



SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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

UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA, Accredited by NAAC with A+
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Estd:1980

Regulation: R20		IV / IV - B.Tech. I - Semester							
CIVIL ENGINEERING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CE4101	Estimation, specifications & contracts	PC	3	3	0	0	30	70	100
#PE-III	Professional Elective -III	PE	3	3	0	0	30	70	100
#PE-IV	Professional Elective -IV	PE	3	3	0	0	30	70	100
#PE-V	Professional Elective -V	PE	3	3	0	0	30	70	100
#OE-III	Open Elective-III	OE	3	3	0	0	30	70	100
#OE-IV	Open Elective-IV	OE	3	3	0	0	30	70	100
B20CE4114	Irrigation Structures Design and Drawing (Skill Oriented Course)	SOC	2	1	0	2	--	50	50
B20CE4115	Industrial/Research Internship 2 Months	PR	3	--	--	--	--	50	50
TOTAL			23	19	0	2	180	520	700

	Course Code	Course
#PE-III	B20CE4102	Design of Advanced RCC Structures
	B20CE4103	Solid Waste Management
	B20CE4104	Surface Hydrology
	B20CE4105	Soil Dynamics & Machine Foundation
#PE-IV	B20CE4106	Repairs, Retrofitting and Rehabilitations of structures
	B20CE4107	Ground Improvement Techniques
	B20CE4108	Traffic management
	B20CE4109	Construction Technology & Management
#PE-V	B20CE4110	Prestressed Concrete
	B20CE4111	Expansive soils
	B20CE4112	Advanced Water Resources Engineering
	B20CE4113	Disaster Management and Preparedness
#OE-III & #OE-IV	Student has to study one Open Elective each from OE-III & IV offered by AIDS or CSBS or CSE or ECE or EEE or IT or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	IM	EM	Exam
B20CE4101	PC	3	---	---	3	30	70	3 Hrs.

ESTIMATION SPECIFICATIONS & CONTRACTS

(For CE)

Course Objectives:

1	To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply, road works and irrigation works
2	To Equip the student with the ability to do rate analysis
3	To develop the valuation of properties and preparation of reports for estimation of various items of work

Course Outcomes: At the end of the course, students will be able to

S. No	Outcome	Knowledge Level
1	List out various components, estimations and units of measurement for different works	K2
2	Apply the method of building estimate to find out the quantities of various items of work	K3
3	Determine the rate per unit of various items of work and their specifications	K3
4	Interpret the estimation of various roads and related items	K3
5	Select various methods to find out the valuation of a property & contracts	K3

SYLLABUS

UNIT- I (8 Hrs.)	Definitions-Importance of estimation and costing, Standard units, Units of measurement of different items of work. ,Different types of estimates, Data required for preparation of estimate, Different technical terms in estimation- Contingencies, Work charged Establishments, measurement book, schedule of rates and related terms in the estimate, different types of approvals.
UNIT- II (12 Hrs.)	Detailed estimate of buildings: Different items of work in building; Long wall and short wall method of building estimate, Centre line method of building estimate. Estimation of an RCC framed structure; Bar bending schedule- Beam and slab.
UNIT- III (12 Hrs.)	Specifications: Meaning, purpose, types of specifications, general specification, detailed specifications of different items of buildings and other structures – Rate analysis –Data sheet for materials and various items of work in buildings and other structures, schedule of rates.
UNIT- IV (8 Hrs.)	Estimate of earth work in roads; different formulae for calculations, Estimate of metalled road

UNIT-V (8 Hrs.)	Valuation of buildings & Contracts: Purpose, different methods of building valuation; different terms used in valuation and their meaning, Types of contracts, Contract Documents, Conditions of contract.
Text Books:	
1	Estimating and Costing in Civil Engineering by B.N. Dutta.
2	Estimation, Costing, Specifications and Valuation in civil Engineering by M. Chakraborti.
Reference Books:	
1	Textbook of Estimating and Costing by G.S. Birdie.
2	Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli.



Code	Category	L	T	P	C	IM	EM	Exam.
B20CE4102	PE	3	---	---	3	30	70	3 Hrs.

