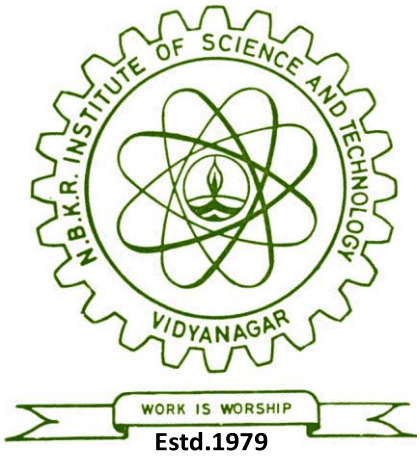
N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY

(AUTONOMOUS)
COLLEGE WITH POTENTIAL FOR EXCELLENCE (CPE)
Affiliated to JNTUA, Ananthapuramu
Re-Accredited by NAAC with 'A' Grade
B.Tech. Courses Accredited by NBA under TIER-I



SYLLABUS

B.TECH. DEGREE COURSE

CIVIL ENGINEERING

(With effect from the batch admitted in the academic year 2017-2018)

VIDYANAGAR - 524413
SPSR Nellore-Dist., Andhra Pradesh
www.nbkrist.org

VISION AND MISSION OF THE INSTITUTE

Vision

- To emerge as a comprehensive Institute that provides quality technical education and research thereby building up precious human resource for the industry and society.

Mission

- To provide a learner-centered environment that challenges individuals to actively participate in the education process.
- To empower the faculty to excel in teaching while engaging in research, creativity and public service.
- To develop effective skills enabling learners to pick up critical thinking thus crafting them to be professionally fit and ethically strong.
- To reach out industries, schools and public agencies to partner and share human and academic resources.

VISION AND MISSION OF THE CIVIL ENGINEERING DEPARTMENT

Vision

- To promote excellence in civil engineering education, enrich research and provide quality professional service to the society in all areas of civil engineering.

Mission

- To provide a learner-centered environment for students to gain comprehensive knowledge in civil engineering.
- To provide a learning experience that fosters an aptitude for research.
- To provide graduates with contemporary skills and tools required to excel in civil engineering profession or alternate fields. To produce graduates to serve within the constraints of complex needs of the society with high integrity.

PROGRAMME EDUCATIONAL OBJECTIVES OF THE DEPARTMENT

PEO 1 : Graduates will be proficient in the fundamental knowledge of basic science, engineering science including mathematical and computational skills appropriate for civil engineering.

PEO 2 : Graduates will be successful practicing engineers in civil engineering and allied fields or alternate careers using their technical knowledge, teamwork, communication skills and leadership qualities.

PEO 3 : Graduates will be innovative problem solvers within the realistic constraints of economic, environmental, social, political, health, safety and sustainability impacts and serve the society as responsible professionals with integrity.

PEO 4 : Graduates will engage in lifelong learning within the profession or through higher studies.

PROGRAMME OUTCOMES OF THE DEPARTMENT

The programme outcomes are the skills and knowledge which the graduates have at the time of graduation:

a. An ability to apply knowledge of mathematics, science and engineering.

b. An ability to design and conduct experiments, as well as to analyze and interpret data.

c. An ability to design an engineering system, component or process.

d. An ability to identify, formulate and solve engineering problems.

e. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

f. Knowledge of contemporary issues.

g. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

h. An understanding of professional and ethical responsibility.

i. An ability to function on multi-disciplinary teams.

j. An ability to communicate effectively.

k. To embark on a career as an entrepreneur or civil engineering project manager/ consultant thereby playing a very important role in society.

l. Recognition of the need to be successful in competitive examinations, and an ability to engage in lifelong learning.

FOUR YEAR BACHELOR OF TECHNOLOGY DEGREE PROGRAM

(With effect from the batches admitted in the academic year 2017-18)

Branch: Civil Engineering

Total credits (Four year course): 192

LIST OF VARIOUS CLASSIFICATIONS OF COURSES

1. Course Category: Basic Science

S. No.	Course Code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17SH1101	Functional English	I-I	3	0	0	3
2	17SH1103	Engineering Chemistry	I-I	3	0	0	3
3	17SH1104	Numerical Analysis	I-I	2	2	0	3
4	17SH1201	Professional English	I-II	3	0	0	3
5	17SH1202	Engineering Physics	I-II	3	0	0	3
6	17SH1204	Engineering Mathematics-I	I-II	3	2	0	4
7	17SH2101	Engineering Mathematics – II	II-I	2	2	0	3
8	17SH4101	Economics & Accountancy	IV-I	3	0	0	3
9	17SH1101	English Language Lab	I-I	0	0	3	2
10	17SH1102	Chemistry Lab	I-I	0	0	3	2
11	17ME1101	Workshop	I-I	0	0	2	1
12	17SH1201	Engineering Physics Lab	I-II	0	0	3	2

Total = 32

2. Course Category : Engineering Science

S. No.	Course code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17CS1102	Introduction to Computing	I-I	3	0	2	4
2	17EE1102	Basics of Electrical Engineering	I-I	3	0	0	3
3	17CE1101	Building Materials	I-I	3	0	0	3
4	17ME1203	Computer Aided. Engg. Draw.	I-II	2	0	4	4
5	17CE1201	Engineering Mechanics	I-II	2	2	0	3
6	17CE1202	Building Construction	I-II	3	0	0	3
7	17CS1201	Computer programming Lab	I-II	0	0	3	2

Total = 22

3. Course Category : Professional Core

S. No.	Course Code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17CE2101	Strength of Materials	II-I	3	2	0	4
2	17CE2102	Fluid Mechanics-I	II-I	3	2	0	4
3	17CE2103	Building Planning and Drawing	II-I	1	0	3	3
4	17CE2104	Surveying – I	II-I	2	2	0	3
5	17CE2105	Engineering Geology	II-I	3	0	0	3
6	17CE2201	Fluid Mechanics – II	II-II	2	2	0	3
7	17CE2202	R.C.C Structural Design – I	II-II	3	2	0	4
8	17CE2203	Surveying – II	II-II	2	2	0	3
9	17CE2204	Soil Mechanics	II-II	3	2	0	4
10	17CE2205	Structural Analysis-I	II-II	2	2	0	3
11	17CE2206	Transportation Engineering - I	II-II	2	2	0	3
12	17CE3101	Structural Analysis- II	III-I	3	2	0	4
13	17CE3102	Foundation Engineering	III-I	2	2	0	3
14	17CE3103	Transportation Engineering - II	III-I	2	2	0	3
15	17CE3104	RCC Structural Design- II	III-I	3	2	0	4
16	17CE3105	Steel Structural Design	III-I	2	2	0	3
17	17CE3201	Environmental Engineering - I	III-II	3	2	0	4
18	17CE3202	Water Resources Engineering	III-II	2	2	0	3
19	17CE3203	Engineering Ethics	III-II	3	0	0	3
20	17CE3204	Construction Planning & Management	III-II	2	2	0	3
21	17CE3205	Quality Surveying & Valuation	III-II	3	2	0	4
22	17CE4101	Design and Drawing of Irrigation Structures	IV-I	3	2	0	4
23	17CE4102	Environmental Engineering-II	IV-I	3	2	0	4
24	17CE4103	Concrete Technology	IV-I	2	2	0	3
25	17CE21P1	Survey Lab-I	II-I	0	0	3	2
26	17CE21P2	Engg. Geology Lab	II-I	0	0	3	2
27	17CE22P1	Survey Lab-II	II-II	0	0	3	2
28	17CE22P2	FM & HM Lab	II-II	0	0	3	2
29	17CE31P1	Material Testing Lab	III-I	0	0	3	2
30	17CE31P2	Soil Mechanics Lab	III-I	0	0	3	2
31	17CE32P1	Highway Materials Lab	III-II	0	0	3	2
32	17CE32P2	Env. Engineering Lab	III-II	0	0	3	2
33	17CE41P1	Concrete Technology Lab	IV-I	0	0	3	2
34	17CE41P2	CAAD Lab	IV-I	0	0	3	2
35	17CE31MP	Mini Project	III-II	0	0	0	2
36	17CE42IP	Internship	IV-II	0	0	0	2
37	17CE42PR	Project	IV-II	0	0	3	11

Total =117

4. Course Category : Professional Elective

S. No.	Course Code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17CE31EX	Core Elective-I	III-I	3	0	0	3
2	17CE32EX	Core Elective-II	III-II	3	0	0	3
3	17CE41EX	Core Elective-III	IV-I	3	0	0	3
4	17CE42EX	Core Elective-IV	IV-II	3	0	0	3

Total = 12

Core Elective-I:

17CE31E1	Advanced Structural Analysis
17CE31E2	Industrial Steel Structures
17CE31E3	Ground Water Hydrology
17CE31E4	Traffic Engineering & Management
17CE31E5	Remote Sensing & GIS

Core Elective-II:

17CE32E1	Advanced Structural Design
17CE32E2	Finite Element Analysis
17CE32E3	Integrated Watershed Management
17CE32E4	Urban Transportation Planning
17CE32E5	Advanced Foundation Engineering

Core Elective-III:

17CE41E1	Pre Stressed Concrete
17CE41E2	Bridge Engineering
17CE41E3	Pavement Construction & Management
17CE41E4	Ground Improvement Techniques
17CE41E5	Solid Waste Management

Core Elective-IV:

17CE42E1	Repair and Rehabilitation of Structures
17CE42E2	CAAD in Civil Engineering
17CE42E3	Structural Health Monitoring
17CE42E4	Geo Synthetics and Reinforced Soil Structures
17CE42E5	Environmental Impact and Project Assessment

5. Course Category: Open Elective

S. No.	Course code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17CE4XOX	Open Elective-I	IV-I	3	0	0	3
2	17CE4XOX	Open Elective-II	IV-II	3	0	0	3

Total = 06

6. Course Category: Mandatory Course

S. No.	Course code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17MC2102	Technical English & Soft Skills	II-I	2	0	2	0
2	17MC2201	Environmental Studies	II-II	3	0	0	0

7. Course Category: Massive Open Online Courses (MOOCS)

S. No.	Course code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17CE42MO	-	IV-II	0	0	0	3

8. Course Category: Audit Course

S. No.	Course code	Course Title	Year & Sem	Hours per week			Credits
				L	T	P	C
1	17CE31AC	Professional Ethics and Life Skills	III - I	2	0	0	0

N.B.K.R. INSTITUTE OF SCIENCE &TECHNOLOGY:: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

I YEAR OF FOUR YEAR B.TECH. DEGREE COURSE - I SEMESTER

S.No.	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test-I (2 hrs.)	Assign ment-I	Max. Marks	Test-II (2 hrs.)	Assign ment-II	Max. Marks		Duration In Hours	Max. Marks	
1	17SH1101	Functional English**	3	0	0	3	34	6	40	34	6	40	0.8*Best mid+ 0.2* other	3	60	100
2	17SH1103	Engg. Chemistry#	3	0	0	3	34	6	40	34	6	40		3	60	100
3	17SH1104	Numerical Analysis**	2	2	0	3	34	6	40	34	6	40		3	60	100
4	17CS1102	Introduction to Computing#	3	0	2	4	34	6	40	34	6	40		3	60	100
5	17EE1102	Basics of Electrical Engineering	3	0	0	3	34	6	40	34	6	40		3	60	100
6	17CE1101	Building Materials	3	0	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17SH11P1	English Language Laboratory**	0	0	3	2	-	-		-	-		Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17SH11P3	Chemistry Lab#	0	0	3	2	-	-		-	-			3	60	100
3	17ME11P1	Workshop#	0	0	2	1	-	-		-	-			3	60	100
		TOTAL				**24**										

**Common to ALL #Common to CE & ME

17SH1101 - FUNCTIONAL ENGLISH
(Common to all branches)

Course Category	Basic Science	**Credits:**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Basic Level of LSRW Skills	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To develop basic communication skills in English. 2. To achieve specific linguistic and communicative competence. 3. To acquire relevant skills and function efficiently in a realistic working context. 4. To inculcate the habit of reading.	
Course Outcomes	CO1	Correct the error of the sentence; improve language proficiency and face competitive exams such as GATE, GRE, TOEFL, GMAT, etc.
	CO2	Comprehend the advanced level of reading comprehensions.
	CO3	Write clear and coherent passages for social and professional contexts.
	CO4	Write proposals and business letters.
	CO5	Acquire considerable flair in using broad range of vocabulary.
	CO6	Drafting speech-building critical thinking.
	UNIT – I **GRAMMAR**: Parts of Speech & Subject- Verb Agreement. **WRITING:** Paragraph Writing: Expressions of ideas, concepts, etc., in unambiguous grammatically acceptable and logically coherent manner (in general items); In particular skills in sentence construction emphasizing on function of word and basic sentence patterns - Framing sentences leading to effective paragraph.	

Course Content	**UNIT – II** **GRAMMAR:** Pronoun: Agreement & usage - Articles: kinds & omission of article. **READING:** Different reading strategies: Skimming, scanning, inferring, predicting and responding to content – Guessing from context and vocabulary extension. **WRITING:** Letter writing – Formal and informal writing. **UNIT – III** **GRAMMAR:** Tenses – Conditional sentences – Non-Finite verbs – Kinds of Non-Finite: Infinitives – Gerund and participle. **WRITING**: Dialogue writing: Communicating and presenting ideas effectively and coherently and exchanging conversation in a group or between two persons directed towards a particular subject. **UNIT – IV** **GRAMMAR:** Prepositions: Kinds, position, adverb usage, question tags & transformation of sentences – Degrees of comparison. **WRITING:** Telephonic conversations and etiquettes. **UNIT – V** **GRAMMAR:** Transformation of sentences- Direct and Indirect Speech – Active & Passive Voice – Modifiers. **WRITING:** Story Writing. **UNIT – VI** **GRAMMAR:** Simple, Complex and Compound Sentences - Parallelism. **WRITING:** Drafting of Public Speech**:** Ideas / Content Generation and Structure.
Textbooks & Reference books	**REFERENCE BOOKS:** 1. Essential English Grammar: Raymond Murphy, Cambridge University Press. 2. Advanced Grammar in Use: Martin Hewings, Cambridge University Press. 3. High School English Grammar: Wren and Martin, S Chand Publications. 4. Effective Technical Communication: Ashraf Rizvi, Tata McGraw Hill Publications.

17SH1103 - ENGINEERING CHEMISTRY

(Common to CE & ME)

Course Category	Basic Science	**Credits**	3
Course Type	Theory	**Lecture – Tutorial – Practical**	3 - 0 - 0
Prerequisite	Fundamental concepts of Chemistry	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To strengthen the fundamentals of chemistry and then build an interface of theoretical and experimental concepts with their industrial/ engineering applications. 2. The extension of fundamentals of electrochemistry to energy storage devices such as batteries and fuel cells is one such example. 3. To know the factors affecting the rate of corrosion and its prevention. 4. To design engineering materials and solve problems related to them. 5. To understand various water softening methods. 6. To understand preparation of polymers and their applications.	
Course Outcomes	CO1	Understand the electrochemical sources of energy.
	CO2	Identify and investigate means of protecting metal against corrosion.
	CO3	Understand industrially based engineering materials.
	CO4	Understand the classification of fuels and their analysis.
	CO5	Know the disadvantages of hard water and ability to remove hardness by using various methods.
	CO6	Understand the basics of polymers and their preparation and uses in engineering field.
Course Content	**UNIT – I** **ELECTROCHEMISTRY:** Single electrode potential – Explanation and measurement – Reference electrodes – Hydrogen gas electrode – Calomel electrode – Glass electrode – Electrochemical cells: Lead-Acid storage cells – Batteries: Li-ion batteries – Fuel cells: Hydrogen - Oxygen fuel cell conduct metric titration of strong acid and strong base.	

UNIT – II

CORROSION: Definition – Classification – Theories of corrosion – Factors affecting the corrosion – Prevention methods of corrosion – Metallic coatings (Electroplating and cementation) and cathodic protection.

UNIT – III

CHEMISTRY OF ENGINEERING MATERIALS:

ELECTRICAL INSULATORS: Definition – Classification – Characteristics – Application of electrical insulating materials (solid, liquid and gaseous insulators) Refractories: Classification – Properties and applications of refractories.

LUBRICANTS: Lubricant – Lubrication – Classification of lubricants – Properties and applications of lubricating oils.

UNIT – IV

FUEL TECHNOLOGY: Classifications of fuels – Characteristics of fuels – Calorific value – Determination – Bomb calorimeter – Boy's gas calorimeter – Theoretical calculation of calorific value – Solid Fuels: Coal – Analysis of coal – Liquid fuels: Petroleum – Refining of petroleum – Synthetic petrol – Fischer Tropch's synthesis – Gaseous fuel – Flue gas analysis by Orsat's apparatus.

UNIT – V

WATER TREATMENT: Impurities in water – Hardness of water – Estimation of hardness by EDTA method – Estimation of dissolved oxygen – Alkalinity – Chlorides in water – Industrial use of water: For steam generation – Troubles in boilers – Scale and sludge – Priming and foaming – Caustic embrittlement – Boiler corrosion – Softening methods of hard water: Lime – Soda process – Zeolite process – Ion exchange method.

