b>	
1	Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi.
2	Airport Engineering by Khanna & Arora - Nemchand Bros, New Delhi.
3	Docks and Harbour Engineering by Bindra S.P. - Dhanpathi Rai & Sons, New Delhi.
<b>Reference Books:</b>	
1	S.P. Bindra, “A course work in Docks and Harbour Engineering”, Dhanpat Rai Publications Pvt., Ltd, New Delhi, 2003.
2	R. Srinivasan, “Dock, Harbour and Tunnel Engineering”, Charotar Publishing House, Anand, 1989.
3	S.C. Rangwala, “Principles of Railway Engineering”, Charotar Publishing House, Anand, 2000.



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4103	PE	3	--	--	3	25	75	3 Hrs.

## ADVANCED STRUCTURAL ANALYSIS

(For CE)

### Course Objectives:

1	Analysis of fixed beams and portal frame using by column-analogy method.
2	Analysis of portal frame by matrix methods.
3	Analysis of multi-storey frames by substitute frame method.
4	Analysis of multi-storey frames by approximate methods.
5	Analysis of shear deformations of statically determinate beams matrix methods.

**Course Outcomes:** The student will be able to

S.No	Outcome	Knowledge Level
1	Determine the fixed end moments of fixed beams with different moment of inertia and member end moments of symmetrical and un symmetrical portal frame by column-analogy method.	K4
2	Determine the member end moments of single bay single storeyportal frames by flexibility and stiffness matrix methods	K4
3	Determine the moments of multi-storey frames subjected to vertical loads by substitute frame method.	K4
4	Determine the moments of multi-storey frames subjected to lateral loads by portal, cantilever and girder factor method.	K4
5	Determine the shear Deflections of statically determinate beams by Force Method and displacement method.	K4

## SYLLABUS

<b>UNIT-I (8Hrs)</b>	<b>Column-analogy method:</b> Fixed-end moment for beams element with constant and variable moment of inertia by column-analogy method. Moments in quadrangular frames with one axis of symmetry and moments in unsymmetrical quadrangular frames by column-analogy method.
<b>UNIT-II (8Hrs)</b>	<b>Introduction to Matrix methods:</b> Introduction to matrix methods of structural analysis, static indeterminacy, kinematic indeterminacy, flexibility and Stiffness method for two span continuous beams. Analysis of single bay single storey portal frames by Flexibility matrix method and stiffness matrix method. (Up to two degrees of freedom)
<b>UNIT-III (8 Hrs)</b>	<b>Analysis for design moments in continuous systems:</b> Assumptions for vertical-load analysis. Gravity load patterns for maximum moments - design moments in beams-design moments in columns. Simplified method- analysis of multistory-frames by substitute frame method, subjected to gravity loads.

<b>UNIT-IV (8 Hrs)</b>	<b>Analysis of Multistory-frames by approximate methods for lateral loads:</b> lateral-load analysis of multistory frames. Degree of indeterminacy vs number of assumptions, Assumptions for lateral-load analysis. Analysis of multistory frames with wind loads by Portal Method, and Cantilever Method.
<b>UNIT-V (8 Hrs)</b>	<b>Effects of Shear Deformations:</b> General Introduction, shape Factor, shear Deflections of statically determinate beams, Relative significance of shear Deflections to Bending deformations. Force Method and displacement method
<b>Text Books:</b>	
1	Statically indeterminate structures – C.K. Wang, Mc Graw Hill Education PVT.LTD
2	Mechanics of structures Vol. II- S.B.Junnarkar and Dr.H.J.shah, Charotar Publishing House.
3	Structural analysis – Devdas Menon, Narosa Publishing House PVT.LTD
<b>Reference Books:</b>	
1	Matrix Analysis of framed Structures- Weaver& Gere
2	Basic Structural Analysis, C.S. Reddy, Mc Graw Hill Education(India) PVT.LTD
3	Structural Analysis- T.S. Thandavamoorthy, Oxford University Press, New Delhi



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4104	PE	3	--	--	3	25	75	3 Hrs.

## SOLID WASTE MANAGEMENT

(For CE)

### Course Objectives:

1	To introduce the problem of linear economy and resource depletion
2	To stress upon the importance of reuse, reduce, repair, refuse, recycle and reimagining
3	To emphasize the role of early segregation of wastes.
4	To discuss the possibilities of material and energy recovery from wastes
5	To brief the solid waste disposal methods.

### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Categorise and communicate the types of solid wastes, along with their sources	K2
2	Elaborate the strategies for the 6 R's of solid waste management	K2
3	Explain transport and segregation of solid wastes	K2
4	Suggest methods for material and energy recovery based on quality and quantity of solid wastes.	K2
5	Outline disposal methods of solid wastes.	K2

## SYLLABUS

<b>UNIT-I (06 Hrs)</b>	Introduction – Linear Economy vs Circular Economy - Solid wastes and its types – Sources– Characteristics of solid wastes: Physical, Chemical and biological characteristics- Problems due to improper disposal of solid waste.
<b>UNIT-II (08 Hrs)</b>	Solid Waste Management –Reuse, Reduction, recycling and recovery principles of waste management – Functional elements of solid waste management – Waste generation and handling at source – Collection of solid wastes – Collection methods and services guidelines for collection route layout.
<b>UNIT-III (08 Hrs)</b>	Transfer and Transport of Solid Wastes: Transfer station – Processing and segregation of the solid waste – Various methods of material segregation
<b>UNIT-IV (08 Hrs)</b>	Processing and transformation of Solid Wastes: Composting – advantages- methods – Incineration and its methods – advantages and disadvantages of incineration - energy recovery processes
<b>UNIT-V (06 Hrs)</b>	Ultimate disposal of Solid Waste: Volume reduction - open dumping, land filling techniques, design and operation of landfills- land farming – deep well injection