DESIGN OF ADVANCED RCC 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 the design concept of piles and pile cap
5	Understand the design concept of flat slabs.

Course Outcomes: At the end of the course, students 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 (LSM) : 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 ϕ -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 (10 hrs.)	Water Tanks (WSM): 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-Rectangular tanks below ground level- Overhead tanks- Intze tank including staging.
UNIT- III (10 Hrs.)	Bridges (WSM): 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.

UNIT- IV (10 Hrs.)	<p>Design of Piles (WSM): 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.</p> <p>Design of Pile caps: Code requirements for pile cap design Sectional method of design of pilecap, Strut-and-tie model for pile caps, Detailing of pile caps.</p>
UNIT- V (10 Hrs.)	<p>Design of Flat Plates and Flat Slabs (WSM): 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 plates and Flat slabs- Oneway and Two-way shear. Design procedure for flat slabs and plates, Detailing of reinforcement.</p>
Text Books:	
1	Reinforced concrete design by S.Unni krishna 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.
Reference Books:	
1	Reinforced concrete Limit state design by Ashok K. Jain, Nem Chand & Bros, Roorkee.
2	Fundamentals of Reinforced concrete design by M.L.Gambhir, Printice Hall of India Private Ltd., New Delhi.
3	Reinforced concrete structural elements–behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill,1994.
4	Design of concrete structures – Arthus H.Nilson, David Darwin, and ChorlesW. Dolar, Tata Mc.Graw-Hill, 3rd Edition, 2005.

Code	Category	L	T	P	C	IM	EM	Exam
B20CE4103	PE	3	---	---	3	30	70	3 Hrs.
SOLID WASTE MANAGEMENT								
(For CE)								
Course Objectives:								
1	To introduce the problems due to improper disposal of solid waste							
2	To stress upon the importance of reuse, reduce, recycle and repairing							
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: At the end of the course, students will be able to								
S. No.	Outcome							Knowledge Level
1	Categorize and communicate the types of solid wastes, along with their sources							K2
2	Elaborate the strategies for the 4 R's of solid waste management							K3
3	Explain transport and segregation of solid wastes							K3
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								
UNIT-I (8 Hrs)	Solid wastes and its types – Sources– Characteristics of solid wastes: Physical, Chemical and biological characteristics- Problems due to improper disposal of solid waste.							
UNIT-II (10 Hrs)	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.							
UNIT-III (8 Hrs)	Transfer and Transport of Solid Wastes: Transfer station – Processing and segregation of the solid waste – Various methods of material segregation							
UNIT-IV (10 Hrs)	Processing and transformation of Solid Wastes: Composting – advantages- methods – Incineration and its methods – advantages and disadvantages of incineration - energy recovery processes							
UNIT-V (8 Hrs)	Ultimate disposal of Solid Waste: Volume reduction - open dumping, land filling techniques, design and operation of landfills- land farming – deep well injection							

Text Books:	
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)
Reference Books:	
1.	Solid And Hazardous Waste Management, P.M.Cherry, CBS Publishers (1 January 2017)
2.	Integrated Solid Waste Management by George Tchobanoglous, McGraw Hill Education (28 April 2014)
3.	Solid waste management rules notified by CPCB (2016), Government of India
4.	Municipal Solid Waste Manual by CPHEEO, Government of India
5.	Environmental Engineering by HOWARD S PEAVY Mc Graw Hill International Editions



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4104	PE	3	---	---	3	30	70	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: At the end of the course, students will be able to								
S. No.	Outcome							Knowledge Level
1	Express 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	Differentiate various methods of runoff estimation.							K2
4	Analyse stream flow measurement by using various techniques.							K4
SYLLABUS								
UNIT-I (12Hrs)	HYDROMETEOROLOGY: 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.							
UNIT-II (10Hrs)	PRECIPITATION: 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.							
UNIT-III (10Hrs)	ABSTRACTIONS: Water losses - Initial losses – Interception and depression storage – Evaporation – Evaporimeters – Estimation of Evaporation - Evapotranspiration – Field Measurement – Empirical Equations - Infiltration – Infiltrimeters – Infiltration Equations – Infiltration Indices.							
UNIT-IV (10Hrs)	RUNOFF: 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							