UNIT – VI

POLYMERS: Introduction to polymers – Polymerization process – Types of polymerization Elastomers: Natural rubber – Vulcanization of rubber – Compounding of rubber – Synthetic rubbers: Preparation, properties and engineering applications of Buna – N, Neoprene, Thiokol and silicon rubbers – Plastomers: Thermosetting and thermoplastics – Preparation, properties and engineering applications of PVC, bakelite, nylons and urea-formaldehyde.

Textbooks & Reference books	**TEXTBOOKS:** 1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GV and Rama Chandraiah C, McGraw Hill Higher Education, New Delhi, 2013. 2. A Text Book of Engineering Chemistry, 15th Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013. **REFERENCE BOOKS:** 1. A Text book of Engineering Chemistry, 12th Edition, S S Dhara, Uma, S. Chand Publications, New Delhi, 2010. 2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN. Das and Sujatha Mishra, SCITECH Publications India Pvt. Limited, 2010. 3. Engineering Chemistry, First edition, Sesha Maheswaramma K and Mridula Chugh, Pearson Education, 2013.

17SH1104 - NUMERICAL ANALYSIS

(Common to all Branches)

Course Category	Basic Science	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	2 - 2 - 0
Prerequisite	Intermediate Mathematics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. The bisection, false position, iteration and Newton-Raphson Methods. 2. The basic concepts of numerical solutions of simultaneous linear and non-linear algebraic equations. 3. The concepts of interpolation. 4. The concepts of numerical differentiation and integration. 5. The numerical methods to solve ordinary differential equations by using Taylor's series method, Picard's method, Euler's and Modified Euler's Methods and Runge-Kutta methods of 2^{nd} and 4^{th} order. 6. The concepts of curve fitting and regression analysis.	
Course Outcomes	CO1	Acquire knowledge in solving algebraic and transcendental equations by using the appropriate numerical methods.
	CO2	Develop skills in analyzing the simultaneous linear and non-linear algebraic equations by various numerical methods.
	CO3	Attain skills in analyzing the methods of interpolating the given data.
	CO4	Acquire knowledge in numerical differentiation by Newton's formula and in numerical integration by trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules.
	CO5	Apply appropriate numerical methods to solve ordinary differential equations.
	CO6	Develop skills in designing mathematical models for fitting geometrical curves to the given data and also acquire knowledge in regression analysis.

Course Content	**UNIT - I** **SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:** Bisection - False position - Iteration - Newton-Raphson methods. **UNIT - II** **SOLUTION OF SIMULTANEOUS LINEAR AND NON-LINEAR ALGEBRAIC EQUATIONS:** Iteration method – Gauss Jordon method – Gauss elimination with pivotal condensation method – Triangular factorization method – Gauss-Seidal method – Newton-Raphson method. **UNIT - III** **INTERPOLATION:** Newton's forward and backward interpolation formula – Lagrange's interpolation – Gauss forward and backward formulae – Stirling's formula. **UNIT - IV** **NUMERICAL DIFFERENTIATION AND INTEGRATION:** First and second order derivatives at given points by Newton's formula. Trapezoidal rule – Simpson's 1/3 rule and Simpson's 3/8 rule. **UNIT – V** **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIALEQUATIONS:** Solution by Taylor's series - Picard's method of successive approximations –Euler's and modified Euler's methods – Runge-Kutta method of 2^{nd} order and 4^{th} order. **UNIT - VI** **CURVE FITTING:** Introduction – Method of least squares – Linear and non-linear equations – Correlation coefficient: Lines of regression – Rank correlation coefficient (Spearman's Rank - Correlation).

Textbooks & Reference books	**TEXTBOOKS:** 1. Higher Engineering Mathematics – B.S. Grewal, Khanna Publishers, New Delhi. 2. Mathematical Methods – Dr. T.K.V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham, Dr. M.V.S.S.N. Prasad, S. Chand Publication, New Delhi. **REFERENCE BOOKS:** 1. Introductory Methods of Numerical Analysis - S.S. Sastry, Prentice Hall India Learning Private Limited, New Delhi. 2. Numerical Methods - E. Balagurusamy, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. 3. Numerical Methods for Scientific & Engineering Computation - S.R.K. Iyengar, R.K. Jain and M.K. Jain, New Age International Publishers, New Delhi.

17CS1102 – INTRODUCTION TO COMPUTING

(Common to CE & ME)

Course Category	Engineering Science	**Credits**	4
Course Type	Theory	**Lecture – Tutorial – Practical**	3 - 0 - 2
Prerequisite	Basic usage of Computer	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. Understand the basics of computer fundamentals, identification of various components of computers and their need. 2. Creating awareness regarding various I/O devices. 3. Gaining knowledge about the working principle of CPU and its advancements. 4. Study of different storage media and operating system basics. 5. Getting fundamental ideas about core concepts of computer domains.	
Course Outcomes	CO1	Identify physical components of a computer and their functionalities.
	CO2	Learn and recognize various interactive mechanisms through different devices.
	CO3	Strengthen regarding the structure and working principle of CPU.
	CO4	Understand the storage media and types of different operating system basics.
	CO5	Understand the basics of network and communication services.
	CO6	Gain the basic knowledge in core concepts of computers such as databases, programming languages, internet and security.
Course Content	**UNIT – I** **INTRODUCTION TO COMPUTERS**: Overview and definitions – Computers for individual users – Desktop – Workstations – Notebook computers – Tablet and handheld computers – Smart phones – Computers for organizations – Network servers, Mainframes – Mini and super computers – Computers in society – Why are so important, home, education, small business, industry, government, healthcare, banking and communication.	

INSIDE THE COMPUTER: Various parts of a computer system – Software, hardware, data, users, information processing cycle and essential computer hardware: Processor, memory, I/O and storage, software and major categories – System software and application software.

UNIT – II

I/O DEVICES: The Keyboard – Layout, Types of keys, Input from keyboard, The Mouse – Usage, variants of mouse – Devices for hand – Pens, touch screens, game controllers and optical devices – Bar code readers, image scanners and OCR monitors – Types, CRT monitors and flat panel monitors.

DATA STORAGE: Categories of storage devices: Magnetic: How data is stored and organized on disk, how OS access the data, diskettes, hard disks, removable high-capacity magnetic disks, tape drives and optical storage devices: CD-ROM, DVD-ROM, recordable optical technologies and solid-state storage devices: Flash memory, smart cards and solid state disks.

UNIT – III

DATA PROCESSING: How Computers represent data – Number systems, bits and bytes, text codes – How computers process data: The CPU, Machine cycles, Memory – Factors affecting processing speed: Registers, memory and computing power – The Computer's internal clock – The BUS – Cache memory.

MODERN CPU'S: Look inside the processor, microcomputer processors: Intel, AMD, free scale and IBM processors, RISC and CISC processors – Parallel processing – MP, SMP and MPP.

UNIT – IV

OS BASICS: Types of operating systems: Real time operating systems, single-user/single – Tasking OS, and single user/multitasking OS and multi-user/multitasking OS – User interfaces: Graphical user interfaces – Command – Line interfaces and running programs – Sharing information.

UNIT – V

NETWORKING BASICS: The usage of network: Simultaneous access, shared peripheral devices, personal communications and easier data backup – Common types of networks: LANs and WANs – Hybrid networks: CANs, MANs, HANs, Intranets and Extranets – Network topologies: Bus, ring, star, mesh, tree and hybrid topologies.

UNIT – VI

DATABASE MANAGEMENT SYSTEMS: Databases and database management systems – The database – The DBMS – Working with database – Creating database tables.

	COMPUTER SECURITY: Basic security concepts: Threats, degrees of harm and countermeasures, and threats to users – Identify theft – Loss of privacy – Online spying tools – Spam – Computer related injuries – Hardware threats: Power related threats, theft and vandalism and natural disasters.
Textbooks & Reference books	**TEXTBOOKS:** 1. Peter Norton "Introduction to Computers", McGraw Hill Publishers, 7th Edition 2011. **REFERENCE BOOKS:** 1. Alex Leon and Mathews Leon "Fundamentals of Information Technology", Vikas Publishers, 2nd Edition 1999. 2. David Cyganski & John A. Orr "Information Technology - Inside and Outside", Pearson Education, 2002. 3. Marilyn Wolf "Computers as Components", MK publications, 3rd Edition, 2014.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

17EE1102 - BASICS OF ELECTRICAL ENGINEERING

(Civil Engineering)

Course Category	Engineering Science	**Credits**	3
Course Type	Theory	**Lecture - Tutorial -Practical**	3 - 0 - 0
Prerequisite	1. Differentiations, integration and complex calculations. 2. Basics of Electricity	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. The basic concepts of magnetic circuits, AC and DC circuits. 2. The working principle, construction, applications of AC machines. 3. The fundamentals of wiring, earthing, switch gear and safety measures.	
Course Outcomes	CO1	Realize the fundamental concepts of DC circuits.
	CO2	Understand the fundamental concepts of AC circuits.
	CO3	Understand the operation of transformers.
	CO4	Understand the operations of AC machines.
	CO5	Realize the concepts of electrical safety and wiring system.
	CO6	Comprehend the fundamentals of power system.
Course Content	**UNIT-I** **FUNDAMENTALS OF DC CIRCUITS:** Introduction to DC circuits – Active and passive elements – Ohm's law – Voltage – Current relations for resistor – Inductor – Capacitor – Kirchhoff's laws – Mesh analysis – Nodal analysis and star-delta transformation. **UNIT-II** **FUNDAMENTALS OF AC CIRCUITS:** Generation of AC – Average and RMS values – Form and peak factors for sinusoidal – Concept of phasor representation – j-operator – Analysis of R, L, C, R-L, R-C and R-L-C circuits – Introduction to three phase systems – Types of connections – Relationship between line and phase values. **UNIT-III** **SINGLE PHASE TRANSFORMERS:** Principle and operation of a transformer – Construction – EMF equation – Principle of operation of auto transformer.	

	UNIT-IV **AC MOTORS:** Classification of electrical machines – Working principle – Construction and applications of alternators and AC machines (single phase induction motors: split phase, capacitor start and capacitor start & run motors). **UNIT-V** **ELECTRICAL SAFETY, WIRING SYSTEM:** Safety measures in electrical system – Types of wiring – Wiring accessories – Staircase, fluorescent lamps – Basic principles of earthing – Types of earthing – Types of conductors and cables. **UNIT-VI** **INTRODUCTION TO POWER SYSTEM:** Simple layout of generation, transmission & distributions – Working principle, application of fuses (Rewirable fuse, HRC) – Relays, circuit breakers. – Types of towers.
Textbooks & Reference Books	**TEXTBOOKS:** 1. "Basic Electrical Engineering" by Dash.S.S, Subramani.C and Vijaya kumar.K First edition, Vijay Nicole Imprints Pvt.Ltd, 2013. 2. "Basic Electrical Engineering" by M.S.Naidu and S. Kamakshaiah, First Edition 2001Tata McGraw Hill. 3. "Basic Electrical Engineering" by Metha.V.K, Rohit Metha, Fifth edition, Chand. S & Co, 2016. **REFERENCE BOOKS:** 1. "Basic Electrical Engineering" by Kothari .D.P and Nagrath.I.J, Second edition, Tata McGraw - Hill, 2009. 2. "Basic Electrical and Electronics Engineering" by Bhattacharya.S.K, First Edition, Pearson Education, Reprint 2015. 3. "A Text book on Power System Engineering" by A. Chakrabarti, M.L. Soni, P.V.Gupta, U.S. Bhatnagar and Dr. A Chakrabarti, DhanpathRai & Company Pvt Ltd, 2009.
E-Resources	1. http://nptel.ac.in/courses. 2. http://iete-elan.ac.in. 3. http://freevideolectures.com/university/iitm.

17CE1101 - BUILDING MATERIALS

(Civil Engineering)

Course Category	Engineering Science	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To know the significance of various building materials used in construction industry. 2. To illustrate various classification of stones and their physical and mechanical characteristics. 3. To explain various classification of woods, ferrous metals and ceramic metals and their characteristics. 4. To explain the manufacturing process of basic building materials. 5. To explain the different types of mortars and their applications. 6. To classify the smart building materials and their use in constructions.	
Course Outcomes	CO1	Gain an in-depth knowledge on the engineering aspects of clay bricks.
	CO2	Gain an in-depth knowledge on the engineering aspects of natural and artificial stones used as building material.
	CO3	Gain an in-depth knowledge on the use of wood, ferrous metals, and ceramic materials in construction industry.
	CO4	Understand the materials and manufacturing process of cement concrete.
	CO5	Understand the various types of mortar and their suitability.
	CO6	Understand the use of modern construction materials.

UNIT - I

STRUCTURAL CLAY PRODUCTS:

Clay: Classifications and physical properties of clay.

Bricks: Manufacture of bricks – Classification of bricks – Characteristics of good brick – Ingredients of good brick earth – Harmful substances in brick earth – Testing of bricks – Forms of bricks – Defects of bricks.

Course Content	**UNIT- II** **ROCKS AND STONES:** **Rock:** Introduction, Classification of rocks. **Stones:** Quarrying of stones – Natural bed of stone – Seasoning of stone – Dressing of stone – Uses of stones – Characteristics of good building stone – Testing of stones – Deterioration of stones – Durability of stones – Preservation of stones – Selection of stones – Common building stones – Artificial stones and applications of stones. **UNIT- III** **WOOD, WOOD PRODUCTS, FERROUS METALS AND CERAMIC MATERIALS:** **Wood:** Introduction – Classification of trees – Classification of timber (IS: 399) – Macro-structure of timber – Characteristics of good timber – Seasoning of timber – Defects in timber – Diseases of timber – Preservation of timber (IS: 401) – Testing of timber (IS: 1708) – Ply-wood – Types and uses. **Ferrous metals:** Types (iron, pig iron, cast iron, wrought iron, steel, rolled steel sections and reinforcing steel bars) – Rusting and Corrosion – Tensile testing of steel sections (IS: 1608) – Common anti-corrosive coatings. **Ceramic materials**: Introduction – Classification of ceramic – Glass. **UNIT- IV** **MATERIALS FOR MAKING CEMENT CONCRETE:** **Cement**: Introduction – Manufacture of cement – Portland cement – Hydration of cement – Field tests of cement. **Aggregates**: Introduction – Classification of aggregates – Characteristics of aggregate – Deleterious materials – Organic impurities. **Water**: Introduction – Quality of mixing water – Effect of mixing water from different sources – Water for washing aggregates – Standards for curing water. **UNIT- V** **BUILDING MORTARS:** Introduction – Classification (cement mortar, lime mortar, surkhi mortar, lime-cement mortar, mud mortar and special mortars) – Characteristics of good mortar – Functions of ingredients – Selection of mortar – Grouting – Guniting. **UNIT– VI** **SMART CONSTRUCTION MATERIALS:** Overview and use of fly ash, silica fume, carbon fibers, self-healing materials and fibre reinforced plastics – Benefits of nano-technology in construction industry.

Textbooks & Reference Books	**TEXTBOOKS:** 1. Engineering Materials by S.C Rangwala. 2. Building Materials by S.K Duggal. 3. A Text Book of Building Construction and Construction Materials 4th Edition by T. D. Ahuja, G. S. Birdie. **REFERENCE BOOKS:** 1. Building Materials Technology by U.K. Shrivastava. 2. Building and Construction Materials: Testing and Quality Control 1st Edition by M. L. Gambhir, Neha Jamwal. 3. Indian Standard Institution, National Building Code of India, ISI, 1984, New Delhi.

17SH11P1 - ENGLISH LANGUAGE LABORATORY
(Common to all Branches)

Course Category	Basic Science	**Credits**	2
Course Type	Practical	**Lecture-Tutorial-Practical**	0 - 0 - 3
Prerequisite	Basic level of LSRW Skills	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective(s)	The main objective is to develop students' basic skills of communication viz. LSRW in English through which communicative competence can be enhanced and can communicate efficiently in a realistic professional ambience.
Course Outcomes	1. These activities practiced in the laboratory are helpful in comprehending the important language aspects which are useful for the real life situations. 2. These are also helpful in enhancing the language competency and communicative level of confidence.
Course Content	**I. LISTENING SKILLS:** a. Listening for pleasure. b. Listening for details and listening for Information. **II. SPEAKING SKILLS:** a. Jam. b. Extempore. c. Presentations. d. Seminars. **III. READING SKILLS**: Newspaper reading. **IV. WRITING SKILLS:** (i) Story writing. (ii) Description. a. Object b. Place c. Person d. Situation (iii) Giving directions & instructions. **TEXTBOOKSAND REFERENCE BOOKS** : 1. A Manual for English Language Laboratories: Dr. D. Sudha Rani, Pearson Publications. 2. Pronunciation Dictionary: Daniel Jones. 3. Techniques of Teaching English: A.L. Kohli. 4. A Textbook of English Phonetics: For Indian Students: T Bala Subramanian., Macmillan India Limited.