<b>Text Books:</b>	
1.	Solid and Hazardous Waste Management, 2nd Edition, M.N.Rao, Razia Sultana, BS Publications / BSP Books; 2nd edition (1 January 2020)
2.	Solid Waste Management, K Sasi Kumar, Prentice Hall India Learning Private Limited (1 January 2009)
3.	integrated Solid Waste Management by George Tchobanoglous, McGraw Hill Education (28 April 2014)
<b>Reference Books</b>	
1.	Solid And Hazardous Waste Management, P.M.Cherry, CBS Publishers (1 January 2017)
2.	Solid waste management rules notified by CPCB (2016), Government of India
3.	Municipal Solid Waste Manual by CPHEEO, Government of India



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4105	PE	3	--	--	3	25	75	3 Hrs.

## SURFACE HYDROLOGY

(For CE)

### Course Objectives:

1	The subject aims at making the students to understand the relevance of various components of hydrologic cycle, which are responsible for spatial and temporal Distribution of water availability in any region.
2	To study the various aspects of precipitation and abstractions and their analysis
3	To understand the concepts of catchment and the factors influencing runoff

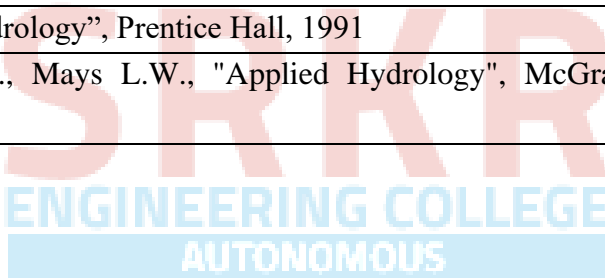
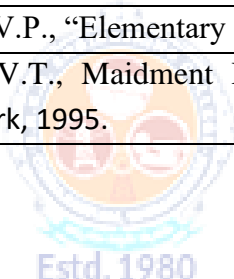
### Course Outcomes: The student will be able to

S.No	Outcomes	Knowledge Level
1	Obtain the complete knowledge on hydrologic cycle, hydrometeorology and formation of precipitation.	K2
2	Apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation and runoff.	K3
3	Know the various methods of runoff estimation.	K2
4	Analyse stream flow measurement by using various techniques.	K4

## SYLLABUS

<b>UNIT-I</b> (12Hrs)	<b>HYDROMETEOROLOGY:</b> Hydrologic cycle – Global water budget – Practical applications – Hydrometeorology – Constituents of atmosphere – Vertical structure of the atmosphere – general circulation – Transitory system – Air mass – Air front – cyclones – Formation of precipitation – Types and forms of precipitation – Climate and Weather – Meteorological Observations.
<b>UNIT-II</b> (10Hrs)	<b>PRECIPITATION:</b> Measurement of rainfall – Rain gauges – Radar Measurement of rainfall - Rainfall Hyetograph – Intensity Duration and Frequency analysis – Consistency – Missing data – Rain gauge network – Average depth of rainfall analysis – Annual rainfall of India.
<b>UNIT-III</b> (10Hrs)	<b>ABSTRACTIONS:</b> Water losses - Initial losses – Interception and depression storage – Evaporation – Evaporimeters – Estimation of Evaporation - Evapotranspiration – Field Measurement – Empirical Equations - Infiltration – Infiltrimeters – Infiltration Equations – Infiltration Indices.

<b>UNIT-IV (10Hrs)</b>	<b>RUNOFF:</b> Concept of catchment – Linear, Areal and Relief Aspects – Detailed study of Runoff process – Factors affecting Runoff – Hydrograph – Unit Hydrograph – Synthetic Hydrograph –Runoff estimation. Disaster Management
<b>UNIT-V (8Hrs)</b>	<b>STREAM FLOW MEASUREMENT:</b> Stage and Velocity Measurement – Gauges – Current meter and Doppler flow velocity meter - Discharge measurement – Area Velocity method - Area Slope method – Discharge Measuring Structures - Dilution Technique – Stage Discharge relationship – Selection of a Stream Gauging Site.
<b>Text Books:</b>	
1.	Irrigation and water power engineering by Dr.B.C.Punmia.
2.	Jaya Rami Reddy.P, "Hydrology", Laxmi Publications, New Delhi, 2004
3.	Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008, 2ndEdition, New Delhi, 2008.
<b>Reference Books:</b>	
1.	Singh, V.P., “Elementary Hydrology”, Prentice Hall, 1991
2.	Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, NewYork, 1995.



Code	Category	L	T	P	C	LM	E.M	Exam
B19CE4106	PE	3	--	--	3	25	75	3 Hrs.

## TRAFFIC MANAGEMENT

(For CE)

### Course Objectives:

1	To understand various concepts in traffic management.
2	To determine traffic regulations and rules.
3	To learn various concepts of Highway capacity.
4	To acquire knowledge about traffic safety measures and control devices.
5	To understand various design intersection methods.

### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Develop the schemes and policies for efficient traffic management.	K3
2	Design traffic control measures for all type of roads.	K4
3	Evaluate traffic control system alternatives for urban/rural roadways.	K3
4	Design traffic safety measures and traffic control devices for all type of roads.	K4
5	Develop and apply design intersection models at local and regional level road network	K3

## SYLLABUS

<b>UNIT-I (8Hrs)</b>	Traffic management – scope of traffic management measures – restrictions to turning movements – one-way streets – tidal flow operations-Traffic segregation –Traffic calming- Exclusive bus lanes, Introduction to ITS
<b>UNIT-II (8Hrs)</b>	Regulation of traffic – Need and scope of traffic regulations- Motor Vehicle Act – Speed limit at different locations- regulation of the vehicle – regulations concerning the driver rules of the road enforcement
<b>UNIT-III (10Hrs)</b>	<b>Highway capacity:</b> Its importance in transportation studies – basic, possible and practical capacity – determination of theoretical maximum capacity -passenger car units – level of service – concept in HC manual – factors affecting level of service.
<b>UNIT-IV (8Hrs)</b>	<b>Traffic Safety:</b> causes of road accidents – collection of accident data – influence of road, the vehicle .the driver, the weather and other factors on road accident – preventive measures. Traffic control devices : Signs, markings, islands ,channelization, one-way streets, speed breakers, bus stop locations, and bus ways, segregations, tidal flow arrangements, area traffic control, parking, pedestrian flow control.

<b>UNIT-V (8 Hrs)</b>	<b>Design of Intersection:</b> Design of at grade & grade separated intersection – rotary intersection – capacity of rotary intersection – traffic signals – warrants of traffic signals,- types of signals, signal coordination, design of fixed time signal –Webster’s approach.
<b>Text Books:</b>	
1	Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
2	JotinKhisty, S.C. and Kent Lall, B., Transportation Engineering – An Introduction, Prentice-Hall, NJ
3	S.C. Saxena Traffic Planning And Design .Dhanpat Rai Pub, NewDelhi.
<b>Reference Books:</b>	
1	Hutchison, B.G., Introduction to Transportation Engineering, & Planning, McGraw Hill Book Co.
2	Papacostas, C.S., Fundamentals of Transportation System Analysis, PHI
3	John W. Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Pub. Co.



Code	Category	L	T	P	C	LM	E.M	Exam
B19CE4107	PE	3	--	--	3	25	75	3 Hrs.

## ADVANCED STEEL STRUCTURES

(For CE)

### Course Objectives:

1	Understand the design of columns bases and eccentric shear connections.
2	Understand various components of a plate girder, design components of a plate girder by using IS code.
3	Understand the designing of elevated circular steel tanks in working stress method
4	Understand the specification of Plate girder bridge,
5	Understand types and design of bearings.

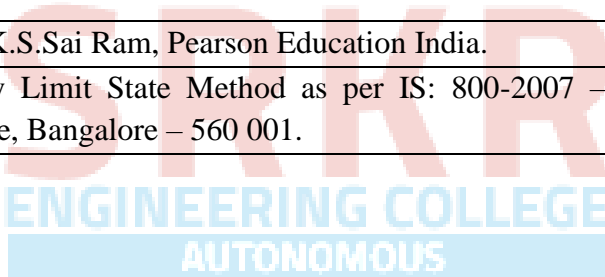
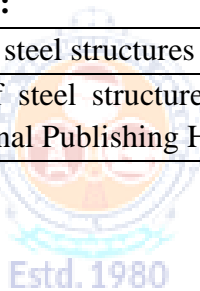
### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Determine the size and thickness of the slab base, gusset base and eccentric connections. Design of beam-column connections subjected to eccentric shear connections.	K4
2	Design components of a plate girder with and without stiffeners by using IS: 800-2007 code	K4
3	Design of circular water tank in working stress method.	K4
4	Design of deck type Plate girder bridges	K4
5	Design of end bearings	K4

## SYLLABUS

<b>UNIT-I (08 Hrs)</b>	<p><b>Column bases and Foundations:</b> Allowable stress in bearing, Slab base, Gusset base.</p> <p><b>Eccentric shear connections:</b> Introduction, beam-columns connections, connections subjected to eccentric shear: welded seat connections: unstiffened seat angle connection and stiffened seat angle connections.</p>
<b>UNIT-II (08 Hrs)</b>	<p><b>Plate Girders (Welded):</b> Components of a plate girder, Economical depth, proportioning of web and flanges, shear buckling resistance of web by simple post critical and tension field methods, connection of flange angles to web and flange angles to flange plates. Web stiffeners: Design of bearing stiffeners. End panel design, design of intermediate stiffeners, connections</p>
<b>UNIT-III (08 Hrs)</b>	<p><b>Water tanks:</b> Introduction, permissible stresses in water tanks, Design of circular steel water tank: forces acting over the tanks, stresses in elevated circular tanks, stresses in segmental and spherical bottoms, stresses in conical bottom, Design of circular girder (ring beam),staggering for</p>

	circular steel tanks, stresses in columns, wind bracings
<b>UNIT-IV (10 Hrs)</b>	<b>Bridges:</b> Classification, Loadings, Deck type and through type bridges, design of through type Plate girder bridges, design of stringers, cross girders, wind bracings.
<b>UNIT-V (06 Hrs)</b>	<b>Bearings:</b> Introduction, IS code requirements for bearing, Types of bearings-plate bearing Rocker bearing, Roller bearing, Knuckle pin bearing. Design of Rocker bearing and Roller bearing.
<b>Text Books:</b>	
1	Design of Steel structures by N. Subramanian, Oxford University Press.
2	Limit State Design of steel structures by S.K.Duggal, McGraw Hill Education Private Ltd.
3	Limit State Design of steel structures – Ramchandra and VirendraGehlot, Scientific Publishers (India)
<b>Reference Books:</b>	
1	Design of steel structures by K.S.Sai Ram, Pearson Education India.
2	Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House, Bangalore – 560 001.