UNIT-V (8Hrs)	STREAM FLOW MEASUREMENT: 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.
Text Books:	
1.	Irrigation and water power engineering by Dr.B.C.Punmia.
2.	Jaya Rami Reddy P, "Hydrology", Laxmi Publications, New Delhi, 2004
Reference Books:	
1.	Singh, V.P., “Elementary Hydrology”, Prentice Hall, 1991
2.	Patra.K.C, "Hydrology and Water Resources Engineering", Narosa Publications, 2008, 2ndEdition, New Delhi, 2008.
3.	Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, NewYork, 1995.



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4105	PE	3	---	---	3	30	70	3 Hrs.

SOIL DYNAMICS AND MACHINE FOUNDATIONS

(For CE)

Course Objectives:

1	Understand the fundamental concepts of theory of vibration and the various terminologies 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: At the end of the course, students 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

UNIT-I (10 Hrs)	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.
UNIT-II (12 Hrs)	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.
UNIT-III (12 Hrs)	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.

UNIT-IV (8 Hrs)	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.
UNIT-V (8 Hrs)	Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.
Text Books:	
1	Vibrations of Soils and Foundations by Richart Hall and Woods
2	Dynamics of bases and Foundations by D D Barkar
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	IM	EM	Exam
B20CE4106	PE	3	---	---	3	30	70	3 Hrs.

REPAIRS, RETROFITTING AND REHABILITATIONS OF STRUCTURES

(For CE)

Course Objectives:

1	To describe causes of distress in concrete structures and plan repair strategies.
2	To explain issues on serviceability and durability of concrete
3	To throw light on various repair materials and their characteristics
4	To demonstrate repair techniques and protection measures
5	To illustrate suitable retrofitting schemes.

Course Outcomes: At the end of the course, students will be able to

S. No.	Outcome	Knowledge Level
1	Describe the reasons for deterioration in the concrete structures	K3
2	Evaluate the damage of concrete structures using various techniques like destructive and non-destructive tests	K3
3	Explain various parameters influencing the serviceability and durability of structures	K3
4	Understand the suitability of certain materials for a specific type of repair	K2
5	Recognize suitable techniques for repair and retrofitting.	K3

Estd. 1980

SYLLABUS

UNIT- I (10 Hrs.)	Concept: Definition of Repair, Retrofitting, strengthening and rehabilitation. Types of failure/damages in concrete structures. Causes of deterioration of concrete structures. Cracking-Types, causes and characteristics. Cracking in masonry walls and RCC structures.
UNIT- II (10 Hrs.)	Damage Assessment: Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive, and semi destructive testing systems
UNIT- III (10 Hrs.)	Influence on Serviceability and Durability of Concrete: Strength, Durability and Thermal properties– Effects due to climate, temperature, Corrosion- Effects of cover thickness and cracking. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.
UNIT- IV (10 Hrs.)	Materials for Repair: Artificial fibre reinforced polymer like CFRP, GFRP, AFRP. Adhesive like Epoxy Resin, Special concretes and mortars, sulphur infiltrated concrete, polymer concrete, Expansive cement, Ferrocement, concrete chemicals, special elements

	for accelerated strength gain.
UNIT- V (10 Hrs.)	<p>Techniques for Repair: Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning.</p> <p>Techniques for Retrofitting: Retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique, near surface mounted (NSM) technique, External post-tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building.</p>
Text Books:	
1	Poonam I. Modi, Chirag N. Patel, "Repair and Rehabilitation of Concrete Structures", PHI Learning private limited, Delhi.
2	J Bhattacharjee, "Concrete Structures: Repair, Rehabilitation and Retrofitting", CBS Publishers and Distributors Pvt. Ltd, New Delhi.
Reference Books:	
1	R T. Allen and S.C. Edwards, "Repair of concrete Structures", Blakie and sons, UK.
2	Santhakumar, A. R. "Training Course notes on damage assessment and Repair in Structures"
3	Raikar, R. N. "Learning from failures –deficiencies in Design, construction and service" R&Dcentre(SDCPL), Raikar Bhavan, Bombay.
4	D Campbell- Allen and Harold Roper, "Concrete Structures: Materials, Maintenance and Repair", Longman Scientific and Technical, U.K.
5	F. K. Garas, J. L. Clarke, G.S.T. Armer, "Structural Assessment", Butterworths, UK.
6	A.R. Santhakumar, "Concrete chemicals – Theory and applications, Indian society for construction Engineering and Technology", Madras