17SH11P3 - ENGINEERING CHEMISTRY LABORATORY

(Common to CE& ME)

Course Category	Basic Science	**Credits**	2
Course Type	Practical	**Lecture-Tutorial-Practical**	0 - 0 - 3
Prerequisite	Fundamental concepts of Chemistry	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective(s)	The main objective is to provide students to learn about experimental techniques in chemistry with knowledge in theoretical aspects so that they can excel in that particular field.
Course Outcomes	1. These experiments in the laboratory are helpful in understanding key concepts of chemistry through involvement in the experiments by applying theoretical knowledge. 2. It helps to recognize where the ideas of the student agree with those accepted by chemistry and where they do not.
Course Content	Minimum of 8 experiments to be completed out of the following: **LIST OF EXPERIMENTS** 1. Determination of total hardness of water by EDTA method. 2. Determination of copper by EDTA method. 3. Estimation of dissolved oxygen by Winkler's method. 4. Determination of acidity of water. 5. Determination of total alkalinity of water. 6. Estimation of chlorides using potassium chromate indicator. 7. Conduct metric titration of strong acid vs. strong base. 8. Determination of pH of unknown solution. 9. Preparation of bakelite. 10. Determination of viscosity of oils with redwood viscometer. **TEXTBOOKS AND REFERENCE BOOKS:** 1. Vogel's Textbooks of quantitative chemical analysis, Mendham et all, person publications. 2. Chemistry lab manual – KN Jayaveera, Subba Reddy & Chandra Sekher. Instrumental methods of chemical analysis – Chatwal and Anand Himalaya publications.

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17ME11P1 - ENGINEERING WORKSHOP
(Common to CE and ME)

Course Category	Engineering Science	**Credits**	1
Course Type	Practical	**Lecture-Tutorial-Practical**	0 - 0 - 2
Prerequisite	Engineering Physics and Basics Electrical Sciences	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Outcome(s)	Upon successful completion of the course, the students will be able to know the trades and do carpentry, fitting, tin-smithy, house wiring and foundry.
Course Content	**TRADES FOR EXERCISES:** At least two exercises from each trade: 1. **CARPENTRY**: Lap joint, Mortise and Tenon joint, Bridle joint. 2. **FITTING:** Square, V, Half round and dovetail fittings. 3. **TIN-SMITHY:** Tray, Cylinder, Hopper and Cone. 4. **HOUSE-WIRING:** One lamp controlled by one switch, Two lamps (bulbs) controlled by two switches, Staircase connection, Water pump connected with single phase starter. 5. **FOUNDRY**: Single - piece pattern, Two- piece pattern. **TRADES FOR DEMONSTRATION:** 1. Machine Tools 2. Welding 3. Black Smithy **TEXTBOOKSAND REFERENCE BOOKS:** 1. Engineering Work shop practice for JNTU V. Ramesh Babu, VRB Publishers Pvt. Ltd. 2. Work shop Manual / P.Kannaiah/ K.L. Narayana/ SciTech Publishers. 3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, Vikas publishers.

N.B.K.R. INSTITUTE OF SCIENCE &TECHNOLOGY:: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

I YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – II SEMESTER

S. No.	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test-I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max. Marks		Duration In Hours	Max. Marks	
1	17SH1201	Professional English**	3	0	0	3	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17SH1202	Engineering Physics#	3	0	0	3	34	6	40	34	6	40		3	60	100
3	17SH1204	Engg. Mathematics-I**	3	2	0	4	34	6	40	34	6	40		3	60	100
4	17ME1203	Computer aided Engineering Drawing#	2	0	4	4	34	6	40	34	6	40		3	60	100
5	17CE1201	Engineering Mechanics	2	2	0	3	34	6	40	34	6	40		3	60	100
6	17CE1202	Building Construction	3	0	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17SH12P2	Physics lab#	0	0	3	2	-		-	-		-	Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17CS12P4	Computer Programming Lab#	0	0	3	2	-		-	-		-		3	60	100
		TOTAL				**24**	-		-	-		-				

**Common to ALL #Common to CE & ME

17SH1201 - PROFESSIONAL ENGLISH

(Common to all branches)

Course Category	Basic Science	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	3 - 0 - 0
Prerequisite	Basic level of LSRW skills	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To develop their basic professional writing skills in English. 2. To achieve specific linguistic and verbal competence. 3. To acquire relevant skills and function efficiently in a realistic professional working environment. 4. To inculcate the habit of reading and writing.	
Course Outcomes	CO1	Equip verbal proficiency and face competitive exams such as GATE, GRE, TOEFL, GMAT etc.
	CO2	Draft professional writings: Email drafting, professional letters etc. for social and professional contexts.
	CO3	Write effective book reviews and make effective notes in professional environment.
	CO4	Procure considerable knack in using wide range of vocabulary.
	CO5	Write proposals, business letters, project reports and writing proposals.
	CO6	Acquire skills: Prepare speeches in analytical and critical procedures.
	UNIT –I **DATA INTERPRETATION:** Interpretation and analysis of the data based on text, tables and graphs (linear) – Charts: Bar, Pie etc. **VERBAL**: Verbal reasoning- Analogies, homophones & homonyms.	

Course Content	**UNIT –II** **WRITING:** Email Communication – Writing effective business email. **VERBAL:** Idioms and Phrases – One word substitutes. **UNIT –III** **ANALYTICAL WRITING**: Presenting perspective of an issue – Compare and Contrast – Cause and effect – Analyze and argument. **VERBAL**: Affixes: Prefix and suffix – Root words – Derivatives. **UNIT –IV** **TECHNICAL WRITING:** Writing Proposals: Significance, structure, style and writing of project reports. **VERBAL:** Synonyms and antonyms. **UNIT –V** **WRITING:** Introduction to different kinds of materials: Technical & non-technical – note taking and note making – Identification of important points and precise the content. **VERBAL:** Words often confused. **UNIT –VI** **BOOK REVIEWS:** Review of a technical and non-technical – A brief written analysis including summary and appreciation. **VERBAL:** Sentence completion.
Textbooks & References Books	**TEXTBOOKS & REFERENCE BOOKS:** 1. A Textbook of English for Engineers and Technologists (Combined edition, Vol. 1 & Orient Black Swan 2010.) 2. Word Power Made Easy by Norman Lewis. 3. A Communicative Grammar of English by Geoffrey Leech.

17SH1202 - ENGINEERING PHYSICS

(Common to CE & ME)

Course Category	Basic Science	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	3 - 0 -0
Prerequisite	Fundamental concepts of Physics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. Explain the structure of crystalline solids and their uses in X-ray diffraction techniques. 2. Basic properties of magnetic materials and the uses in Science & Technology. 3. Explain and provide the knowledge about semiconductors and their use in electronic devices. 4. Describe the basic principles of communication system and their uses in communication filed. 5. Describe the characteristics of lasers and their fibers construction and applications in Science & Technology. 6. Understand the behavior of these nanomaterial's, quantum phenomena and the limitations of basic physical laws.	
Course Outcomes	CO1	Understand the structure of crystalline solids and their applications in X-ray diffraction.
	CO2	Understand the concept of magnetization and polarization and applications of magnets and dielectric materials in various disciplines.
	CO3	To know the properties of semiconductor materials by projecting the view of energy bands.
	CO4	Understand the concept of communication system with its applications in the field of Science & Technology.
	CO5	Understand the utilization of laser technology in various disciplines and know the concept of optical fiber and its applications.
	CO6	Basic ideas about superconductors and Nano materials with their uses in various fields of Science & Technology.

Course Content	**UNIT-I** **CRYSTALLOGRAPHY AND X-RAY DIFFRACTION:** **Crystallography:** Introduction – Space lattice – Unit cell – Lattice parameters – Bravia's lattice – Crystal systems – Packing fractions of SC, BCC and FCC – Planes in crystals – Miller indices – Inter planar spacing in cubic crystals. **X-ray diffraction:** X-ray diffraction in crystals - Bragg's law of diffraction – X-ray diffraction techniques - Laue method - Powder method (Debye-Scherer method). **UNIT-II** **DIELECTRICS AND MAGNETIC MATERIALS:** **Dielectric properties:** Basic definitions, electronic, ionic (quantitative) and orientation polarizations (qualitative) – Internal fields in solids, Classius – Mossotti equation. **Magnetic materials:** Introduction and basic definitions – Origin of magnetic moments – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis – Soft and hard magnetic materials – Applications of magnetic materials. **UNIT-III** **SEMICONDUCTORS AND SEMICONDUCTOR DEVICES:** **Semiconductors:** Intrinsic and extrinsic semiconductors – Electrical conductivity in semiconductors – Drift and diffusion currents – Einstein relations – Hall effect and its applications – Direct and indirect band gap semiconductors. **Physics of semiconductor devices:** Formation of PN Junction – I-V characteristics of PN junction diode – LED – Photo diode – Solar cell. **UNIT-IV** **COMMUNICATION SYSTEMS:** Communication System – Principles of basic communication system – Digital communication system – Analog communication system - Basic steps for analog/digital conversion – Sampling theorem. System-Signal bandwidth of signal – Signal impairment – Modulation – Different types - Demodulation process.

	UNIT-V **LASERS AND OPTICAL FIBERS:** **Lasers:** Introduction – Characteristics of lasers – Spontaneous and stimulated emission of radiation – Condition for Population inversion – Ruby Laser - He-Ne Laser – Applications of Lasers. **Optical fibers:** Introduction – Construction and working principle of optical fiber – Acceptance angle –Numerical aperture – Types of optical fibers – Block diagram of optical fiber communication system – Applications of optical fibers. **UNIT-VI** **SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS:** **Superconductivity:** Introduction – Effect of magnetic field – Meissener effect – Type I and Type II superconductors – Flux quantization – BCS theory (Qualitative treatment) –Applications of superconductors. **Physics of Nanomaterials:** Introduction – Significance of Nano scale and types of Nano materials – Physical properties: Optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterial's by top down and bottom up approaches: Ball mill, chemical vapour deposition and Sol gel – Applications of Nanomaterials.
Textbooks & Reference Books	**TEXT BOOKS:** 1. "Principles of electronics" by V.K.Mehtha, Tata McGraw Hill. 2. "Solid State Physics" by S.O.Pillai, New Age Publications (Labs edition). 3. "Introduction to Solid State Physics" by Charles Kittel, Wiley India Pvt Ltd, 7^{th} Edition. 4. "Engineering Physics" by R.K.Gaur & S.L.Gupta, Dhanpat Rai Publications. **REFERENCES BOOKS:** 1. "Modern Engineering Physics" by Dr. K. Vijaya Kumar, Dr. S. Chandra Lingam, S.Chand & Company ltd. 2. "Applied Physics" by P.K. Palanisamy: SciTech Publishers. 3. "Engineering Physics" by Dr. K.T. Tyagarajan, V.Rajendran, and Tata McGraw Hill.

17SH1204 - ENGINEERING MATHEMATICS - I

(Common to all Branches)

Course Category	Basic Science	**Credits**	4
Course Type	Theory	**Lecture-Tutorial-Practical**	3 - 2 - 0
Prerequisite	Intermediate Mathematics	**Sessional Evaluation** **Semester End Evaluation** **Total Marks**	40 60 100

Course Objectives	1. The basic concepts of matrices. 2. Solving Higher order differential equations with RHS of different types by using analytical techniques. 3. Taylor's and Maclaurin's series, maxima and minima of the functions of two and three variables. 4. The concepts of double and triple integrals, areas and volumes. 5. The gradient, divergence and curl operators, Solenoidal and irrotational vectors. 6. The basic concepts of vector integration.	
Course Outcomes	CO1	Understand effectively the analyzation of the rank of the matrix, consistency of system of linear equations, Eigen values and Eigen vectors.
	CO2	Acquire knowledge in solving higher order differential equations by using various types.
	CO3	Attains skills in analyzing the Taylor's and Maclaurin's series and maxima and minima of the functions of two and three variables.
	CO4	Apply double and triple integrals to find areas and volumes.
	CO5	Understand effectively curl, divergence and gradient operators, solenoidal and irrotational vectors with their applications.
	CO6	Acquire knowledge in analyzing the applications of Green's, Stoke's and Gauss-divergence theorems.
	UNIT-I **MATRICES:** Rank of matrix - Echelon form and Normal form - Consistency of system of linear equations - Eigen values and Eigen vectors.	

Course Content	**UNIT-II** **HIGHER ORDER DIFFERENTIAL EQUATIONS:** Homogeneous linear differential equations of second and higher order with constant coefficients with R.H.S. of the type e^{ax}, $\sin ax$ or $\cos ax$, x^n, e^{ax} V and $x^n\ v(x)$. **UNIT-III** **DIFFERENTIAL CALCULUS:** Taylor's and Maclaurin's series - Maxima and minima of function of two variables - Lagrangian method of multipliers with three variables only. **UNIT-IV** **MULTIPLE INTEGRALS:** Double and triple integrals - Change of order of integration - Change to polar coordinates - Area and volumes by double integration - Volume by triple integration. **UNIT-V** **VECTOR DIFFERENTIATION:** Gradient – Divergence – Curl – Solenoidal and irrotational vectors. **UNIT-VI** **VECTOR INTEGRATION:** Line, surface and volume integrals - Green's, Stoke's and Gauss-divergence theorem (without proof) – Applications to theorems.
Textbooks & References	**TEXTBOOKS:** 1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers, New Delhi. 2. Engineering Mathematics – B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. **REFERENCE BOOKS:** 1. Higher Engineering Mathematics - H.K. Dass, Er. RajnishVerma, S. Chand Publication, New Delhi. 2. Advanced Engineering Mathematics - N.P. Bali & M. Goyal, Lakshmi Publishers and New Delhi. 3. Engineering Mathematics-I& II - Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad, S. Chand Publication, New Delhi. 4. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India.

17ME1203 - COMPUTER AIDED ENGINEERING DRAWING

(Common to CE and ME)

Course Category	Engineering Science	**Credits**	4
Course Type	Theory	**Lecture-Tutorial-Practical**	2 - 0 - 4
Prerequisite	Knowledge of basic math concepts and different types of shapes, angles, symmetry, scaling and unit measurement systems.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To enable the students with various concepts like dimensioning, construction of conic sections, polygons, cycloids and involutes. 2. To impart and inculcate proper understanding of AutoCAD fundamentals. 3. To apply the knowledge of AutoCAD for the projections of points, lines and solids. 4. To know about sections and development of solids. 5. To improve the visualization skills with isometric projections.	
Course Outcomes	CO1	Apply the conventions and the methods of engineering drawing.
	CO2	Create geometric constructions, conics with hand tools to draw lines, polygons, circle, tangencies, conic sections and irregular arcs.
	CO3	Sketch the solutions to the problems on projection.
	CO4	Use the sectioning and developments concepts of solids in actual applications.
	CO5	Visualize the objects that they can apply these skills in developing new products.

<table>
<tr><th colspan="5">SCHEME OF EVALUATION</th></tr>
<tr><th>Course</th><th>Marks</th><th colspan="2">Examination and Evaluation</th><th>Scheme of examination</th></tr>
<tr><td rowspan="3">Computer Aided Engineering Drawing</td><td>60</td><td colspan="2">Semester end Examination for 3 hours duration (External evaluation) in the CAEG Laboratory</td><td>60 marks are allotted for the drawing examination during semester end.</td></tr>
<tr><td rowspan="2">40</td><td>20</td><td>Day-to-Day evaluation during the practice. (Internal evaluation).</td><td>Marks are evaluated based on average performance of student in day-to-day exercises and finalized for 20 marks</td></tr>
<tr><td>20</td><td>Drawing examination (Internal Evaluation)</td><td>Two drawing examinations are conducted for 20 marks. 80% of better one and 20% of the other are added and finalized for 20 marks. Drawing examination-I: Shall be conducted just before I mid-term examinations.
Examination-II: Shall be conducted just before II mid-term exam.</td></tr>
<tr><td>Course Content</td><td colspan="4">UNIT-I
GEOMETRICAL CONSTRUCTIONS, CONICS AND SPECIAL CURVES :
Introduction: Importance of Drawing – Drawing instruments – Sheet layout – BIS Conventions – Types of lines –Lettering –Dimensioning methods.
Geometrical constructions: Regular polygons (Triangle, square, pentagon and hexagon)
Conic sections: Introduction – Construction of ellipse – Parabola and hyperbola using eccentricity method and rectangular/ oblong methods.
Special curves: Introduction –Construction of cycloids and involute curves.