Code	Category	L	T	P	C	LM	E.M	Exam
B19CE4108	PE	3	--	--	3	25	75	3 Hrs.
<b>EXPANSIVE SOILS</b>								
<b>(For CE)</b>								
<b>Course Objectives:</b>								
1	Understand the behaviour of expansive soil with moisture content, various foundation techniques and improvement of soil for construction of foundations.							
<b>Course Outcomes:</b> The Student will be able to								
S.No	Outcome							Knowledge Level
1	Understand the occurrence and effect of expansive soils.							K2
2	Understand the clay mineralogy of soil.							K2
3	Apply the knowledge of soil mechanics for predicting the heave of the soil.							K3
4	Design the foundation of structures for various field conditions.							K4
<b>SYLLABUS</b>								
<b>UNIT-I (08 Hrs)</b>	<b>Origin and Occurrence of expansive Soils:</b> Occurrence and Distribution in India-Moisture equilibrium-Soil, Structure, environmental interaction –Distress symptoms case histories.							
<b>UNIT-II ( 08 Hrs)</b>	<b>Identification of Expansive soils:</b> Soil Structure –Clay mineralogy; Swell potential-Field Exploration-Laboratory tests for identification.							
<b>UNIT-III (08 Hrs)</b>	<b>Prediction of heave – Osmotic and matric suction:</b> Methods of prediction of heave –Empirical Methods- 1-D Swell consolidation test by oedometer tests –soil moisture suction-field observations-shrinkage.							
<b>UNIT-IV (10 Hrs)</b>	<b>Remedial Foundation techniques:</b> Design considerations-individual and continuous footings –Stiffened mats, under reamed piles, codal provisions							
<b>UNIT-V (06 Hrs)</b>	<b>Chemical Stabilization and special Foundation:</b> Mechanical alteration-sand cushion technique-CNS concept-Chemical stabilization with lime,flyash and cement-Special foundations-Under reamed piles – Straight Shafted drilled piers-Belled Piers- Granular pile anchors.							



<b>Text Books:</b>	
1	Swami Saran (1998), Analysis and design of sub structures, Limit State Design, Oxford & IBH Publishing Co.Pvt.Ltd., 66, Janpath, New Delhi 110001
2	F.H.Chen (1995), Foundations in Expansive soils, Elsevier Publications.
<b>Reference Books:</b>	
1	R.E.Peck, W.E.Hansen & T.H.Thornburn (1996), Foundation Engineering, John Wiley
2	Varghese.P.C. (2005), Foundation Engineering, Prentice-Hall India Pvt Ltd



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4109	PE	3	--	--	3	25	75	3Hrs.

## REMOTE SENSING AND GIS APPLICATIONS

(For CE)

### Course Objectives:

- |   |  |
|---|--|
| 1 | To introduce the fundamentals of remote sensing data acquisition.                                |
| 2 | To familiarise with the structure and function of computer-based Geographic Information Systems. |
| 3 | To demonstrate the multidisciplinary nature of Geoinformatics applications.                      |

### Course Outcomes: The Student will be able

S.No	Outcome	Knowledge Level
1	Relate the scientific theories to the interaction of electromagnetic spectrum with terrestrial matter.	K2
2	Identify different types of satellites, sensor platforms and choose appropriate remote sensing data products for mapping, monitoring, and management applications.	K2
3	Interpret processed satellite images and outputs for extracting relevant information	K3
4	Structure the concept of a spatial decision support system in its analog and digital forms.	K2
5	Explain the applications of Geoinformatics in various fields of human endeavour	K2

## SYLLABUS

<b>UNIT-I (8 Hrs)</b>	<b>Introduction to Remote Sensing:</b> Introduction, Basic components of remote sensing, electromagnetic radiation & electromagnetic spectrum and its interaction with atmosphere, energy interaction with the earth surfaces, Sensors: types and characteristics, passive sensor, active sensor, Platforms: air borne remote sensing & space borne remote sensing.
<b>UNIT-II (8Hrs)</b>	<b>Image Analysis:</b> Introduction, elements of visual interpretations, Digital Image Processing-Image pre processing, Image rectification, Image enhancement, Image classification: Supervised classification, Unsupervised classification.
<b>UNIT-III (8Hrs)</b>	<b>Introduction to Geographic Information System (GIS):</b> Introduction, key components, application areas of GIS, Spatial data models: Raster data models, Vector data models, Raster versus Vector, Data input methods, Map projections.
<b>UNIT- IV (8Hrs)</b>	<b>Spatial Analysis:</b> 2D: Overlay Analysis – Applications, Network Analysis – Applications – 3D: Digital Elevation Model, Digital Surface Model, Digital Terrain Model– Applications in Area, Volume calculations and scenario planning.