Code	Category	L	T	P	C	IM	EM	Exam
B20CE4107	PE	3	---	---	3	30	70	3 Hrs.
GROUND IMPROVEMENT TECHNIQUES								
(For CE)								
Course Objectives:								
1	Various techniques of in-situ ground modification.							
2	Concepts, purpose and effects of grouting.							
3	Knowledge of reinforcement to soils in the form of geo textiles and geo grids.							
4	Basic knowledge on various ground improvement techniques and their suitability for various types of soil conditions.							
Course Outcomes: At the end of the course, students will be able to								
S. No.	Outcome							Knowledge Level
1	Apply in-situ densification methods for improving cohesive and cohesion less Soil deposits							K3
2	Apply grouting technique for improving soils							K3
3	Understand the purpose of geo textile and geo grid							K2
4	Apply the concepts of reinforced soil to various structures							K3
5	Understand various soil stabilization techniques							K2
SYLLABUS								
UNIT- I (8 Hrs.)	In-situ densification Methods: Granular soils–Introduction of vibration at the ground surface, Impact at the ground surface, vibration at depth, impact at depth, field compaction control; Cohesive soils- introduction, pre loading or de watering, drain walls, sand drains, sand wicks ,geo drains /band drains, lime columns, Stone columns: construction practice, comparison with lime column, design principles, vibro floatation techniques and other techniques like dynamic replacement etc., forced vacuum pre consolidation, thermal methods.							
UNIT- II (8 Hrs.)	Grouting: Introduction, grout injections, suspension and solution grouts, grouting equipment and methods, applications.							
UNIT- III (8 Hrs.)	Geo synthetics: Geo textiles: Introduction, types of geo textiles; Functions and their application, tests for geo textile, Geo grids: Introduction, types, functions and applications, tests for geo grids.							
UNIT- IV (8 Hrs.)	Reinforced Soil: Principles, components of reinforced soil, functions, determination of angle of inter facial friction, factors effecting angle of inter facial friction, application of reinforced soil technique.							

UNIT- V (8 Hrs.)	Stabilization: Mechanical stabilization, Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization: types of admixtures, mechanism, factors affecting, construction methods.
Text Books:	
1	Purushothama Raj.P,“Ground Improvement Techniques”, 2nded., Laxmi Publications(p) Ltd., New Delhi, 1998.
2	Engineering with Geosynthetics by G.Venkatappa Rao and G.V.S.Suryanarayana Raju–Tata McGraw Hill, New Delhi, 1990.
Reference Books:	
1	Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla, Jian-Hua Yin, CR C Press.
2	Construction and Geotechnical Methods in Foundation Engineering, Robert M. Koerner: McGraw Hill.
3	NPTEL: https://nptel.ac.in/courses/105108075/



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4108	PE	3	---	---	3	30	70	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: At the end of the course, students 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

UNIT-I (8Hrs)	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
UNIT-II (8Hrs)	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
UNIT-III (10Hrs)	Highway capacity: 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.
UNIT-IV (8Hrs)	Traffic Safety: 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.
UNIT-V	Design of Intersection: Design of at grade & grade separated intersection – rotary

(8 Hrs)	intersection – capacity of rotary intersection – traffic signals – warrants of traffic signals, types of signals, signal coordination, design of fixed time signal –Webster’s approach.
Text Books:	
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
Reference Books:	
1	S.C. Saxena Traffic Planning And Design Dhanpat Rai Pub, NewDelhi.
2	Hutchison, B.G., Introduction to Transportation Engineering, & Planning, McGraw Hill Book Co.
3	Papacostas, C.S., Fundamentals of Transportation System Analysis, PHI
4	John W. Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Pub. Co.