UNIT-II
INTRODUCTION TO CAD SOFTWARE:
Introduction: Importance of computer aided drawing – Software tool environment – Drawing size and scale – Main menu –Tool bar and menus – Co-ordinate system and drafting settings.
Creation and Editing: Points – Lines – Poly lines – Polygons – Splines – Circle – Ellipse – Text – Move – Copy – Off-set – Pan – Mirror – Rotate – Trim – Extend – Break – Chamfer – Fillet – Curves – Block – Layers – line representations – Dimensioning – Hatching.
UNIT-III
PROJECTIONS OF POINTS AND LINES:
Projections of points: Principles of projections – Planes of projection – Points in four quadrants.</td></tr>
</table>

	Projections of lines: Line inclined to both the principal planes (first angle projection only). **UNIT-IV** **PROJECTIONS OF PLANES AND SOLIDS:** **Projections of planes:** Plane (triangle, square, rectangle, pentagon, hexagon and circular) inclined to both the principal planes. **Projections of solids:** Solids such as Prisms – Pyramids – Cylinders – Cones **UNIT-V** **SECTIONS OF SOLIDS, DEVELOPMENT OF SURFACES:** **Sections of solids:** Solids such as Prisms, Pyramids – Cylinders and cones resting on their bases on HP. **Development of surfaces:** Lateral surfaces of solids such as prisms – Pyramids – Cylinders and cones (cut by a plane inclined to HP). **UNIT-VI** **ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS:** **Isometric projections:** Isometric projections of simple objects. **Orthographic projections:** Conversion of pictorial views into orthographic views.
Textbooks & Reference books	**TEXTBOOKS:** 1. Engineering Drawing, N.D. Bhat / Charotar Publishing House, Gujarat, 51st edition, 2013. 2. Sham Ticked, AutoCAD 2013 for Engineers and Designers, Dream tech Press, 2013. **REFERENCE BOOKS:** 1. Engineering Drawing and Graphics, Venugopal K, New Age International Pvt. Ltd. New Delhi, 2001. 2. D.M. Kulkarni, A.P. Rastogi and A.K. Sarkar, Engineering Graphics with Auto CAD, PHI Learning Private Limited, Revised Edition, August 2010. 3. T.Jeyapoovan, Engineering Drawing and Graphics Using Autocad, Vikas Publishing House, 3rd Edition, 2010. 4. Jolhe, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2007. 5. Basant Aggarwal, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2008.

17CE1201 - ENGINEERING MECHANICS

(Civil Engineering)

Course Category:	Engineering Science	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	Engineering Physics, Engineering Mathematics.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To analyze the system of forces acting in a plane in different conditions. 2. To calculate unknown force components under the action of frictional forces. 3. To explain the properties of surfaces by calculating centroid, moment of inertia and other related concepts. 4. To evaluate motion characteristics of body subjected to given force. 5. To analyze the system of forces using moment of momentum principle, D Alembert principle and Work-Energy equations. 6. To analyze the components of forces in trusses and cables.	
Course Outcomes	CO1	Determine the components of forces in rectangular and non-rectangular coordinates.
	CO2	Determine the support reactions on structures and analyze systems that include frictional forces.
	CO3	Locate the centroid of an area, calculate the second moment and principal second moment of an area
	CO4	Calculate the motion characteristics of a body subjected to a given force system
	CO5	Determine the resultant forces using moment of momentum principle, D Alembert principle and Work-Energy equations.
	CO6	Determine resultant forces in trusses and cables for a given system of forces
	UNIT-I **STATICS**: Introduction – Units and Dimensions – Law of mechanics – Vectors – Vectorial representation of forces and moments – Vector operations – Coplanar and concurrent forces – Resolution and composition of forces – Equilibrium of a particle –Equivalent systems of forces – Principle of transmissibility – Single equivalent force and Free body diagram – Types of supports and their reactions – Equilibrium of rigid bodies in two dimensions.	

Course Content	**UNIT – II** **FRICTION :** Types of friction – Limiting friction – Laws of friction – Static and dynamic friction – Motion of bodies – Belt drivers, open crossed and compound – Length of belt, Tension – Tight side and slack side initial power transmitted and centrifugal power transmitted and conditions for maximum power – Screw jacks. **UNIT – III** **PROPERTIES OF SURFACES AND SOLIDS**: Determination centroids of areas – First moment of area and the centroid – Second and product moments of plane area – Parallel axis theorems and perpendicular axis theorems – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia. **UNIT – IV** **DYNAMICS-1**: Displacement – Velocity and acceleration and their relationship – Relative motion – Curvilinear motion – Newton's law of motion. **UNIT – V** **DYNAMICS-2**: Impact of elastic bodies – Moment of Momentum Equations – Work energy equation – D Alembert's Principle and its uses, Impulse and Momentum. **UNIT – VI** **ANALYSIS OF PLANE TRUSSES & CABLES:** **Trusses:** Assumptions – rigid and non-rigid trusses – Simple truss, analysis by method of joints, method of sections and tension coefficient method. **Cables:** Assumptions, parabolic and catenary cables.
Textbooks & Reference books	**TEXTBOOKS:** 1. Engineering Mechanics by S. Timoshenko, D.H. Young, J V Rao and Sukumar 2. Engineering Mechanics by A. K. Tayal. 3. Engineering Mechanics by R.K. Bansal. **REFERENCE BOOKS:** 1. Engineering Mechanics by F. L. Singer. 2. Engineering Mechanics by J .L .Meriam and L. G. Kraige. 3. Engineering Mechanics and statistics by P.B.Beer & E. R. Johnston.

17CE1202 - BUILDING CONSTRUCTION

(Civil Engineering)

Course category	Engineering Science	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Building Materials	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To learn various types of building and their components. 2. To explain different types of masonries and their applications. 3. To describe various types of lintels and arches. 4. To select suitable type of flooring, staircases, doors and windows. 5. To explain different special treatment for buildings. 6. To be aware of engineering green building technology.	
Course Outcomes	CO1	Understand with various types of buildings, components of a building and foundation.
	CO2	Understand various types of masonry construction.
	CO3	Understand the various types of openings in buildings.
	CO4	Understand the various types of floors, roofs, and their construction practices.
	CO5	Know various special treatments for fire, thermal and acoustic insulation.
	CO6	Understand the principles and concept of Green building technology.
Course Content	**UNIT – I** **INTRODUCTION:** Types of buildings – Components of a building – Design loads – Types and uses of shallow and deep foundations. **UNIT – II** **MASONRY CONSTRUCTION :** **Stone Masonry:** Technical terms – Lifting appliances – Joints – Types – Random (un-coarsed) rubble – Coarsed rubble – Dry rubble masonry – Ashlar masonry – Ashlar fine – chamfered fine – Supervision.	

Brick masonry: Technical terms – Bonds in brick work-English bond – Single & Double Flemish bond – Garden wall bond.
Raking bond – Dutch bond – Defects – Comparison of brick masonry and stone masonry.

Composite masonry: Stone facing with brick backing – Brick facing with concrete backing – Hollow concrete blocks and construction.

Cavity walls: Brick cavity walls – Position of cavity at foundation – Roof and at opening levels.

Lintels & Arches: Lintels – Types – Construction. Arches: Technical terms – Types – Brick arches – Rough – Axed – Stone arches – Flat – Semicircular.

Introduction to plain and reinforced concrete: construction: Merits and demerits.

UNIT – III

DOORS AND WINDOWS :

Doors: Location – Technical terms – Size – Types – Construction – Suitability.

Windows: Factors affecting selection of size – Shape – Location and no. of windows – Types – Construction – Suitability – Fixtures and fastenings.

Ventilators: Ventilators combined with window – Fan light.

Stairs and Staircases: Definition – Technical terms – Requirements of good stair – fixing of going and rise of a step – Types of steps – Classification – Example –Stair planning – Elevators – Escalators.

UNIT – IV

FLOORINGS : Introduction – Essential requirements of a floor – Factors affecting selection of flooring material – Types of ground floors – Brick – Flag stone – tiled cement concrete – Granolithic – Terrazzo – Marble – Timber flooring – Upper floor - Timber – Timber floor supported on RSJ flag stone floor resting on RSJ – jack arch floor – Reinforced concrete floor – Ribbed floor – Pre-cast concrete floor.

Roofs and roof coverings: Introduction – Requirements of good roof technical terms – Classification – Types of roof coverings for pitched roof. A.C. sheet roofs – Fixing of A.C. sheets – Laying of big six sheets – G.I. Sheets roofs – slates – Flat roof –advantages – Disadvantages – Types of flat terraced roofing.

	Wall finishes: Plastering- Objectives of plastering – Requirements of good plaster – Types of mortars for plastering – Terms used in plastering work tools used in plastering – Types of pointing. **Temporary works:** Formwork – Stripping of form work – Timbering in Trenches – Types of scaffolding – Shoring and under pinning. **UNIT – V** **SPECIAL TREATMENTS:** **Fire Resistants:** Characteristics of fire resisting materials – Fire resisting – Properties of common building materials (brick – stone, Tiles, glass). **Thermal insulators:** Thermal insulating materials – Methods of thermal insulation. **Acoustical construction:** Introduction – Characteristics of audible sound – Behavior of sound in enclosure – Reflection of sound – Reverberation and absorption. **UNIT – VI** **GREEN BUILDING:** Principles – Concepts – Case study.
Textbooks & Reference books	**TEXT BOOKS:** 1. Building Construction by Dr. B. C. Punmia. 2. Building Construction by Gurucharan Singh. 3. Building Construction by Sushil Kumar. **REFERENCE BOOKS:** 1. Building Construction by S. C. Rangwala. 2. Building Construction by P.C Varghese, Prentice -Hall of India, New Delhi. 3. Indian Standard Institution, National Building Code of India, ISI, 1984, New Delhi.

17SH12P2 - ENGINEERING PHYSICS LABORATORY

(Common to CE & ME)

Course Category	Basic Science	**Credits**	2
Course Type	Practical	**Lecture-Tutorial-Practical**	0 - 0 - 3
Prerequisite	Engineering Physics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective(s)	The main objective is to provide students to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field.
Course Outcomes	1. These experiments in the laboratory are helpful in understanding important concepts of physics through involvement in the experiments by applying theoretical knowledge. 2. It helps to recognize where the ideas of the students agree with those accepted by physics and where they do not.
Course Content	Minimum of 8 experiments to be completed out of the following : **LIST OF EXPERIMENTS** 1. Determination of Rigidity modulus of a material – Torsional pendulum. 2. Melde's Experiment – Transverse and Longitudinal modes. 3. Time constant of RC circuit. 4. Resonance in LCR circuit. 5. Magnetic field along the axis of a coil (Stewart-Gees Method). 6. Study of characteristics of LED and LASER Sources. 7. Evaluation of Numerical Aperture of a given fiber. 8. Energy Gap of a material of p-n junction. 9. Diode Characteristics. 10. Transistor Characteristics. 11. Characteristics of Solar cell. 12. Logic Gates. 13. Hall Effect.

17CS12P4 - COMPUTER PROGRAMMING LABORATORY

(Common to CE & ME)

Course Category	Engineering Science	**Credits**	2
Course Type	Practical	**Lecture – Tutorial – Practical**	0 - 0 - 3
Prerequisite	Basic mathematical knowledge to solve problems in analytical manner and idea on programming Methodologies.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Outcome(s)	Upon successful completion of the course, the students will be able to: Solve problems using C Programming concepts.
Course Content	1. Write a C program to evaluate expressions. (3 Labs) 2. Write a C program to implement if constructs. (3 Labs) 3. Write a C program to implement Switch statement. 4. Write a C program to implement all iterative statements. (3 Labs) 5. Write a C program to implement Arrays. (2 Labs)
Textbooks & Reference books	**TEXTBOOK(S):** 1. Programming with ANSI & TURBO C by Ashok N.Kamthane, Pearson Education 2007. **REFERENCE BOOKS:** 1. Let Us C by Yashavant Kanetkar, BPB Publications. 2. Programming in ANSI C by Balaguruswamy 6th Edition, Tata McGraw Hill Education, 2012.
E-Resources	1. https://nptel.ac.in/courses 2. https://freevideolectures.com/university/iitm

N.B.K.R. INSTITUTE OF SCIENCE &TECHNOLOGY:: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

II YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – I SEMESTER

S.NO.	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	D/P		Test-I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max Marks		Duration In Hours	Max. Marks	
1	17SH2101	Engineering Mathematics-II **	2	2	0	3	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17CE2101	Strength of Materials	3	2	0	4	34	6	40	34	6	40		3	60	100
3	17CE2102	Fluid Mechanics – I	3	2	0	4	34	6	40	34	6	40		3	60	100
4	17CE2103	Building Planning & Drawing	1	0	3	3	34	6	40	34	6	40		3	60	100
5	17CE2104	Surveying – I	2	2	0	3	34	6	40	34	6	40		3	60	100
6	17CE2105	Engineering Geology	3	0	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17CE21P1	Surveying – 1 Lab	0	0	3	2	-	-	-	-	-	-	Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17CE21P2	Engineering Geology Lab	0	0	3	2	-	-	-	-	-	-		3	60	100
		MANDATORY														
1	17MC2102	Technical English & Soft Skills **	2	0	2	0	34	6	40	34	6	40	0.8(Better of two) + 0.2(Other)	3	60	100
		TOTAL				**24**										

**Common to ALL

17SH2101 - ENGINEERING MATHEMATICS -II

(Common to all Branches)

Course Category	Basic Science	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	2-2-0
Prerequisite	Intermediate Mathematics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. The concept of First shifting theorem, change of scale property, Laplace transformation of multiple by t and division by t and transformation of derivatives and integrals. 2. The application of solutions of ordinary differential equations. 3. The determination of Fourier coefficients, Fourier series, even and odd functions and change of intervals. 4. The concept of Fourier transforms. 5. The properties of Z - Transforms, shifting properties, initial value and final value theorems. 6. The applications of difference equations and to develop the basic mathematical knowledge and computational skills of the students in the areas of applied mathematics.	
Course Outcomes	CO1	Acquire basic knowledge in Laplace transforms and their applications.
	CO2	Develop analytical skills in solving the ordinary differential equations by using the Laplace transform technique.
	CO3	Develop analytical skills in solving the problems involving Fourier series.
	CO4	Understand effectively Fourier sine and cosine integral, Fourier transforms, Fourier sine and cosine transforms.
	CO5	Attains skills in analyzing the Z - Transforms and their applications.
	CO6	Understand effectively Inverse Z - Transforms and applications to difference equations.

UNIT – I

LAPLACE TRANSFORMATION: Laplace transformations of standard functions – First shifting theorem – Change of scale property – Laplace transformation of multiple by t and division by t – Transformation of derivatives and integrals.

Course Content	**UNIT – II** **INVERSE LAPLACE TRANSFORMATION:** Inverse transforms – Method of partial fractions – Shifting property – Inverse Laplace transform of a multiple by s and division by s – Inverse Laplace transform of derivatives and integrals – Convolution theorem – Application to solutions of ordinary differential equations. **UNIT – III** **FOURIER SERIES:** Determination of Fourier coefficients – Fourier series – Even and odd functions – Change of intervals (0,2l). **UNIT – IV** **FOURIER TRANSFORMS:** Fourier Integral Theorem (Without proof) –Fourier sine and cosine integrals – Fourier integral in complex form – Fourier Transforms – Fourier sine and cosine transforms. **UNIT – V** **Z-TRANSFORMS:** Z–Transform of some standard functions – Properties of Z-Transforms – Shifting properties– Initial value theorem and final value theorem. **UNIT – VI** **INVERSE Z- TRANSFORM AND DIFFERENCE EQUATIONS:** Inverse Z-Transform – Convolution theorem - Inversion by partial fractions – Applications to difference equations.
Textbooks & Reference books	**TEXTBOOKS:** 3. Higher Engineering Mathematics - B.S.Grewal, Khanna Publishers, New Delhi. 4. Engineering Mathematics - B.V. Ramana, Tata McGraw-Hill Education Pvt. Ltd, New Delhi. **REFERENCE BOOKS:** 4. Higher Engineering Mathematics - H.K. Dass, Er. RajnishVerma, S.Chand Publication, New Delhi. 5. Advanced Engineering Mathematics - N.P. Bali & M. Goyal, Lakshmi Publishers, New Delhi. 6. Advanced Engineering Mathematics - Erwin Kreyszig, Wiley, India.

17CE2101 - STRENGTH OF MATERIALS

(Civil Engineering)

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial -Practical**	3 - 2 - 0
Prerequisite	Engineering Mechanics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the behavior of ductile and brittle materials under uni-axial loading. 2. To apply the method of Mohr's circle for principle stresses and strains and understand theories of failures. 3. To construct shear force and bending moment for every section of the loaded beam and compare relations among shear force, bending moment and rate of loading. 4. To apply the concept of theory of simple bending for calculating flexural and shear stresses. 5. To calculate stresses and strains associate with thin and thick cylinders. 6. To implement the concept of theory of torsion for calculating shear stresses and understand the mechanical behavior of spring.	
Course Outcomes	CO1	Gain in knowledge of types of material and their behavior under uni-axial loading.
	CO2	Calculate the principle stresses and strains by applying Mohr's circle method.
	CO3	Construct shear forces and bending moments for various types of beams under different types of loading.
	CO4	Understand and analyze the variation of flexural and shear stresses across the cross-section due to shear force and bending moment.
	CO5	Calculate hoop and longitudinal stresses in thin and thick cylinders.
	CO6	Calculate shear stress due to twisting effect and understand the mechanical behavior of spring.
	UNIT – I **STRESS & STRAIN:** Concept of stress and strain – Elasticity and plasticity – Hooke's law – Stress – Strain diagram – Tapered bars, Compound bars – Poison's ratio – Volumetric strain – Relation between elastic constants.	