<b>UNIT-V (8Hrs)</b>	<b>RS and GIS applications:</b> Land Cover and Land Use, Agriculture, Forestry, Geology, Geomorphology, Urban applications Flood zoning and mapping, Ground water prospects and Potential Recharge Zones, Watershed Management. Environmental Impact Assessment.
<b>Text Books:</b>	
1	Remote Sensing and GIS by Basu deb Bhatta, Oxford University Press
2	Remote Sensing and Geographical Information Systems by M. Anji Reddy, BS Publications
<b>Reference Books:</b>	
1	Principles of Geographical Information Systems by Peter A Burrough and Rachel A. Mc. Donnel, Oxford Publications
2	Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman, 7th Edition (2015), Wiley India Pvt. Ltd., New Delhi



Code	Category	L	T	P	C	LM	E.M	Exam
B19CE4110	PE	3	--	--	3	25	75	3 Hrs.

## CONSTRUCTION TECHNOLOGY & MANAGEMENT

(For CE)

### Course Objectives:

1	To introduce the concept of construction and project management including network drawings and Cost-Time optimization to the students
2	To introduce various equipment's like earth moving equipment, trucks and handling equipment related to construction
3	To introduce the importance of safety in construction projects

### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Understand the concept of construction management by applying the concepts of planning, scheduling and controlling	K2
2	Determine various time estimates of a project network	K3
3	Estimate the optimum cost –time relationship and update the project network	K3
4	Estimate the truck production and understand the functioning of various earth moving equipment	K3
5	Apply the safety norms and acts in construction industry	K3

## SYLLABUS

<b>UNIT-I (08 Hrs)</b>	Construction Management scope and Significance, Qualities of project Manager. Planning, Scheduling and controlling of a project. Bar charts, Milestone charts, weaknesses in Bar charts.
<b>UNIT-II (08 Hrs)</b>	PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's rule) : Dummy activities, Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack, project duration, Start and Finish time estimates, Floats
<b>UNIT-III (08 Hrs)</b>	Cost Time Optimization – Direct and Indirect project costs – Total costs – Cost Slopes – Crashing. Updating– Process of updating; when to update
<b>UNIT-IV (10 Hrs)</b>	Construction equipment - economic considerations - earthwork equipment - Trucks and handling equipment - rear dump trucks - capacities of trucks and handling equipment- calculation of truck production

<b>UNIT-V (06 Hrs)</b>	Concept and importance of Safety in Construction Industry, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948. Construction Safety Problems, Approaches to improve Construction Safety
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**Text Books:**

1	Project Planning and Control with PERT and CPM by B.C.Punmia
2	Construction Planning Equipment and Methods, Peurifoy and SchexnayderShapira, Tata Mcgrawhill
3	Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson

**Reference Books:**

1.	Construction Project Management. An Integrated Approach, Peter Fewings Taylor and Francis
2	Construction Management Emerging Trends and Technologies, Trefor Williams, Cengagelearning
3	Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi,



Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4111	PE	3	--	--	3	25	75	3 Hrs.

## DESIGN OF ADVANCED REINFORCED CONCRETE STRUCTURES

(For CE)

### Course Objectives:

1. Understand the design concepts of cantilever and counter fort retaining walls.
2. Understand the design concept of reinforced concrete water tanks.
3. Understand the design concept of reinforced concrete bridges.
4. Understand design concept of piles and pile cap
5. Understand the design concept of flat slabs.

### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1.	Distinguish between the behavior of cantilever and counter fort retaining walls and design the cantilever and counter fort retaining walls.	K4
2.	Design the reinforced concrete circular and rectangular water tanks.	K4
3.	Design the reinforced concrete T-beam bridge.	K4
4.	Design the piles and pile cap.	K4
5.	Design the flat slabs.	K4

## SYLLABUS

### UNIT-I (12 Hrs)

**Design of Retaining Walls:** Types of retaining walls and their behavior, forces on retaining walls, Theories of Earth pressures-Rankine's and Coulomb's earth pressure theories (  $c$  and  $\phi$  soils). Earth pressures and Stability requirements. Soil bearing pressure requirements. Drainage of retaining walls. Proportioning and Design of cantilever and counterfort retaining walls- position of Stem on base slab for economical design. Proportioning and Design of Elements of cantilever wall- Thickness of Base slab and Stem, design of stem, Toe and Heel Slab. Proportioning and Design of Elements of a counter fort wall- Thickness of various elements, design of stem, Toe and Heel Slab, Design of counter forts..

### UNIT-II (14 Hrs)

**Water Tanks:** Classification-Basis of Design-Permissible stress in concrete and steel in water tanks-Joints in tanks- Flexible joint-Joints of bottom slabs of tanks-Joints between wall and floor-Tanks resting on ground-Circular tank on ground with flexible joint between wall and the base slab Approximate design of circular tanks with walls restrained at the base-Rectangular tanks on ground-Analysis of a tank wall section subjected to bending moment and pull-Overhead tanks- Intze tank including staging, -Underground rectangular tanks.