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4109	PE	3	---	---	3	30	70	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: At the end of the course, students 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								
UNIT-I (8 Hrs)	Construction Management scope and Significance, Qualities of project Manager. Planning, Scheduling and controlling of a project. Bar charts, Milestone charts, weaknesses in Bar charts.							
UNIT-II (8 Hrs)	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							
UNIT-III (8 Hrs)	Cost Time Optimization – Direct and Indirect project costs – Total costs – Cost Slopes – Crashing. Updating– Process of updating, when to update							
UNIT-IV (10 Hrs)	Construction equipment - economic considerations - earthwork equipment - Trucks and handling equipment - rear dump trucks - capacities of trucks and handling equipment- calculation of truck production							
UNIT-V (6 Hrs)	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
Text Books:	
1	Project Planning and Control with PERT and CPM by B.C.Punmia
2	Construction Planning Equipment and Methods, Peurifoy and Schexnayder Shapira, Tata Mcgraw hill
Reference Books:	
1.	Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson
2	Construction Project Management. An Integrated Approach, Peter Fewings Taylor and Francis
3	Construction Management Emerging Trends and Technologies, Trefor Williams, Cengage learning
4	Handbook of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi,



Code	Category	L	T	P	C	IM	EM	Exam.
B20CE4110	PE	3	---	---	3	30	70	3 Hrs.

PRESTRESSED CONCRETE

(For CE)

Course Objectives:

1	To impart the knowledge on pre-stressing systems, materials required for pre-stressing, losses of pre-stress and flexural strength and shear strength of pre-stressed members.
2	To familiarize the student with the design and analysis of beams for flexure, shear and transfer of prestress in pretensioned members, anchorage zone stress distribution in post tensioned members.

Course Outcomes: At the end of the course, students will be able to

S. No.	Outcome	Knowledge Level
1	Understand the general mechanical behaviour of pre stressed concrete.	K3
2	Analyze pre stressed concrete flexural members.	K3
3	Analyze vertical and horizontal shear in pre stressed concrete.	K3
4	Analyze transfer and development length as well as pre stress losses.	K3
5	Design for deflection and crack control of pre stressed concrete members.	K4

SYLLABUS

UNIT- I (8 Hrs.)	Prestressed Concrete: Introduction, Basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete. Materials for prestressed concrete, high strength concrete and high strength steel. Prestressing systems (1) Fressinet System (2) Gifford Udall (3) Magnel Blaton System, Tensioning devices, anchoring devices. (d) Pre tensioning and Post tensioning
UNIT- II (8 Hrs.)	Analysis of Prestress: Basic Assumptions, Pressure Line or Thrust Line, Concept of Load Balancing, cable profile, kern distance, Resultant Stresses at a Section, Stresses in Tendons as per IS 1343-2012
UNIT- III (8 Hrs.)	Losses of Prestress: Prestressing losses, Loss Due to Elastic Deformation of Concrete, Loss due to shrinkage of Concrete, Loss Due to Creep of Concrete, Loss Due to Relaxation of stress in Steel, Loss Due to Friction, Loss Due to Anchorage Slip, Loss Due to Curvature etc. I.S. code provisions
UNIT- IV (8 Hrs.)	Flexural and Shear Strength of Prestressed Concrete: Limit state design of flexural members, IS code provisions, design beams, Types of Flexural Failure, design for shear, IS code provisions.
UNIT- V	Transfer of Prestress (Pretensioned members): (a)Transmission length, bond stress,

(8 Hrs.)	transverse tensile stress, end zone reinforcement, flexural bond stress, IS code provisions for Bond and Transmission Length. (b) Anchorage Zone in Post-Tensioned members: Introduction, Stress Distribution in End Block, Guyon's method of approach of analysis Of end block (not more than 2 cables)
Text Books:	
1	Pre stressed Concrete by N Krishna Raju, 5 th edition, Tata McGraw Hill Publications.
2	Prestressed Concrete by Ramamrutham, 5 th edition, Dhanpatrai Publications
Reference Books:	
1	Fundamentals of Pre-stressed Concrete by Sinha N.C. and Roy S.K, 3 rd edition, S.Chand & Company Limited.
2	Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns 3 rd edition, John Wiley & Sons
3	Pre-stressed concrete structures by N.Rajagopalan, 2 nd edition, Alpha Science International Ltd
4	Prestressed Concrete by P. Dayaratnam.