Course Content	Temperature stresses – Factor of safety – Ductile and brittle materials under compression – Endurance limit. **UNIT – II** **PRINCIPAL STRESSES:** Principal stresses and principal strains – Mohr's circle of stresses – Theories of failure. **UNIT –III** **SHEAR FORCE AND BENDING MOMENT IN BEAMS:** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads and combination of these loads – Point of contra flexure– Relation between S.F, B.M and rate of loading at a section of a beam. **UNIT –IV** **FLEXURAL AND SHEAR STRESSES IN BEAMS**: Theory of simple bending – Distribution of flexural stresses and shear stresses – Resilience due to flexure and shear – Bending in unsymmetrical sections – Shear centre. **UNIT –V** **CYLINDERS:** Thin cylinders subjected to internal fluid pressure – Thick cylinders – Lame's theorem – Internal and external pressure – Compound cylinders. **UNIT – VI** **TORSION OF CIRCULAR SHAFTS**: Theory of pure torsion in solid and hollow circular shafts – Transmission of power – Combined bending – Torsion and end thrust. **SPRINGS:** Types of springs – Close and open coiled helical springs under axial loads and axial couple – Springs in series and parallel – Carriage or leaf springs.
Textbooks & Reference books	**TEXTBOOKS:** 1. Strength of Materials by R.K. Bansal. 2. Strength of Materials Vol.I & Vol.II by Timoshenko. 3. Strength of Materials by Ramamrutham. **REFERENCE BOOKS:** 1. Mechanics of Structures Vol.I &Vol.II by S.B.Junnarkar. 2. Strength of Materials by Andrew Pytel and Ferdinand Singer. 3. Strength of Materials by B.C. Punmia.

17CE2102 - FLUID MECHANICS – I

(Civil Engineering)

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3-2-0
Prerequisite	Engineering Mathematics-II	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objectives	1. To impart knowledge on fluid properties and types of pressure. 2. To understand the pressure and buoyancy acting on submerged and floating bodies. 3. To study the theories of fluid flow and its pressure variations. 4. To understand the basics of fluid properties, pressure and buoyancy. 5. To learn about fluid pressure and its measurements. 6. To learn about open channel flow and uniform flow.	
Course Outcomes	CO1	Understand the properties of fluid, differentiate type of pressures.
	CO2	Compute hydrostatic pressure acting on surface apply the concept of buoyancy and flotation to determine the stability of floating bodies.
	CO3	Apply conservation laws to derive governing equations of fluid flows and measurement.
	CO4	Apply principles of dimensional analysis to design models.
	CO5	Analyze and design the open channel with uniform flow condition.
	CO6	Analyze and design the open channel with gradually varied flow and rapidly varied flow.
Course Content	**UNIT - I** **PROPERTIES OF FLUIDS:** Introduction – Units, properties of fluids – Density, specific weight, specific volume and specific gravity – Thermodynamic Properties –Equation of perfect gas – Viscosity –Kinematic viscosity, dynamic viscosity –Compressibility and elasticity – Surface tension and capillarity – Liquid droplet, Hollow bubble, liquid jet – Vapour pressure and cavitation. **FLUID PRESSURE AND ITS MEASUREMENT:** Fluid pressure at a point; Pressure variation in a fluid at rest – Pascal's Law – Atmospheric, absolute, gauge and vacuum pressures – Measurement of pressure – Simple manometers and differential manometers.	

UNIT– II

HYDROSTATIC FORCES ON SURFACES: Total pressure and centre of pressure on Plan surface – Vertical, horizontal and inclined – Total pressure and centre of pressure on curved surfaces – Total pressure and centre of pressure on lock gates.

BUOYANCY AND FLOTATION: Buoyant force and centre of buoyancy – Meta centre and Meta centric height – Stability of submerged and floating bodies – Determination of Meta centric height – Meta centric height for floating bodies containing liquid – Time period of transverse oscillation of a floating body.

UNIT - III

FUNDAMENTALS OF FLUID FLOW: Introduction – Velocity of fluid particles – Types of fluid flow – Description of the flow pattern – Basic principles of fluid flow –Continuity equation – Acceleration of a fluid particle – Rotational and irrotational motions – Circulation and Vorticity – Velocity potential – Stream function; Streamlines, equipotential lines – Flow net – Methods of drawing flow nets – Use of flow net – Limitations of flow net.

EQUATION OF MOTION AND ENERGY EQUATION: Forces acting on fluid motion; Euler's equation of motion – Bernoulli's equation from the principle of conservation of energy – Energy correction factor – Application of Bernoulli's equation – Venturi meter, Orifice meter, Nozzle meter, Pitot tube – Impulse – Momentum equations, Momentum correction factor.

UNIT - IV

DIMENSIONAL ANALYSIS: Derived quantities; Dimensional homogeneity – Methods of dimensional analysis – Rayleigh's method, Buckingham's Pie theorem – Repeating variable – Model analysis – Similitudes – Forces acting on fluid – Dimensional numbers – Model laws – Classification of models.

UNIT– V

OPEN CHANNEL FLOW – INTRODUCTION: Types of channels – Classification of flows – Velocity distribution – One dimensional method of flow analysis – Pressure distribution – Equation of continuity – Energy equation – Momentum equation – Specific energy – Critical depth – Section factor.

	UNIFORM FLOW IN OPEN CHANNEL: Chezy's equation – Darcy-Weisbach friction factor – Manning's formula – Velocity-shear distribution – Manning's roughness coefficient – Hydraulically efficient channel section – Critical slope. **UNIT– VI** **GRADUAL VARIED FLOW (GVF) IN OPEN CHANNEL:** Differential equation of GVF – Classification of flow properties – Analysis of flow profile – Transitional depth – GVF differential equation. **RAPIDLY VARIED FLOW (RVF) IN OPEN CHANNEL:** Momentum equation formulation for jump – Hydraulic jump in a horizontal rectangular channel – Non-rectangular channel – Sloping floor – Use of the jump as an energy dissipator.
Textbooks and Reference books	**TEXTBOOKS:** 1. Hydraulics and Fluid Mechanics Including Hydraulics machines by Dr. P.N. Modi, Dr. S.M. Seth, and Standard book house publications. 2. Hydraulics and Fluid Mechanics Including Hydraulics machines A.K. Jain, Khanna Publications. 3. Subramanya.K, Flow in Open channel, Tata McGraw Hill Publications, New Delhi. **REFERENCE BOOKS:** 1. F M White, Fluid Mechanics, Tata McGraw Hill Publication. 2. Fluid Mechanics – Fundamentals and Applications by Yunus A. Cengel, Jhon M. Cimbala, Tata McGraw Hill Publications. 3. A Textbook of Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal, Laxmi Publications. 4. Chow V.T. Open Channel Hydraulics, Blackburn Press.

17CE2103 - BUILDING PLANNING AND DRAWING

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	1-0-3
Prerequisite	Building Materials and Building Construction	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand and apply the basic concepts of building drawing as per NBC standards. 2. To understand the basics of planning of different types of buildings. 3. To prepare plans, sections and elevations of G + 1 buildings. 4. To execute the plan for residential buildings. 5. To illustrate various components of buildings. 6. To prepare detailed drawing for residential buildings.	
Course Outcomes	CO1	Understand the terms in building drawing, and able to apply the NBC standards in building drawing.
	CO2	Understand the basics of planning of different types of buildings.
	CO3	Prepare plans, sections and elevations of G + 1 buildings.
	CO4	Familiar with plan approval procedure.
	CO5	Draw various components of buildings using conventional symbols.
	CO6	Prepare detailed drawings of a two storey building.
Course Content	**PART-A (Theory)** **INTRODUCTION:** Terms used in building drawing as per NBC – Factors affecting in selection of site – Functional requirements of a residential building – Minimum size requirements as per NBC – Standard sizes of door, windows and ventilators. **PLANNING:** Principles of planning – Factors to be considered in planning – Planning of residential, Office, School and Hospital buildings – Preliminaries of vaastu – Municipal bye-law – List of documents to be submitted for building plan approval.	

	PART-B (Drawing) Standard conventional signs and symbols used in Civil Engineering Drawing – Bonds in brick masonry – Paneled and flush doors – Glazed windows – Steel roof truss. Preparation of plan, section and elevation of simple residential buildings with flat roof not exceeding two storeys. **EVALUATION:** 1. For university examination, two out of three questions to be answered from Part–A (Theory) for 30 marks (i.e. 2x15=30). And one compulsory drawing question to be answered from Part-B (Drawing) for 30 marks (i,e.1x30=30) 2. For internal evaluation, a weightage of 20 marks out of a total of 40 marks to be given for day-to-day work.
Textbooks and Reference books	**TEXTBOOKS:** 1. Building Planning and Drawing by Dr. N. Kumara Swamy & A. Kameswara Rao. 2. Building Planning Design and Scheduling by Gurucharan Singh & Jagadish Singh. 3. Building Planning and Drawing by S.S. Bhavikatti and M.V.Chitawaagi. **REFERENCE BOOKS:** 1. Building Drawing by Shah M.H and Kale C.M. 2. NBC of India -2016 (Vol.I & Vol.II). 3. Model Building Bye-laws -2016 govt. of A.P building rules – 2017.

17CE2104 – SURVEYING – I

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2-2-0
Prerequisite	Mathematics	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objectives	1. To apply knowledge of mathematics, science and engineering for understanding measurement techniques and equipment used in land surveying. 2. To understand various methods of measurements and markings. 3. To understand various methods of locating points related to land surveying. 4. To understand the procedure of establishing control points. 5. To interpret contours from levelling survey. 6. To understand various methods of completing areas and volumes.	
Course Outcomes	CO1	Understand basic principles of land surveying. Be able to apply chain surveying principles to book observations and make necessary calculations.
	CO2	Understand various methods of angle measurement. Be able calculate bearings, magnetic dip and declination. Be able to plot survey using a prismatic compass. Be able to calculate errors in compass survey.
	CO3	Understand the fundamentals of plane table surveying. Apply various methods of plane tabling and be able to plot plane table survey with correction for errors.
	CO4	Understand fundamental principles and techniques of leveling and different types of level instruments. Use leveling principles to draw profiles, longitudinal sections and cross-sections.
	CO5	Understand the basic principles of contouring and uses of contour maps.
	CO6	Calculate areas and volumes from survey data using mathematical principles.

Course Content	**UNIT – I** **BASIC CONCEPTS:** Surveying definition – Classification – Principles of Surveying – Measurements – Basic measurements and methods – Plan and map – Scales used for maps and plans. **CHAIN SURVEYING**: Principles of chain surveying – Basic definitions – Well conditioned triangle; Selection of survey stations and survey lines – Field work – Recording measurements – Types of Cross staff – Instruments for setting out right angles – Line ranger – Cross staff survey – Obstacles in chain survey. **UNIT – II** **COMPASS SURVEYING**: Traversing – Meridians – Azimuth – Bearings – Magnetic dip and declination – Prismatic compass – Compass traverse – Local attraction – Plotting of a survey work – Errors in compass surveying – Limits of accuracy. **UNIT – III** **PLANE TABLE SURVEYING**: Plane table and its accessories – Setting up – Plane tabling – Radiation – Traversing – Intersection and resection methods – Resection by trial and error method – Graphical method – Tracing paper method – Lehmann rules – Errors in plane tabling. **UNIT-IV** **LEVELLING:** Basic definitions – Curvature and refraction – Different methods of levelling – Classification of direct levelling methods – Levels – Dumpy level – Tilting level – Auto level – Levelling staff – Level field book – Profile levelling – Cross sectioning – Reciprocal levelling – Sources of errors in levelling – Degree of precision. **UNIT – V** **CONTOURING**: Methods of representing relief – Contouring – Contour interval – Characteristics of contours – Methods of locating contours – Direct and indirect methods of contouring – Interpolation and sketching of contours – Location of a contour gradient – Uses of contour maps. **UNIT – VI** **AREAS AND VOLUMES:** Computation of areas from field notes and plotted figures. Areas of figures at boundaries by mid-ordinate rule – Trapezoidal rule – Average ordinate rule – Simpson's 1/3 rd rule. Computation of straight volumes of level section using Trapezoidal and Prismoidal rules. Computations of volumes of borrow pits by spot levels and reservoirs by contours.

Textbooks and Reference books	**TEXTBOOKS:** 1. Surveying by Dr. K. R. Arora. 2. Surveying by Dr. B. C. Punmia. 3. Surveying by Dr. C. Venkatramaiah. **REFERENCE BOOKS:** 1. Surveying and Levelling by S.S.Bhavikatti. 2. Surveying and Levelling by T.P.Kanetkar and S.V.Kulkarni. 3. Plane Surveying by A. M. Chandra.

17CE2105 - ENGINEERING GEOLOGY

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3-0-0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objectives	1. To introduce the basic concepts of geology and mineralogy. 2. To acquire the knowledge of petrology in identification of rocks. 3. To understand the basic concepts of geomorphology. 4. To introduce the basic concepts of structural geology. 5. To understand the general geological hazards and their remedial measures. 6. To understand and apply the geological concepts for civil engineering works.	
Course Outcomes	CO1	Understand the surface geological processes and importance of geology in Civil Engineering.
	CO2	Understand and identify various types of minerals.
	CO3	Understand and identify various types of rocks.
	CO4	Understand the elements of structural geology.
	CO5	Understand general geological disasters.
	CO6	Apply the geology concepts in major civil engineering projects.
Course Content	**UNIT - I** **INTRODUCTION**: Branches of geology useful to Civil Engineering – Scope of geological studies in GSI, NIRM. **MINERALOGY**: Definition, origin and composition of mineral – Physical properties of minerals – Megascopic identification of common rock forming minerals & economic minerals. **UNIT - II** **PETROLOGY**: Definition of rock and its forming processes.	

IGNEOUS PETROLOGY: Different types of magma – Volcanic phenomenon and different materials ejected by volcanoes – Types of volcanic eruption – Classification of rock on the basis of depth of formation – Chemical and mineralogical composition – Texture and its types.

Various forms of igneous rocks – Detailed study of acidic igneous rocks like Granite, Rhyolite – Basic igneous rocks like Gabbro, Dolerite and Basalt – Engineering aspect of igneous rocks.

SEDIMENTARY PETROLOGY: Mode of formation, mineralogical composition – Structures and textures – Classification of sedimentary rocks and their characteristics – Gradation of classic rocks – Detailed study of Conglomerate, Breccia, Sandstone, Mudstone and Shale, Limestone with engineering consideration.

METAMORPHIC PETROLOGY: Agents and types of metamorphism, metamorphic grades, mineralogical composition, structures & textures in metamorphic rocks. Distinguishing features of metamorphic rocks as rock cleavage, Schistosity, Foliation. Classification of metamorphic rocks and detailed study of Gneiss, Schist, Slate with engineering consideration.

UNIT - III

PHYSICAL GEOLOGY: Factors causing weathering – Erosion and denudation – Product of weathering and engineering consideration – Geomorphological features by geological agents as Water fall, Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landforms, Loess, Residual deposits of clay with flints, Solifluction deposits, mudflows, coastal deposits.

UNIT - IV

STRESS AND STRAIN IN ROCKS: Concept of rock deformation & tectonics –Structural elements as Dip and Strike – Fold types and nomenclature, Criteria for their recognition in field – Faults: Classification, recognition in field – Types of joints, unconformity – Importance of structural elements in engineering operations.

Consequences of failure as land sliding, earthquake and subsidence – Strength of Igneous rock structures.

UNIT - V

GEOLOGICAL HAZARDS: Rock instability and slope movement: Concept of sliding blocks – Different controlling factors – Instability in vertical rock structures and measures to prevent collapse – Rock quality designation, rock mass description – Types of landslide and their prevention – (By surface drainage.

	slope reinforcement by rock bolting and rock anchoring, retaining wall, slope treatment) – Ground water: Factors controlling water bearing capacity of rock – Pervious & impervious rocks and lowering of water table and subsidence. Earthquake: Magnitude and intensity of earthquake – Case study on elevation and subsidence in India – Seismic zone in India. **UNIT - VI** **GEOLOGY OF DAM, RESERVOIR AND TUNNEL SITE:** Required geological consideration for selecting dam, reservoir and tunnel site –Failure of Reservoir – Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions for dams, reservoirs and tunnels.
Textbooks and Reference books	**TEXTBOOKS:** 1. Engineering and General Geology, Parbin Singh, 8th Edition, S K Kataria & Sons. **REFERENCE BOOKS:** 1. Text Book of Engineering Geology, Kesavvalu, MacMillan India. 2. Engineering Geology by K.M. Bangar. 3. Engineering Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press.