<b>UNIT- III</b> <b>(15 Hrs)</b>	<b>Bridges:</b> Components of a bridge in sub structure and super structure. Classification of bridges. Highway loading standards, kerbs, footpaths, railings, parapet loadings, Impact. Longitudinal forces. Design of solid slabs Design of T-beam bridge deck slab, Longitudinal and Cross beams Courbon's theory.
<b>UNIT- IV</b> <b>(10 Hrs)</b>	<b>Design of Piles:</b> Behaviour of piles. Static formula for pile capacity, dynamic pile formula, Pile groups. Structural design of piles-design of bored cast in situ piles (bearing and friction types), under reamed piles. <b>Design of Pile caps:</b> Code requirements for pile cap design Sectional method of design of pilecap, Strut-and-tie model for pile caps, Detailing of pile caps.
<b>UNIT-V</b> <b>(12 Hrs)</b>	<b>Design of Flat Slabs:</b> Introduction, Proportioning of Flat slabs- Thickness of flat slabs, Drop panel, Column Heads, Shear Caps, behaviour of flat slabs, Methods of Analysis-Direct Design Method, Equivalent Frame method, Transfer of Moments to column. Shear in Flat slabs- Oneway and Two-way shear. Design procedure for flat slabs, Detailing of reinforcement.
<b>Text Books:</b>	
1	Reinforced concrete design by S.Unnikrishna Pillai & Devdas Menon, TataMc.Graw Hill, New Delhi.
2	Limit State Design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi.
3	Reinforced concrete Limit state design by Ashok K. Jain, Nem Chand & Bros, Roorkee.
<b>Reference Books:</b>	
1	Fundamentals of Reinforced concrete design by M.L.Gambhir, Printice Hall of India Private Ltd., New Delhi.
2	Reinforced concrete structural elements-behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill,1994.
3	Design of concrete structures – ArthusH.Nilson, David Darwin, and ChorlesW. Dolar, Tata Mc.Graw-Hill, 3rd Edition, 2005.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4112	PE	3	--	--	3	25	75	3Hrs.

## DISASTER MANAGEMENT AND PREPAREDNESS

(For CE)

### Course Objectives:

- |   |   |
|---|---|
| 1 | To apprise about disasters, their types and impact on affected communities                    |
| 2 | To familiarise with disaster management paradigms adopted by the government at various levels |
| 3 | To emphasise the role of engineering and technology in disaster mitigation and management     |

**Course Outcomes:** The Student will be able to

S.No	Outcome	Knowledge Level
1	Differentiate between the types of disasters, their causes and impact on environment and society.	K2
2	Analyse relationship between development and disasters	K4
3	Express the relation between development and disasters	K3
4	Summarise the role of education and community engagement in disaster mitigation	K2
5	Paraphrase the role of engineering and technology in disaster management.	K2

## SYLLABUS

<b>UNIT-I (8Hrs)</b>	<p><b>Concepts and definitions:</b> Disaster, disaster Management, hazard, vulnerability, Risk, capacity building, mitigation. Types of Disasters, five priorities for action, relationship between disaster and human development –Disasters classification; Natural disasters –floods, Drought, earthquake, cyclone, Landslide. Manmade disasters –industrial pollution, nuclear radiation, chemical spills, bioterrorism, transportation accidents. Hazard and vulnerability profile of India.</p>
<b>UNIT-II (8Hrs)</b>	<p><b>Disaster Impacts:</b> Introduction, Life and livestock loss, Habitation, agricultural and livelihood loss, Additional health hazards, Contamination of drinking water sources, impact on Children, Environmental loss. Impacts of climate change, greenhouse gases.</p>
<b>UNIT-III (8Hrs)</b>	<p>Disaster management cycle-its phases, prevention, mitigation, preparedness, relief &amp; recovery; structural and non-structural measures, basic strategies and practices of disaster risk reduction, global policies and practices, risk management framework, vulnerability, and capacity assessment.</p>
<b>UNIT-IV (8Hrs)</b>	<p><b>Education and Community Preparedness:</b> Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery-Community based disaster management and social capital-Designing resilience- building community capacity for action.</p>



<b>UNIT-V (8 Hrs)</b>	<b>Role of Technology in Disaster Management:</b> Disaster management for infrastructures, mitigation program for earthquakes –flowchart, geospatial information in agriculture drought assessment- multimedia technology in disaster risk management and training- Transformable indigenous knowledge in disaster reduction.
<b>Text Books:</b>	
1	Disaster Management–Global Challenges and Local Solutions’ by Rajibshah & RR Krishnamurthy (2009), Universities press.
2	‘Disaster Management–Future Challenges and Opportunities’ by Jagbir Singh (2007), IK International Publishing House Pvt. Ltd.
<b>Reference Books:</b>	
1	‘Disaster Management’ edited by HK Gupta (2003) Universities press.
2	‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt.Ltd., New Delhi.



Code	Category	L	T	P	C	LM	E.M	Exam
B19CE4113	PE	3	--	--	3	25	75	3 Hrs.

## SOIL DYNAMICS AND MACHINE FOUNDATIONS

(For CE)

### Course Objectives:

1	Understand the fundamental concepts of theory of vibration and the various terminology encompassed to study the behaviour of soils due to the effects of dynamic loads.
2	To recognize phenomenon of Vibration Isolation & assess the nature of wave propagation through soil
3	To study about the dynamic soil properties & their determination by field and laboratory tests & create an understanding about the general principles of analysis and design of machine foundation

### Course Outcomes: The student will be able to

S.No	Outcome	Knowledge Level
1	Develop skill in applying theory of vibrations to basic facets of soil behaviour under dynamic loading together with the exposure of the fundamental principles of wave propagation in engineering examples.	K3
2	Classify theories of vibrations	K2
3	Calculate modulus of elasticity and Poisons ratio from field and laboratory tests	K3
4	Classify types of machine foundations	K3
5	Design impact type of foundations using IS code provisions	K4

## SYLLABUS

<b>UNIT-I (10Hrs)</b>	Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping - Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.
<b>UNIT-II (12Hrs)</b>	Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung’s solutions -- Pauw’s Analogy – Heigh’s Theory.
<b>UNIT-III (12Hrs)</b>	Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests. – Block vibration test – Determination of Damping factor.