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4111	PE	3	---	---	3	30	70	3 Hrs.
EXPANSIVE SOILS								
(For CE)								
Course Objectives:								
1	Understand the behaviour of expansive soil with moisture content, various foundation techniques and improvement of soil for construction of foundations.							
Course Outcomes: At the end of the course, students 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
SYLLABUS								
UNIT-I (8 Hrs)	Origin and Occurrence of expansive Soils: Occurrence and Distribution in India-Moisture Equilibrium-Soil, Structure, environmental interaction –Distress symptoms case histories.							
UNIT-II (8 Hrs)	Identification of Expansive soils: Soil Structure –Clay mineralogy; Swell potential-Field Exploration-Laboratory tests for identification.							
UNIT-III (8 Hrs)	Prediction of heave – Osmotic and matric suction: Methods of prediction of heave – Empirical Methods- 1-D Swell consolidation test by oedometer tests –soil moisture suction-field observations-shrinkage.							
UNIT-IV (10 Hrs)	Remedial Foundation techniques: Design considerations-individual and continuous footings –Stiffened mats, under reamed piles, codal provisions							
UNIT-V (6 Hrs)	Chemical Stabilization and special Foundation: 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.							
Text Books:								
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.							
Reference Books:								
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	IM	EM	Exam
B20CE4112	PE	3	---	---	3	30	70	3 Hrs.
ADVANCED WATER RESOURCES ENGINEERING								
(For CE)								
Course Objectives:								
1.	Student may know the Major irrigation head works and cross drainage structures; related design aspects, various river training works; Hydel power projects details, aquifer parameters and applications; yield of wells, Drought Management and Water Harvesting.							
Course Outcomes: At the end of the course, students will be able to								
S. No.	Outcome							Knowledge Level
1	Design diversion heads works and cross drainage structures							K4
2	Differentiate various river training works							K2
3	Design the hydro power structures							K4
4	Understand well hydraulics and ground water conditions							K2
5	Understand Drought Management and Water Harvesting							K2
SYLLABUS								
UNIT- I (8 Hrs.)	Diversion Head Works: Types, Location and components, Blighs, Lanes and Khoslas theories, Method of independent variables, Design of vertical drop weir, Silt control devices. Regulation Works: 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. Cross Drainage Works: Types, Classification of aqueducts, Design principles of different types of aqueducts.							
UNIT- II (8 hrs.)	River Training Works: 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.							
UNIT- III (8 Hrs.)	Waterpower engineering: 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.							
UNIT- IV (8 Hrs.)	Ground Water Flow: 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.							

UNIT- V (8 Hrs.)	Drought Management and Water Harvesting: Definition of drought, Causes of drought, measures for water conservation an augmentation, drought contingency planning. Water harvesting rainwater collection, small dams, runoff enhancement, runoff collection, ponds, tanks, natural and artificial ground water recharge methods.
Text Books:	
1	Garg S.K., Hydrology and Water Resources Engineering
2	Subramanya, K., Engineering Hydrology, Tata McGraw Hill, New Delhi.
Reference Books:	
1	Dr.P.Jaya Rami Reddy, A Textbook of Hydrology, University Science Press
2	Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.
3	Raghunath, H.M., Hydrology – Principles, Analysis and Design, 1986, Wiley
4	Todd, D.K., Groundwater Hydrology, 1993 John Wiley & Sons..