17CE21P1 - SURVEYING LABORATORY – I

(Civil Engineering)

Course Category	Professional Core	**Credits**	2
Course Type	Theory	**Lecture - Tutorial - Practical**	0-0-3
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective(s)	To understand handling and operation of various surveying equipment and gain basic proficiency in surveying techniques.	
Course Outcomes	CO1	Measure the horizontal distances and offsets.
	CO2	Locate topographical features by conducting chain traversing.
	CO3	Calculate the area of given field.
	CO4	Determine the directions of various objects.
	CO5	Determine the elevations of various points & to operate various minor instruments.
	CO6	Prepare Contour maps.
Course Content	**EXERCISE-1:** a) To measure horizontal distance between two points. b) To measure area of given field using cross staff and tape. **EXERCISE-2:** To locate topographic features using chain, cross-staff and tape. **EXERCISE-3:** To determine the distance between two inaccessible points using chain, tape / compass, tape. **EXERCISE-4:** To conduct a closed traverse &open traverse and adjustment of closing error by Bowditch's method.	

	EXERCISE-5: A. To locate points using radiation method of plane table surveying. B. To locate points using intersection method of plane table surveying. **EXERCISE-6:** To determine the elevation of a given points by simple levelling. **EXERCISE-7:** To determine difference in elevation between two points use Differential levelling and Fly levelling. **EXERCISE-8:** To conduct profile levelling for water supply/sewage line and to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level. **EXERCISE-9:** To locate contours in the given field and plot the contour map.

17CE21P2 - ENGINEERING GEOLOGY LABORATORY

(Civil Engineering)

Course Category	Professional Core	**Credits**	2
Course Type	Theory	**Lecture - Tutorial - Practical**	0-0-3
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective(s)	To gain sufficient knowledge in various aspects of rocks and minerals, basic geomorphology and structural geology along with map interpolation.	
Course Outcomes	CO1	Categorize the various landforms of the Earth surface.
	CO2	Identify the minerals using basic geologic classification systems.
	CO3	Identify the rocks using basic geologic classification systems.
	CO4	Comprehend the elements of structural geology.
	CO5	Study the structural elements of subsurface strata.
	CO6	Interpret various types of geological maps.

Course Content

LIST OF EXPERIMENTS.

1. Study of(physical) properties of minerals
2. Identification of minerals
3. Identification of Rocks
4. Study of Dipping beds and their thickness
5. Study of true dip, apparent dip and strike direction of beds
6. Three point problem or Borehole problem
7. Study of geological maps of
    i. Horizontal beds
    ii. Dipping beds
    iii. Dipping beds with dyke
    iv. Folded beds
    v. Faulted beds
    vi. Beds with unconformity
    vii. Completion of outcrop
8. Study of geological models
9. Aqua meter - Demonstration

Textbooks and Reference books

TEXTBOOKS/LAB MANUALS/ REFERENCE BOOKS:

1. A Laboratory manual of Engineering Geology by N.Chennakesavulu Geological Maps. Gokale.
2. Fundamentals of Engineering Geology by F.H.Bell.
3. Principles of general & engineering Geology by K.M. Bangar.

17MC2102 - TECHNICAL ENGLISH AND SOFT SKILLS

(Common to all Branches)

Course Category	Basic Science	**Credits**	0
Course Type	Theory	**Lecture-Tutorial-Practical**	2-0-2
Prerequisite	Basic Level of LSRW Skills	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To develop their basic technical writing skills in English. 2. To learn specific technical verbal competence. 3. To acquire soft skills and work efficiently in a realistic professional working environment. 4. To develop soft skills including problem solving skills, working in groups and leadership skills.	
Course Outcomes	CO1	Present technical papers and equip technical verbal proficiency.
	CO2	Develop group discussion skills and summarizing skills.
	CO3	Write effective resumes and job applications.
	CO4	Develop soft skills and effective non-verbal communication skills.
	CO5	Develop motivational skills and problem solving skills.
	CO6	Develop professionals with idealistic, practical and moral values.
	UNIT – I **INTRODUCTION TO TECHNICAL ENGLISH:** Writing simple descriptions and explanations on scientific/technical nature – Technical presentations – Communicating technical topics– Jargon.	

Course Content	**UNIT – II** **GROUP DISCUSSION:** Dynamics of Group Discussion – Intervention- Summarizing-Modulation of voice - Body Language – Relevance - Fluency and Coherence. **UNIT – III** **RESUMES AND JOB APPLICATIONS:** Writing resumes – Resume design – Parts of a resume – Resume styles – Cover letter **UNIT – IV** **INTRODUCTION TO SOFT SKILLS & HARD SKILLS**: Non Verbal communication – Haptics – Proxemics – Kinesics – Chronemics – Oculesics – Vocalics. **UNIT – V** **PERSONALITY DEVELOPMENT SKILLS**: Assertiveness – Positive Attitude – Self Confidence– Problem Solving Skills– Leadership Skills. **UNIT – VI** **ETIQUETTE & MANNERS**: Corporate etiquette – Dinning etiquette – Goal Setting – Career Planning – Time Management.
Textbooks and Reference books	**REFERENCE BOOKS:** 1. A Textbook of English for Engineers and Technologists combined edition, Vol. I, Orient Black Swan 2010. 2. Effective Technical Communication, M. Ashraf Rizvi, Tata McGraw- Hill, 2011. 3. Soft Skills, Dr K. Alex, S. Chand Publications, New Delhi.

NBKR INSTITUTE OF SCIENCE &TECHNOLOGY:: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

II YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – II SEMESTER

S.No.	Course Code	Course Title	Contact Hours/ Week			Cred-its	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test-I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max. Marks		Duration in Hours	Max. Marks	
1	17CE2201	Fluid Mechanics – II	2	2	0	3	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17CE2202	R.C.C. Structural Design-I	3	2	0	4	34	6	40	34	6	40		3	60	100
3	17CE2203	Surveying – II	2	2	0	3	34	6	40	34	6	40		3	60	100
4	17CE2204	Soil Mechanics	3	2	0	4	34	6	40	34	6	40		3	60	100
5	17CE2205	Structural Analysis – I	2	2	0	3	34	6	40	34	6	40		3	60	100
6	17CE2206	Transportation Engineering-I	2	2	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17CE22P1	Surveying Laboratory – II	0	0	3	2	-	-	-	-	-	-	Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17CE22P2	Fluid Mechanics & Hydraulic Machinery Laboratory	0	0	3	2	-	-	-	-	-	-		3	60	100
		MANDATORY														
1.	17MC2201	Environmental studies	3	0	0	0	34	6	40	34	6	40	0.8 (Better of two) + 0.2(Other)	3	60	100
		TOTAL				**24**										

Note:-*Survey camp for a duration of 7 days to be conducted before the last day of instruction for II B.Tech, II – Sem. This shall be evaluated as part of Survey Laboratory –II.*

17CE2201 -FLUID MECHANICS – II

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2-2-0
Prerequisite	Fluid Mechanics – I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To study the theories of pipe flow and its losses and analyze the flow through pipes. 2. To study the concepts of differentiate among various types of flows in pipe. 3. To understand the theory of boundary layer, drag and lift concepts. 4. To understand the rate of flow in pipe and its measuring devices. 5. To learn the basic principles and working conditions of turbines and pumps. 6. To understand design criteria of centrifugal pump.	
Course Outcomes	CO1	Analyze and design flow through the pipes.
	CO2	Differentiate and analyze the various types of flow in pipes.
	CO3	Explain the boundary layer concept and compute the drag and lift acting on a body.
	CO4	Compute the rate of flow through various measuring devices.
	CO5	Understand the concept of impact-of-jet, working principle of turbine.
	CO6	Explain the purpose of various elements of turbines and understand the concepts of pumps.
Course Content	**UNIT- I** **FLOW THROUGH PIPES:** Introduction – laws of fluid friction– Froude's experiments – Equation for head loss in pipes due to friction – Darcy-Weisbach equations – Energy losses in pipes – Hydraulic gradient line and energy gradient line – Flow through long pipes – pipes in series or compound – Equivalent pipe – pipes in parallel – Flow through bye-pass – Branched pipes – Siphon – Power transmitted through pipe – Water hammering in pipes – Pipe network - Hardy cross method. **UNIT- II** **LAMINAR AND TURBULENT FLOW IN PIPES:** Reynolds's Experiment - Types of flow – Steady laminar flow in circular pipes - Hagen-Poiseuille Law – Flow of viscous fluid through circular pipe – Flow of viscous fluid between two parallel plates – Characteristics of turbulent flow, Hydrodynamically smooth and rough boundaries.	

Velocity distribution for turbulent flow in hydrodynamically smooth and rough pipes.

UNIT- III

BOUNDARY LAYER FLOW: Definitions of technical terms – Drag force on a flat plate – Turbulent boundary layer – Analysis of turbulent boundary layer – Total drag – Separation of boundary layer – Methods of preventing the separation.

FLUID FLOW AROUND SUBMERGED OBJECTS - DRAG AND LIFT: Introduction – force exerted by a flowing fluid on a stationary body – Expression for drag and lift – drag on sphere – Terminal velocity of a body – Drag on a cylinder – Development of lift on a circular cylinder – Development of lift on airfoil.

UNIT- IV

FLOW THROUGH ORIFICES AND MOUTHPIECES: Definitions – Classifications of orifices and mouthpieces: Sharp-edged orifices – Experimental determination of the coefficient for an orifice: Flow through large vertical orifice – Flow under pressure through orifices – Flow through submerged orifice- Time of emptying and filling tank through orifice – Flow through external cylindrical mouthpiece - convergent divergent mouth piece - Internal mouth piece.

FLOW OVER NOTCHES AND WEIRS: Introduction – Classification of notches and weirs – Flow over a rectangular sharp-crested weir or notch – Calibration of rectangular weir or notch – Empirical formula for discharge over rectangular weirs – Ventilation of weirs – Flow over a triangular weir or triangular notch – Flow over a trapezoidal notch or weir – Broad crested weir.

UNIT– V

IMPACT OF JETS: Force exerted by the jet on a stationary and moving - vertical - inclined - curved - hinged plates – Force exerted by a jet on unsymmetrical moving plate – series vanes – radial curved vanes.

HYDRAULIC TURBINES – I: Turbines – Layout of a hydro-electric power plant – definitions of technical terms – Classification of hydraulic turbines – pelton wheel - velocity triangle and work done– design – radial flow reaction turbines - main parts, inward radial turbine, degree of reaction, outward radial flow reaction turbine – Francis turbine - important relations.

UNIT- VI

HYDRAULIC TURBINES – II: Axial flow reaction turbine - Kaplan turbine – Draft tube - types, theory, efficiency of draft tube – Specific speed - derivation of specific speed, significance of specific speed – Unit quantities - unit speed, unit discharge, unit power – use of unit quantities – Characteristic curves of hydraulic turbines – Governing of turbines.

	CENTRIFUGAL PUMPS: Main parts of centrifugal pumps – work done – definitions of terms – minimum speed for starting a centrifugal pump – multistage centrifugal pump – specific speed – model testing – priming – characteristic curves – cavitation – maximum suction lift – net positive suction head.
Textbooks and Reference books	**TEXTBOOKS:** 1. Hydraulics and Fluid Mechanics Including Hydraulics Machines by Dr. P.N. Modi, Dr. S.M. Seth, and Standard book house Publications. 2. Hydraulics and Fluid Mechanics Including Hydraulics machines A.K. Jain, Khanna Publications. 3. A Textbook of Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal, Laxmi Publications. **REFERENCE BOOKS:** 1. F M White, Fluid Mechanics, Tata McGraw Hill Publication. 2. Fluid Mechanics – Fundamentals and Applications by Yunus A. Cengel, Jhon M. Cimbala, Tata McGraw Hill Publications. 3. A Text book of Fluid Mechanics and Hydraulic Machines by R.K.Rajput, S. Chand Publications.

17CE2202 - R.C.C. STRUCTURAL DESIGN – I

(Civil Engineering)

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture – Tutorial –Practical**	3-2-0
Prerequisite	Strength of materials	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the basic principles of IS: 456-2000 in design of reinforced concrete elements. 2. To design the reinforced concrete beams and slabs subjected to flexure, shear, torsion and bond. 3. To design the reinforced concrete compression members under axial load and moment. 4. To design different types of isolated footings. 5. To understand the serviceability conditions of reinforced concrete flexural members. 6. To gain in-depth knowledge of staircases and able to design the dog-legged staircase.	
Course Outcomes	CO1	Understand the design principles of reinforced concrete members.
	CO2	Design singly and doubly reinforced rectangular and flanged beams for flexure, shear, torsion and bond.
	CO3	Carry out design and detailing of different types of slabs.
	CO4	Carry design and detailing of columns for various loading conditions.
	CO5	Carry out design and detailing of different types of footings under axial load.
	CO6	Analyze reinforced concrete members for serviceability conditions.
Course Content	**UNIT – I** **DESIGN PRINCIPLES:** Basic design principles – Stress Strain curves of concrete and steel – Characteristic strengths and loads – Partial safety factors – Stress block – Various limit states. **DESIGN FOR FLEXURE:** Limit state of collapse in flexure – Ultimate flexural strength – Balanced, under and over – Reinforced sections – Design of singly and doubly reinforced rectangular beams – Design of flanged beams.	

	UNIT – II **DESIGN FOR SHEAR, TORSION AND BOND**: Shear – Truss analogy – Design of beams for shear and torsion – Anchorage and development length. **UNIT – III** **DESIGN OF SLABS AND BEAMS:** Design of one way and two way slabs - Design of continuous beams and slabs. **UNIT – IV** **DESIGN OF COMPRESSION MEMBERS:** Columns – Reduction factors – Axially loaded, eccentrically loaded columns – Uni-axial moment – Biaxial moment (Biaxial moment for practice only and not for university examination). **UNIT – V** **DESIGN OF FOUNDATIONS:** Types of footings – Design of isolated (Square, Rectangular and Circular) footings subjected to axial load. **UNIT – VI** **DESIGN OF STAIR CASE:** Types of staircase – Specifications – Design of doglegged stair case. **LIMIT STATES OF SERVICEABILITY:** Deflection (short and long term) – Cracking.
Textbooks and Reference books	**TEXTBOOKS:** 1. LSD of Reinforced Concrete by Dr. B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain. 2. Reinforced Concrete Design by N. Krishna Raju& R. N. Pranesh. 3. Reinforced Concrete Design by Unni Krishna Pillai and Devdas Menon. **REFERENCE BOOKS**: 1. Reinforced Concrete Design by S. N. Sinha. 2. Reinforced Concrete Structures (LSD) by Dr. Ramchandra. 3. Limit State Theory and Design of Reinforced Concrete by S. R. Karve & V. L. Shah. 4. Plain and Reinforced Concrete – Code of practice (IS456-2000).

17CE2203 - SURVEYING – II

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2-2-0
Prerequisite	Surveying-I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To implement the use of theodolite surveying for measuring various angles. 2. To apply the method of angular surveying (Tacheometric surveying) for computing elevation and distances. 3. To analyze various types of curves and their properties. 4. To understand and implement the remote sensing for aerial surveying. 5. To understand operation and functions of total station. 6. To collect the information from the earth by applying technology of GPS and GIS.	
Course Outcomes	CO1	Use a theodolite for measurements in traverse and able to make all computations in traverse.
	CO2	Calculate elevation and distances using theodolite.
	CO3	Set various types of curves in field.
	CO4	Apply the principles of Remote Sensing in surveying.
	CO5	Use a total station in surveying.
	CO6	Understand the principles and applications of GPS & GIS.
Course Content	**UNIT – I** **THEODOLITE SURVEYING:** Theodolite-Parts-Definitions-Fundamental Axes–Measurement of horizontal angles by repetition and reiteration methods– Measurement of vertical angles, direct angles and deflection angles – Prolonging a straight line – Traverse survey – Checks in traverse – Errors in theodolite traversing – Traverse computations – Coordinate systems – Omitted measurements. **UNIT – II** **TACHEOMETRY:** Principle of stadia method – Tacheometric constants and their determination – Determination of distances and elevations of points by stadia and tangential methods – Tacheometric survey – Errors in stadia surveying.	

	UNIT – III **CURVES:** Principles of simple and compound curves – Curve ranging – Offsets from long chord – Rankine's method one theodolite method –Two theodolite methods – Reverse curve between parallel straights – Super elevation – Uses and characteristics of transition curve – Length of transition curve – Principles of compound curve – Types and elements of vertical curves. **UNIT – IV** **AERIAL SURVEY:** Introduction – Types of photographs – Vertical aerial photographs – Geometry – Scale – Ground coordinates from a vertical photograph – Photomaps and mosaics. **REMOTE SENSING:** Definition – History – Physics of Remote Sensing – Electromagnetic radiation – Interaction of electromagnetic radiation with atmosphere, earth surface features – Vegetation, soils, water. **UNIT – V** **TOTAL STATION INSTRUMENT:** Introduction – Functions – Performed – parts – Handling and setting up a Total Station instrument – Measuring horizontal angles – Deflection angles – Azimuths, vertical or zenith angles – Sights and marks – Adjustments of Total Station instruments and their accessories – Sources of error in Total Station work- Data acquisition process. **UNIT – VI** **GLOBAL POSITIONING SYSTEM:** Introduction – Overview of GPS – Reference coordinate systems for GPS – Fundamentals of GPS positioning – differential GPS. **GEOGRAPHICAL INFORMATION SYSTEM:** Basic principles – Definition – Components – Data Structures – Functioning of GIS - Data Input – Database management systems– Types of maps – Maps & map projections.
Textbooks and Reference Books	**TEXTBOOKS:** 1. Surveying by Dr.K.R.Arora. 2. Surveying and Levelling Vol. II & III by B.C. Punmia. 3. Surveying and Levelling Parts 1 & 2 by T.P. Kanetkarand S.V.Kulkarni. 4. Surveying & Levelling by R. Subramanyam. **REFERENCE BOOKS:** 1. Elements of Photogrammetry by P.R.Wolf. 2. Plane Surveying by A.M. Chandra. 3. Elements of Geomatics by P.R.Wolf.