<b>UNIT-IV (8Hrs)</b>	Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.
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<b>UNIT-V (8 Hrs)</b>	Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.
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**Text Books:**

1	Vibrations of Soils and Foundations by Richart Hall and Woods
2	Dynamics of bases and Foundations by D DBarkar

**Reference Books:**

1	Vibration Analysis and Foundation Dynamics by NSV Kameswara Rao, Wheeler Publishing, New Delhi.
2	Foundations of Machines- Analysis and Design by Prakash and Puri.
3	Fundamentals of Soil Dynamics by B M Das



Code	Category	L	T	P	C	LM	E.M	Exam
B19CE4114	PE	3	--	--	3	25	75	3 Hrs.

## INTELLIGENT TRANSPORT SYSTEM

(For CE)

### Course Objectives:

1	To know the fundamentals of ITS
2	To study sensor technologies and Data requirements of ITS
3	To know ITS functional areas and user services
4	To study various kinds of ITS architecture
5	To study ITS applications in various fields of transportation engineering

### Course Outcomes: The Student will be able to

S.No	Outcome	Knowledge Level
1	Identify the benefits of ITS from various types	K2
2	Determine various sensor applications and ITS data collection techniques	K3
3	Identify ITS user services and functional areas	K2
4	Determine various ITS models, evaluation methods and ITS planning.	K3
5	Determine the suitable ITS technology and assess its effectiveness to solve transportation Problems.	K3

## SYLLABUS

<b>UNIT-I (8Hrs)</b>	<b>Fundamentals of ITS:</b> Definition of ITS s, The historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.
<b>UNIT-II (8Hrs)</b>	<b>Sensor technologies and Data requirements of ITS:</b> Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centres; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.
<b>UNIT-III (8Hrs)</b>	<b>ITS functional areas</b> – Advanced Traffic Management systems (ATMS), Advanced TravelerInformation systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control systems (AVCS), Advanced Public Transportation systems (APTS), Advanced RuralTransportation systems (ARTS). ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

<b>UNIT-IV (8Hrs)</b>	<b>ITS Architecture</b> – Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.
<b>UNIT-V (8 Hrs)</b>	<b>ITS applications:</b> Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions Automated Highway Systems- Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.
<b>Text Books:</b>	
1	Fundamentals of intelligent transportation systems planning ByMashrur A. Chowdhury, Adel Wadid Sadek.
2	ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.
<b>Reference Books:</b>	
1	Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
2	National ITS Architecture Documentation, US Department of Transportation, 2007.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4115	PR	--	--	6	3	20	30	3 Hrs.

**PROJECT WORK - I**

**(For CE)**

**Course Objectives:**

Apply the engineering Knowledge to develop a project in their interested area of civil engineering, in order to gain real-time industry-oriented practical application by solving present-day problems in civil engineering.

**Course Outcomes:** The Student will be able to

S.No	Outcome	Knowledge Level
1	Research and analyze the published literature on the relevant topic.	K4
2	Study existing methodologies relevant to their chosen problem.	K4
3	Determine the objective based on gaps in the literature.	K4
4	Develop the abstract of the chosen problem.	K5
5	Develop methodology for conducting the Experimentation/modeling.	K6

\*The object of Project Work I is to enable the student to take up investigative study in the broad field of Civil Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or a group of students, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

The assignment to normally include:

- a) Survey and study of published literature on the assigned topic.
- b) Working out a preliminary approach to the problem relating to the assigned topic.
- c) Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/ Feasibility.
- d) Preparing a written report on the study conducted for presentation to the department.
- e) Final Seminar, as oral Presentation before a departmental committee.



## SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

All UG Programmes are Accredited by NBA

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### CIVIL ENGINEERING

(Accredited by NBA)

#### SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

**IV/IV B.TECH**

**II-SEMESTER**

(With effect from **2019-2020** Admitted Batch onwards)

Course Code	Name of the Course	Category	Cr.	L	T	P	Internal Marks	External Marks	Total Marks
B19CE4201	Water Resources Engineering-II	PC	3	3	--	--	25	75	100
#OE-III	Open Elective-III	OE	3	3	--	--	25	75	100
B19CE4202	Irrigation Structures Design & Drawing	PC	2	1	--	2	20	30	50
B19CE4203	Project Work-II	PR	8	--	--	16	60	90	150
<b>TOTAL</b>			<b>16</b>	<b>7</b>	<b>--</b>	<b>18</b>	<b>130</b>	<b>270</b>	<b>400</b>