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4113	PE	3	---	---	3	30	70	3 Hrs.
DISASTER MANAGEMENT AND PREPAREDNESS								
(For CE)								
Course Objectives:								
1	To apprise about disasters, their types and impact on affected communities							
2	To familiarize with disaster management paradigms adopted by the government at various levels							
3	To emphasize the role of engineering and technology in disaster mitigation and management							
Course Outcomes: At the end of the course, students 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	Analyze relationship between development and disasters							K4
3	Express the relation between development and disasters							K3
4	Summarize the role of education and community engagement in disaster mitigation							K2
5	Paraphrase the role of engineering and technology in disaster management.							K2
SYLLABUS								
UNIT-I (8Hrs)	Concepts and definitions: 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.							
UNIT-II (8Hrs)	Disaster Impacts: 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.							
UNIT-III (8Hrs)	Disaster management cycle-its phases, prevention, mitigation, preparedness, relief & 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.							
UNIT-IV (8Hrs)	Education and Community Preparedness: 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.
UNIT-V (8 Hrs)	Role of Technology in Disaster Management: 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.
Text Books:	
1	‘DisasterManagement-GlobalChallengesandLocalSolutions’byRajibshah&RRKrishnamurthy (2009), Universities press.
2	‘Disaster Management–Future Challenges and Opportunities’ by Jagbir Singh (2007),IK International Publishing House Pvt. Ltd.
Reference Books:	
1	‘Disaster Management’ edited by HKGupta (2003) Universities press.
2	‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt.Ltd., New Delhi.



Code	Category	L	T	P	C	IM	EM	Exam
B20CE4114	SOC	1	---	2	2	0	50	3 Hrs.

IRRIGATION STRUCTURES DESIGN AND DRAWING

(For CE)

Course Objectives:

1	The paper - space environment, 2D & 3D wire frame models through various editing commands, assemble of various components of solids and various types of irrigation structures
---	--

Course Outcomes: At the end of the course, students will be able to

S. No.	Outcome	Knowledge Level
1	Understand the paper - space environment thoroughly	K2
2	Develop the components using 2D & 3D wire frame models through various editing commands.	K4
3	Explain assemble of various components of compound solids.	K3
4	Design irrigation canal structures.	K4

LIST OF EXPERIMENTS

1	Design and drawing of the following Irrigation Structures
2	Tank Surplus Weir
3	Barrage
4	Glacis type of Canal Drop
5	Notch Fall
6	Siphon Aqueduct- Type III
7	Cross Regulator and Head Regulator

Reference Books:

1	Water Resources Engineering, by C. Satyanarayana Murty
2	Water Resources Engineering, by SK Garg
3	Design of Irrigation Structures by RSN Murthy



Estd:1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

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

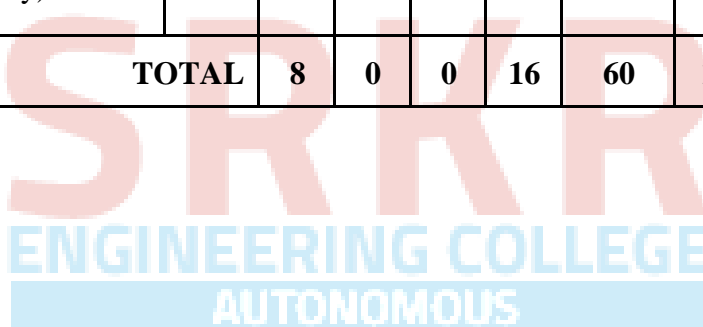
UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA, Accredited by NAAC with A+

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

Regulation: R20		IV / IV - B.Tech. II - Semester							
CIVIL ENGINEERING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CE4201	Project Work (Project work, seminar and internship in industry)	PR	8	0	0	16	60	140	200
TOTAL			8	0	0	16	60	140	200



Estd. 1980



Course Code	Category	L	T	P	C	LM	E.M	Exam
B20CE4201	PR	--	--	16	8	60	140	3 Hrs.

PROJECT WORK

(For CE)

Course Objectives:

1	To provide an opportunity to work in group on a topic / problem / experimentation
2	To encourage creative thinking process
3	To provide an opportunity to analyze and discuss the results to draw conclusions
4	To acquire and apply fundamental principles of planning and carrying out the work plan of the project through observations, discussions and decision-making process.

Course Outcomes: At the end of the course the students will be able to

S.No.	Outcome	Knowledge Level
1	Identify a current problem through literature/field/case studies	K3
2	Identify the objectives and methodology for solving the problem	K3
3	Design and Develop technology/process for solving the problem	K4
4	Evaluate the technology/process	K5

*The object of Project Work 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/Modeling/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.