17CE2204 - SOIL MECHANICS

(Civil Engineering)

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3-2-0
Prerequisite	Engineering Geology, Engineering Mechanics and Hydraulics	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objectives	1. To study the physical properties and their relations and various classifications. 2. To understand the plasticity characteristics of the soil and classification of soil by different systems. 3. To study the hydraulic properties of soils and understand the concept of total stress and effective stress. 4. To understand the stress distribution in soils due to external loads. 5. To study the strength characteristics of soil under load. 6. To understand the deformation characteristics of soil.	
Course Outcomes	CO1	Understand basic concepts, determine basic soil properties as per relevant IS codes.
	CO2	Determine plasticity characteristics of soil and classify the soil. Be able to perform complete grain size analysis and plot combined GSD curve.
	CO3	Determine the permeability of soils. Sketch flownets under different hydraulic structures and compute flow parameters.
	CO4	Calculate effective stress under different flow conditions and plot stress distribution diagrams. Determine OMC and MDD for Light and Heavy compaction using relevant methods. Calculate vertical stresses at any point in the soil for various types of loadings. Understand the concept of pressure bulb.
	CO5	Understand the basics of soil consolidation and be able to derive Terzaghi's 1D equation. Be able to calculate consolidation stresses and settlements.
	CO6	Understand Mohr-Coulomb failure criteria for shear strength and calculate the shear parameters from different types of tests and under different drainage conditions.
	UNIT - I **INTRODUCTION:** Definitions: soils, soil mechanics, soil engineering, rock mechanics, geotechnical engineering – Scope of soil engineering. Comparison between soil and rock – Basic definitions and relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity.	

Course Content	Definitions: Moisture content, unit weights, degree of saturation, void ratio, porosity, specific gravity, mass specific gravity, etc – Relationship between volume weight, void ratio, moisture content, and unit weight- percent air voids saturation– moisture content– specific gravity, etc – Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method radioactivity method, and alcohol method – Specific gravity by density bottle method, pycnometer method, measuring flask method – Unit weight by water displacement method, submerged weight method, Core cutter method, sands replacement method. **UNIT - II** **PLASTICITY CHARACTERISTICS OF SOIL:** Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity – Determination of: liquid limit, plastic limit and shrinkage limit – Use of consistency limits – Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification, Indian standard soil classification system – Identification: field identification of soils, general characteristics of soil in different groups. **UNIT - III** **PERMEABILITY OF SOIL:** Introduction to hydraulic head, Darcy's law, validity of Darcy's law – Determination of coefficient of permeability: Laboratory method: constant head method, falling head method – Field method: pumping-in test, pumping-out test – Permeability aspects: permeability of stratified soils, factors affecting permeability of soil – Seepage Analysis - Introduction, Laplace equation, characteristics of flow nets, Uses of flow nets: Determination of discharge, total head, pressure head, uplift pressure and hydraulic gradient, critical hydraulic gradient, types of piping failure, prevention of piping failure – Flow net in earth dams with and without horizontal filters, **UNIT - IV** **EFFECTIVE STRESS PRINCIPLE:** Introduction, effective stress principle, nature of effective stress, effect of water table – Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure and quick sand condition – Compaction of soil: Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. Stress distribution in soils**:** Boussinesq's equation. – Vertical stress due to line load, strip load, and uniformly loaded circular area – Newmark's chart – Westergard's approach – Pressure bulb concept – Approximate methods.

	UNIT - V **CONSOLIDATION OF SOIL:** Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, consolidation test results, basic definitions, Terzaghi's theory of consolidation, coefficient of consolidation: square root of time method and logarithm of time method, reconsolidation pressure, final settlement of soil deposits, consolidation settlement: one-dimensional method, secondary consolidation. **UNIT - VI** **SHEAR STRENGTH:** Principal planes parallel to the coordinate axes, Mohr's circle, important characteristics of Mohr's circle, Mohr-Coulomb theory, types of shear test: direct shear test, merits of direct shear test, triaxial compression tests, test behavior of UU, CU and CD tests, relation between major and minor principal stresses, unconfined compression test, vane shear test, pore pressure parameters.
Textbooks and Reference Books	**TEXTBOOKS:** 1. Soil Mechanics and Foundation Engineering by K.R. Arora. 2. Geotechnical Engineering by C. Venkatramaiah. 3. Soil Mechanics and Foundation Engineering by B.C. Punmia, A. K. Jain & Jain. **REFERENCE BOOKS:** 1. Basic and applied soil mechanics by A.S. Rao & Gopal Ranjan. 2. Geo Technical engineering by V.N.S. Murthy. 3. Soil Mechanics by Robert V. Whitman and T. William Lambe.

17CE2205 - STRUCTURAL ANALYSIS - I

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2-2-0
Prerequisite	Engineering Mechanics & Strength of Materials	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the various methods for calculating slope and deflection of beams. 2. To analyze the columns for different end conditions subjected to axial load and moments. 3. To analyze the sections for stresses subjected to direct load and moment. 4. To be capable of analysing and drawing of shear force and bending moment diagrams of propped cantilever and fixed beams under various loading conditions including effect of sinking of supports. 5. To be able to analyze and draw the shear force and bending moment diagrams of continuous beams using Clapeyron's theorem of three moments. 6. To understand the concept of energy theorems and be able to calculate the slope and deflection of beams.	
Course Outcomes	CO1	Determine the slope and deflection of determinate beams under various loading conditions.
	CO2	Analyze the columns subjected to different loading conditions.
	CO3	Analyze the sections for stresses subjected to direct load and moment.
	CO4	Calculate and draw SFD and BMD for propped and fixed beams.
	CO5	Calculate and draw SFD and BMD for continuous beams using Clapeyron's theorem.
	CO6	Understand energy theorems and apply the same to analyze the structures.
Course Content	**UNIT – I** **DEFLECTIONS**: Relationship between curvature, slope and deflection (Differential equation for the elastic line of a beam) – Slope and deflection of cantilevers and simply supported beams by integration method, moment area method and conjugate beam method for point loads, uniformly distributed loads.	

	UNIT – II **COLUMNS:** Stability of columns – Euler's theory – Various end conditions- Rankine's theory – Eccentrically loaded columns (without initial curvature). **UNIT – III** **DIRECT AND BENDING STRESSES:** Stresses under the combined action of direct loading and B.M. – Core of a section – Circular, rectangular and triangular (solid and hollow). **UNIT – IV** **STATICALLY INDETERMINATE BEAMS:** **Propped Cantilever Beams:** Analysis of propped cantilevers for point loads uniformly distributed loads and couple – Shear force and bending moment diagrams. **Fixed Beams**: Analysis of fixed beams with UDL, point loads, uniformly varying load, couple shear force and bending moment diagrams– Effect of sinking of supports. **UNIT – V** **CONTINUOUS BEAMS**: Introduction –Clapeyron's theorem of three moments – Analysis of continuous beams with constant moment of inertia with one or both ends fixed – Continuous beam with overhang – Continuous beam with different moment of inertia for different spans – Effect of sinking of supports – Shear force and bending moment diagrams. **UNIT – VI** **ENERGY THEOREMS**: Strain energy due to axial load, bending moment and shear force – Maxwell's reciprocal's, Betti's theorems – Castigliano's first theorem and unit load method – Deflection of simple beams and pin -jointed trusses.
Textbooks and Reference books	**TEXTBOOKS:** 1. Structural Analysis by T.S. Thandavamoorthy. 2. Structural Analysis Vol. I & II by R. Vaidanathan & Dr. P. Perumal. 3. Strength of Materials by R.K. Bansal. **REFERENCE BOOKS:** 1. Theory of Structures – Vol.I by G.S. Pandit, S.P. Gupta, & R. Gupta. 2. Intermediate Structural Analysis by C.K.Wang 3. Analysis of Structures Vol. I & II by V.N. Vazirani & M.M. Ratwani.

17CE2206 - TRANSPORTATION ENGINEERING - I

(Civil Engineering)

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2-2-0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objectives	1. To discuss the importance of transportation engineering along with the basics of highway alignment. 2. To explain various highway geometric elements. 3. To discuss the suitability of bitumen and aggregate in pavement construction. 4. To explain different methods of flexible pavement design. 5. To understand the concepts of rigid pavement design 6. To explain methods of construction and maintenance of pavements.	
Course Outcomes	CO1	Explain the scope and functions of transportation engineering along with the concepts of highway alignment.
	CO2	Design highway geometric elements such as super elevation, sight distances, horizontal alignment and vertical curves.
	CO3	Perform tests on bitumen and aggregate for assessing their properties and judge their suitability as highway construction materials.
	CO4	Design flexible pavements.
	CO5	Design rigid pavements.
	CO6	Understand the construction and maintenance procedures of WBM, Bituminous and C.C. pavements.
Course Content	**UNIT - I** **HIGHWAY ENGINEERING:** Importance of transportation – Modes of transportation – Characteristics of road transport – Classification of roads – Highway alignment – Basic requirements – Controlling factors – Master plan and its phasing. **UNIT - II** **GEOMETRIC DESIGN:** Important elements – Cross section elements – pavement surface characteristics, camber, width of pavement, kerbs, road margins, formation width, right of way – Sight distance – Factors affecting sight distance – Design of sight distance – Horizontal alignment – Design speed, super elevation, extra widening ,transition curves types – Gradient and types – Vertical curves.	

	UNIT - III **HIGHWAY MATERIALS:** Aggregates and bitumen – Desirable properties, tests and specifications, desirable properties of bitumen – Aggregate mixes. **UNIT - IV** **DESIGN OF FLEXIBLE PAVEMENTS**: Types of pavements, components and their functions, design factors, group index – Design of flexible pavements – Group index method and IRC method based on CBR value. **UNIT - V** **DESIGN OF RIGID PAVEMENTS:** Westergaard's equations – IRC recommendations for design of concrete pavement slab – Thermal stresses and critical combination of stresses – Types of joints, joint filler materials, joint sealer materials. **UNIT - VI** **CONSTRUCTION AND MAINTENANCE OF ROADS**: Construction and maintenance of WBM – Bituminous and concrete roads. **HIGHWAY DRAINAGE:** Importance, surface and sub-surface drainage methods.
Textbooks and Reference Books	**TEXTBOOKS:** 1. Highway Engineering by Khanna, S.K. and Justo C.E.G. 2. Principles and Practice of Highway Engineering by Dr. L.R.Kadiyali. 3. Transportation Engineering Vol I by C Venkatramaiah **REFERENCE BOOKS:** 1. Guidelines for the Design of flexible pavements, IRC:37-1984. 2. Guidelines for the Design of rigid pavements for highways, IRC:58-1988. 3. Transportation Engineering, Vol. I by Vazirani and Chandola.

17CE22P1 - SURVEYING LABORATORY - II

(Civil Engineering)

Course Category	Professional Core	**Credits:**	2
Course Type	Theory	**Lecture - Tutorial - Practical**	0-0-3
Prerequisite	Surveying and Surveying Laboratory	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	To understand and demonstrate the use of theodolite and total station for various survey measurements.	
Course Outcomes	CO1	Use the theodolite along with chain/tape on the field.
	CO2	Apply geometric and trigonometric principles of basic surveying calculations.
	CO3	Setup simple circular curves using linear and angular methods.
	CO4	Use the Total station instrument in basic engineering works.
	CO5	Plan a survey, taking accurate measurements, field booking, plotting and adjustment of errors.
	CO6	Apply field procedures in basic types of surveys, as part of a surveying team.
Course Content	**EXERCISE-1:** Measurement of horizontal angles by repetition and reiteration methods; Measurement of vertical angles. **EXERCISE-2:** a) To determine the elevation of an object when the object and the instrument are in the same plane. b) To determine the elevation of an object when the object and instruments are in different planes. **EXERCISE-3:** To determine the tacheometric constants. **EXERCISE-4:** To determine the distance and gradient between two inaccessible points using stadia tacheometry and tangential tacheometry. **EXERCISE-5:** To set out simple curve using linear methods – Perpendicular offsets from long chord.	

	EXERCISE-6: To set out simple curve using Rankine's deflection angles method (One Theodolite method only). **EXERCISE-7:** Introduction to Advanced surveying instruments like Total station, hand held G.P.S, optical theodolite and electronic theodolite. **EXERCISE-8:** a) Measurement of distance & direction using Total Station. b) Measurement of area of given field using total station. **EXERCISE-9:** a) Data collection using total station by at least two change points. b) Setting out works using total station.

17CE22P2 - FLUID MECHANICS & HYDRAULIC MACHINERY LABORATORY

(Civil Engineering)

Course Category	Professional Core	**Credits**	2
Course Type	Theory	**Lecture - Tutorial - Practical**	0-0-3
Prerequisite	Fluid Mechanics	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objective(s)	To understand and apply the principles of fluid mechanics for analyzing the fluid flow and performance of hydraulic machines.	
Course Outcomes	CO1	Calibration of orifice and mouthpiece.
	CO2	Determination of efficiency of notches, venturimeter and orifice meter.
	CO3	Evaluate the major and minor losses in pipe network.
	CO4	Evaluate the performance characteristics of pump.
	CO5	Evaluate the performance characteristics of turbine.
	CO6	Evaluate the Chezy's and Manning's coefficient in open channel flow.

Course Content

LIST OF EXPERIMENTS

I. EXPERIMENTS ON CALIBRATION OF

a. Orifice
b. Mouth piece
c. Notch
d. Venturimeter
e. Orifice meter
f. Bend meter
g. Friction loss through a pipe
h. Gate valve
i. Bend loss
j. Sudden contraction
k. Sudden Expansion

II. EXPERIMENTS ON PERFORMANCE CHARACTERISTICS OF

a. Turbines
b. Pumps

17MC2201 - ENVIRONMENTAL STUDIES

(Civil Engineering)

Course Category	Mandatory Course	**Credits**	-
Course Type	Theory	**Lecture - Tutorial - Practical**	3-0-0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam. Evaluation	60
		Total Marks	100

Course Objective	1. To understand multidisciplinary nature of environmental studies. 2. To understand the various multidimensional aspects of an ecosystem. 3. To acquire the knowledge on various natural resources and their associated problems. 4. To understand the various aspects of biodiversity and its conservation. 5. To apply the concept of environmental studies for analysis of environmental pollution. 6. To analyze environmental problems in India.	
Course Outcomes	CO1	Explain the importance of environmental studies and its various components.
	CO2	Demonstrate the elements of ecosystem.
	CO3	Identify various natural resources and associated problems.
	CO4	Express the importance of biodiversity and conservations of ecosystem.
	CO5	Explain various types of environmental pollution.
	CO6	Understand environmental problems regulating acts existing in India.
Course Content	**UNIT- I** **INTRODUCTION**: Definition – Scope and Importance of environmental studies – Various components of environment – Atmosphere, biosphere, hydrosphere and lithosphere – Multidisciplinary nature of environmental studies and public awareness. **UNIT- II** **ECOSYSTEMS**: Concept – Structure and function– Producers composers and decomposers–Energy flow– Ecological succession– Food chains, webs and ecological pyramids – Characteristics structures and functions of ecosystems such as forest, grass land, desert – Aquatic ecosystems.	

UNIT- III

NATURAL RESOURCES AND ASSOCIATED PROBLEMS:

LAND RESOURCES: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

FOREST RESOURCES: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.

WATER RESOURCES: Use and over-utilization of surface and groundwater, conflicts over water sharing and watershed management.

MINERAL RESOURCES: Use and exploitation, environmental effects of extracting and using mineral resources.

FOOD RESOURCES: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity,

ENERGY RESOURCES: Growing energy needs renewable and non-renewable energy sources use of alternate energy sources.

UNIT- IV

BIODIVERSITY AND CONSERVATION: Definition, genetic, species, and ecosystem diversity, value of biodiversity at global, national, local levels, hot spots of biodiversity, threats to biodiversity, endangered and endemic species of India, in-situ and ex-situ conservation of biodiversity.

CASE STUDIES: Silent valley project, Mathura refinery and Tajmahal, Tehri dam, Kolleru Lake aquaculture, Fluorosis in Andhra Pradesh.

UNIT- V

ENVIRONMENTAL POLLUTION: Definition, causes, effects and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, ozone layer depletion, global warming and Acid Rains – Solid waste management methods: Composting, vermi composting, Landfill – Disaster management, floods, earthquake, cyclone and landslides.