#OE-III	Student has to study one Open Elective offered by CSE or ECE or EEE or IT or ME or S&H from the list enclosed.
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Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4201	PC	3	--	--	3	25	75	3 Hrs.
<b>WATER RESOURCES ENGINEERING-II</b>								
<b>(For CE)</b>								
<b>Course Objectives:</b>								
1.	Students will be able to understand the design of canal falls and cross drainage works.							
2.	Classification of river training works and usage of hydro power							
<b>Course Outcomes:</b> The Student will be able to								
S.No	Outcome							Knowledge Level
1.	Design Irrigation canals							K4
2.	Understand the various storage works and Diversion works							K2
3.	Classify river training works.							K2
4.	Use the principal components of hydroelectric scheme							K2
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10Hrs)</b>	<b>Canal Systems:</b> Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedy’s and Lacey’s theories, Design problems –Water logging – Causes and control – Land drainage; Canal lining – methods, Design of lined canals.							
<b>UNIT-II</b> <b>(12Hrs)</b>	<b>Storage Works:</b> Classification of dams, Factors governing selection of types of dam, Selection of site. <b>Gravity Dams:</b> Forces acting on a gravity dam, Modes of failure – Elementary and Practical profiles, Principal and shear stress – Galleries, Foundation treatment of gravity dam. <b>Earth Dams:</b> Types, Foundation for earth dams, Causes for failure of earth dams– Seepage control through body and foundation. <b>Spillways:</b> Essential requirements, Components, Types of spillways and their working, Design of ogee spillway, Energy dissipation below spill way, Use of hydraulic jump as energy dissipater – USBR and IS standard basins.							
<b>UNIT-III</b> <b>(10Hrs)</b>	<b>Diversion Head Works:</b> Types, Location and components, Blighs, Lanes and Khoslas theories, Method of independent variables, Design of vertical drop weir, Silt control devices. <b>Regulation Works:</b> Canal falls – Definition, Classification of falls, Design principles of syphon well drop, Notch fall; Cross regulator and Distributary head regulator – Design of cross regulator and Distributor head regulator. <b>Cross Drainage Works:</b> Types, Classification of aqueducts, Design principles of different types of aqueducts.							



<b>UNIT-IV (8Hrs)</b>	<b>River Training Works:</b> River Training and its objectives, Classification of river training works, Marginal embankment, Guide banks, Groynes, cutoffs, Bank pitching, Launching aprons, Miscellaneous types of river training works.
<b>UNIT-V (8Hrs)</b>	<b>Water Power engineering:</b> Development of hydro power in India, Assessment of available power, Utilization factor, Load factor, Diversity factor, Storage and Pondage; Types of hydropower schemes; Components of hydel schemes – Fore bay, Intake structure, Trash racks, Surge tanks; Water hammer pressure, Substructure and Superstructure of power house.
<b>Text Books:</b>	
1.	Garg S.K., Hydrology and Water Resources Engineering
2.	Subramanya, K., Engineering Hydrology, Tata McGraw Hill, New Delhi.
3.	Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.
<b>Reference Books:</b>	
1.	Dr.P.Jaya Rami Reddy, A Textbook of Hydrology, University Science Press.



Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4202	PC	1	--	2	2	20	30	3 Hrs.
<b>IRRIGATION STRUCTURES DESIGN AND DRAWING</b>								
<b>(For CE)</b>								
<b>Course Objectives:</b>								
1	The paper - space environment thoroughly, components using 2D & 3D wire frame models through various editing commands, assemble of various components of compound solids and irrigation canal structures							
<b>Course Outcomes:</b> The student will be able to								
S.No	Outcomes							Knowledge Level
1.	Understand the paper - space environment thoroughly							K2
2.	Develop the components using 2D & 3D wire frame models through various editing commands.							K3
3.	Explain assemble of various components of compound solids.							K3
4.	Design irrigation canal structures.							K4
<b>LIST OF EXPERIMENTS</b>								
1.	Design and drawing of the following Irrigation Structures Tank Surplus weir							
2.	Barrage							
3.	Glacis type of canal drop							
4.	Notch fall							
5.	Siphon Aqueduct- type III							
6.	Cross regulator and head regulator							
<b>Reference Books:</b>								
1.	Water Resources Engineering, by C.SatyanarayanaMurty							
2.	Water Resources Engineering, by SK Garg							
3.	Design of Irrigation Structures by RSN Murthy							
<b>Note: *ISDD External marks are allotted based on Theoretical Design and External viva-voce only</b>								

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE4203	PR	--	--	16	8	60	90	3 Hrs.

### PROJECT WORK - II

(For CE)

#### Course Objectives:

Apply the engineering Knowledge to develop a project in their interested area of civil engineering, in order to gain real-time industry-oriented practical application by solving present-day problems in civil engineering

**Course Outcomes:** Student will be able to

S.No	Outcomes	Knowledge Level
1	Work in team to Execute the Experimental work/ Computer modelling following the methodology.	K5
2	Obtain results from the Experimental program.	K4
3	Analysis and discuss the results to draw conclusions.	K5
4	prepare documentation and communicate technical concepts.	K6

\* The object of Project Work II & Dissertation is to enable the student to extend further the investigative study taken up under Project Work I, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership.

The assignment to normally include:

- a) In depth study of the topic assigned in light of Report prepared under Project Work I.
- b) Review and finalization of the approach to the problem relating to the assigned topic.
- c) Preparing an Action Plan for conducting the investigation, including teamwork.
- d) Detailed Analysis/ Modeling/Simulation/Design/Problem Solving/Experiment as needed.
- e) Final development of product/process, testing, results, conclusions, and future directions.
- f) Preparing a paper for Conference presentation/publication in Journals, if possible.
- g) Preparing a dissertation in the standard format for being evaluated by the department.