	UNIT- VI **ENVIRONMENTAL PROBLEMS IN INDIA:** Effect of urbanization, industrialization and transportation on quality environment and public health – Drinking water, sanitation for good health – Green revolution – Social, economic and environmental interaction for sustainable development. **ENVIRONMENTAL ACTS:** Water act, air act, environment protection act, wildlife protection act, forest conservation act – Coastal regulation zones (CRZ), special economic zones (SEZ). **FIELD WORK**: Visit to a local area having river / forest / grassland / hill/ mountain to document and environmental assets–Study of local environment- common plants, insects, birds – Study of simple ecosystems - Pond, hill slopes, etc – Visits to industries, water treatment plants, effluent treatment plants.
Textbooks and Reference books	**TEXTBOOKS:** 1. Bharucha Erach, Biodiversity of India, Map in Publishing Pvt. Ltd., Ahmadabad, 2002. 2. Environmental Science by Anubha Kaushik and C.P.Kaushik. **REFERENCE BOOKS:** 1. Introduction to Environmental Science by Y.Anjaneyulu. 2. Environmental Studies by Dr.B.S.Chauhan. 3. Environmental Science by M.ChandraSekhar.

N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

III YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – I SEMESTER

S.NO	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test-I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max. Marks		Duration In Hours	Max. Marks	
1	17CE3101	Structural Analysis-II	3	2	0	4	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17CE3102	Foundation Engineering	2	2	0	3	34	6	40	34	6	40		3	60	100
3	17CE3103	Transportation Engineering-II	2	2	0	3	34	6	40	34	6	40		3	60	100
4	17CE3104	RCC Structural Design-II	3	2	0	4	34	6	40	34	6	40		3	60	100
5	17CE3105	Steel Structural Design	2	2	0	3	34	6	40	34	6	40		3	60	100
6	17CE31EX	Core Elective-I	3	0	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17CE31P1	Material Testing Laboratory	0	0	3	2	-	-	-	-	-	-	Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17CE31P2	Soil Mechanics Laboratory	0	0	3	2	-	-	-	-	-	-		3	60	100
3	17CE31AC	Audit course	0	0	0	0										
		TOTAL				**24**										

Core Elective-I:

17CE31E1 : Advanced Structural Analysis
17CE31E2 : Industrial Steel Structures
17CE31E3 : Ground Water Hydrology
17CE31E4 : Traffic Engineering & Management
17CE31E5 : Remote Sensing & GIS

17CE3101 - STRUCTURAL ANALYSIS –II

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 2 - 0
Prerequisite	Structural Analysis - I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	7. To apply Castigliano's theorems for analysis of indeterminate trusses. 8. To calculate the shear force and bending moment of determinate structures using influence lines. 9. To apply the method of slope deflection for analysis of indeterminate structures. 10. To understand the importance of moment distribution method for analysis of indeterminate structures 11. To analyze indeterminate structures using Kani's method and apply various methods for analysis of multistoreyed frames. 12. To assess the location of plastic hinges in beams and frames.	
Course Outcomes	CO1	Analyze indeterminate trusses using Castigliano's theorem.
	CO2	Apply the concepts of ILD and moving loads on determinate structures.
	CO3	Analyze indeterminate structures by slope deflection and moment distribution methods.
	CO4	Analyze indeterminate structures by moment distribution methods.
	CO5	Apply Kani's method for analysis of indeterminate structures and analyze multistoreyed frames by portal and cantilever methods.
	CO6	Identify the location of plastic hinges in beams and frames.
Course Content	**UNIT – I** **INDETERMINATE STRUCTURES:** Determination of static and kinematic indeterminacies – Solution of trusses having up to two degree of internal and external indeterminacies – Castigliano's theorem – II. **UNIT – II** **INFLUENCE LINES :** Influence lines for reactions, shear force and bending moment for determinate structures – Maximum shear force and bending moment for single, two and multipoint loads – UDL longer and shorter than span and EUDL.	

	UNIT – III **SLOPE DEFLECTION METHOD:** Beams with degree of indeterminacy not exceeding three – Effect of sinking **–** Frames with sway limited to single bay single storey. **UNIT – IV** **MOMENT DISTRIBUTION METHOD:** Introduction **–** Frames with sway limited to single bay single storey – Effect of sinking of supports. **UNIT – V** **KANI'S METHOD:** Continuous beams – Settlement of supports – Single bay portal frames with side sway. **MULTISTOREYED FRAMES:** Analysis of multistoreyed frames using portal and cantilever methods. **UNIT – VI** **PLASTIC ANALYSIS:** Idealized stress – Strain diagram – Shape factors – Moment-Curvature relationships – Plastic hinges – Collapse mechanism – Analysis of fixed, continuous beams and portal frames.
Textbooks and References	**TEXTBOOKS:** 4. Structural Analysis by T.S. Thandavamoorthy 5. Structural Analysis Vol. I & II by R. Vaidanathan & Dr. P. Perumal. 6. Analysis of Structures Vol. I & II by V.N. Vazirani, M.M. Ratwani and Dr. S.K Duggal. **REFERENCE BOOKS:** 1. Theory of Structures – Vol.I by G.S. Pandit, S.P. Gupta, & R. Gupta. 2. Mechanics of Structures Vol. I & II by S.B. Junnarkar and H.J. Shah 3. Structural Analysis by R.C. Hibbeler.

17CE3102 – FOUNDATION ENGINEERING

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	Soil Mechanics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To analyse slope stability of finite and infinite slopes. 2. To explain various types of earth pressure in various soils under different types of loading. 3. To demonstrate stability of retaining walls. 4. To study the bearing capacity of shallow foundations. 5. To understand design of pile foundation and characteristics of well foundation. 6. To study the various methods of site exploration and site investigation reports.	
Course Outcomes	CO1	Analyse finite and infinite slopes.
	CO2	Calculate earth pressure in various soils under different types of loading.
	CO3	Analyse stability of retaining walls.
	CO4	Calculate bearing capacity of shallow foundations.
	CO5	Calculate pile load capacities of individual piles and pile groups.
	CO6	Understand the various methods of site exploration and write site investigation reports.
Course Content	**UNIT – I** **STABILITY OF SLOPES:** Stability analysis of infinite slopes – Stability analysis of finite slopes – Swedish circle method – Friction circle method – Tailor's stability number and use of charts – Improving stability of slopes, Bishop's method. **UNIT – II** **EARTH PRESSURES:** Earth pressure theories of lateral earth pressure – Active and passive earth pressures in cohesion less and cohesive soils (with and without surcharge) – Rankine's and Coulomb's earth pressure theories. Graphical methods due to Rebhann and Culmann.	

	UNIT – III **EARTH RETAINING STRUCTURES:** Types of retaining structures – Stability consideration of gravity and cantilever retaining walls – Drainage in retaining walls – Joints in retaining walls **UNIT – IV** **BEARING CAPACITY OF SHALLOW FOUNDATIONS :** Types of foundations – Depth of foundation – Terzaghi's bearing capacity equation – Bearing capacity of square, square, circular, rectangular and continuous footings – Meyerhof's theory – Skempton's method – Brinch Hansen's method – Effect of ground water table on bearing capacity – Bearing capacity from building codes - Types of settlements – Tolerable settlements – Settlement analysis. **UNIT – V** **PILE FOUNDATIONS:** Classification of piles – Pile driving – Load carrying capacity of piles – Dynamic formulae – Static formulae – pile load tests – In situ penetration tests – Group action of piles – Negative skin friction. **WELL FOUNDATIONS:** Types – Different shapes of wells – Components of wells – Functions – Sinking of wells – Tilts and shifts. **UNIT – VI** **SITE INVESTIGATIONS AND SUB-SOIL EXPLORATION:** Site reconnaissance – Depth of exploration – Lateral extent of exploration – Test pits – Auger borings – Wash borings – Soil sampling – Split – spoon sampler – Penetration tests – Geophysical methods – Seismic refraction and electrical resistivity methods – Sub soil investigation reports.
Textbooks and References	**TEXTBOOKS:** 1. Soil Mechanics and Foundation Engineering by K.R.Arora. 2. Geotechnical Engineering by C. Venkatramaiah. 3. Soil Mechanics and foundation engineering by P.N. Modi. 4. Soil Mechanics & Foundation Engineering by Gopalrao & Ranjan. **REFERENCE BOOKS:** 1. Analysis and design of foundations and retaining structures by Shamsher Prakash, Gopal Ranjan & Swamisaran. 2. Soil Mechanics & Foundation Engg. byV.N.S.Murthy. 3. Foundation Engineering by Teng.

17CE3103 - TRANSPORTATION ENGINEERING – II

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	Transportation Engineering – I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To explain different types of traffic studies. 2. To discuss various traffic control devices. 3. To understand the concepts of permanent way and ballast. 4. To discuss different types of stations and yards. 5. To discuss the various concepts in airport engineering. 6. To understand the basic of harbour engineering.	
Course Outcomes	CO1	Conduct traffic studies.
	CO2	Understand the different types of signs and signals
	CO3	Explain requirements and functions of permanent way and ballast.
	CO4	Understand functions, requirements and types of stations, yards, crossing and turnouts.
	CO5	Explain aircraft characteristics, master plan, airport site selection and terminal area.
	CO6	Explain types of harbour, breakwater, docks and dredging.
Course Content	**UNIT - I** **TRAFFIC ENGINEERING:** Road user and vehicular characteristics, traffic studies (uses, field methods and presentation of data only) – Volume, speed, origin and destination, parking studies – Highway capacity, PCU values and level of service. **UNIT – II** **TRAFFIC CONTROL DEVICES:** Signs – Types – Traffic signals – Advantages and disadvantages – Signal indications – Signal face and types of traffic signal systems – Warrants for traffic control, signal installation.	

	UNIT – III **RAILWAY ENGINEERING I:** Comparison of railway and highway transportation – Classification of Indian railways – Permanent way – Components, gauges, coning of wheels, ballast types and functions, renewal of ballast. **UNIT - IV** **RAILWAY ENGINEERING II:** Classification and layout of different types of stations, station yards, types of crossings and type of switches – Turnouts – Factors affecting speed at turnouts. **UNIT - V** **AIRPORT ENGINEERING:** Air craft characteristics - Airport planning – Master plan, regional plan, data for site selection. **AIRPORT LAYOUT AND TERMINAL AREA:** Terminal area – Building area – Parking area – Blast considerations – Typical airport layouts and their features. **UNIT - VI** **DOCKS AND HARBOUR ENGINEERING:** Tides – Winds – Waves – Currents – Classification of harbour – Site selection - Classification of ports – Docks – Types of docks –Breakwaters – Types of break waters – Quays- jetties – Wharves – Dolphins – Fenders - Aprons – Transit sheds and ware houses – Dredging.
Textbooks and References	**TEXTBOOKS:** 1. Traffic Engineering and Transport Planning by L.R. Kadiyali. 2. A text book of Railway Engineering by Saxena S.C. and Arora S.P. 3. Airport Planning and Design by Khanna S.K., Arora M.G. and Jain S.S. 4. Docks and Harbour Engineering by R. Srinivasan. **REFERENCE BOOKS:** 1. Traffic Engineering Vol. I & II by Hobbs F.D. and Richardson P.R. 2. A text book of Railway Engineering by Rangwala. 3. Airport Engineering by Norman J, Ashford, Saleh A. Mumayiz and Paul H Wright. 4. A Course in Docks and Harbour Engineering by S.P.Bindra.

17CE3104 - R.C.C. STRUCTURAL DESIGN – II

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 2 - 0
Prerequisite	R.C.C.Structural Design-I and Foundation Engineering.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the design concept of various foundations. 2. To understand the design concept of various retaining walls. 3. To understand the design of ground liquid retaining structures. 4. To understand the design of elevated liquid retaining structures. 5. To understand the design concept of circular slabs using yield line theory. 6. To understand the behavior of prestressed concrete.	
Course Outcomes	CO1	Design various combined foundations.
	CO2	Design cantilever and counterfort retaining walls.
	CO3	Design ground liquid retaining structures.
	CO4	Design elevated liquid retaining structures.
	CO5	Design circular slabs using yield line theory.
	CO6	Calculate stresses in prestressed concrete structural elements.
Course Content	**UNIT – I** **DESIGN OF FOUNDATIONS:** Design of combined footings (Rectangular and Trapezoidal). **UNIT – II** **DESIGN OF RETAINING WALLS:** Design of retaining walls – Cantilever and Counterfort types for different loadings. **UNIT – III** **DESIGN OF WATER TANKS-I:** Review of working stress design method – Circular and rectangular tanks resting on ground – Circular tanks with IS code method and rectangular tanks with approximate method.	

	UNIT – IV **DESIGN OF WATER TANKS-II:** Spherical and Conical domes – Design of Intze tanks. **UNIT – V** **YIELD LINE THEORY:** Introduction – Behavior of slab up to failure – Assumptions – Guidelines for predicting yield line pattern – Yield criterion – Methods of analysis and basic principles – Virtual work – Equilibrium method – Corner levers – Circular slabs. **UNIT – VI** **PRESTRESSED CONCRETE:** Principles of prestressing – Materials used – Methods and Systems of prestressing – Losses of prestress – Analysis of rectangular sections for stresses.
Textbooks and References	**TEXTBOOKS:** 1. LSD of Reinforced Concrete by Dr. B. C. Punmia, Ashok Kumar Jain &Arun Kumar Jain. 2. Design of Reinforced Concrete Structures by S. Ramamrutham. 3. Prestressed Concrete by N. Krishna Raju. **REFERENCE BOOKS:** 1. Limit State Theory and Design of Reinforced Concrete by S. R. Karve& V. L. Shah. 2. Reinforced Concrete Design by C.K Wang, C.G. and J.A. Pincheira. 3. Design of Reinforced Concrete Structures by N. Subramanian. 4. Plain and Reinforced Cement Concrete – Code of practice (IS: 456-2000).

17CE3105 – STEEL STRUCTURAL DESIGN

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	Engineering Mechanics and Strength of Materials	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To explain different types of connections for steel joists. 2. To understand the behavior and design of tension and compression members. 3. To understand the design of laterally supported beams. 4. To understand the design of laterally unsupported beams. 5. To understand the importance of column bases. 6. To understand the design of column bases under various loads.	
Course Outcomes	CO1	Identify the failure modes in connections, analyse and design bolted and welded connections.
	CO2	Design different types of steel tension members.
	CO3	Design different types of steel laced and battened compression members.
	CO4	Design various laterally supported beams and their connections.
	CO5	Analyze and design laterally unsupported beams and gantry girders.
	CO6	Analyze and design slab and gusset bases and grillage foundation.
Course Content	**UNIT – I** **INTRODUCTION:** Properties of sections – Types of loads – Permissible stresses in tension, compression and shear as per IS code. **BOLTED CONNECTIONS:** Types of bolted joints – Modes of failure of bolted joints – Strength and efficiency of bolted joints – Strength of lap and butt joints – Design of Bolted joints – Design of bracket connections (beam to column and beam to beam connections). **WELDED CONNECTIONS:** Types of welded joints – Strength of fillet and butt welds – Design of welded joints – Design of bracket connections (beam to column and beam to beam connections).	

	UNIT – II **DESIGN OF TENSION MEMBERS:** Design of tension members – Lug angles – Tension splice. **UNIT – III** **DESIGN OF COMPRESSION MEMBERS:** Design of compression members – Single and built-up columns – Design of lacing and battens – Design of eccentrically loaded columns. **UNIT – IV** **LATERALLY SUPPORTED BEAMS:** Design of simple beams – Design of built up beams- Curtailment of flange plates – Connection of flange plate with flange of beam. **UNIT – V** **LATERALLY UNSUPPORTED BEAMS:** Permissible bending compressive stress – Effective length of compression flange – Design of simple beams – Design of Gantry Girders. **UNIT – VI** **DESIGN OF COLUMN BASES:** Slab base – Gusseted base – Bases subjected to moment – Grillage foundation.
Textbooks and References	**TEXTBOOKS:** 1. Design of Steel Structures by S.K. Duggal. 2. Design of Steel Structures by Dr. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain. 3. Design of Steel Structures by S.S. Bhavikatti. **REFERENCE BOOKS:** 1. Limit State Design in Structural steel by M.R. Shiyekar. 2. Design of Steel Structures by N. Subramanian. 3. Design of Steel Structures by P.Dayaratnam.

17CE31E1 – ADVANCED STRUCTURAL ANALYSIS

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Structural Analysis I & II.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To learn the fundamental concepts of matrix methods in structural analysis. 2. To understand the analysis of continuous beams of two and three spans with different end conditions by flexibility and stiffness matrix methods. 3. To understand the analysis of two dimensional portal frames with different end conditions by flexibility and stiffness matrix methods. 4. To learn the concepts of the stiffness method and flexibility method and apply it to a two dimensional pin jointed truss. 5. To understand the transformation of matrices from local to global coordinates using element stiffness matrix. 6. To be familiar with various methods of equation solvers for the analysis of structures.	
Course Outcomes	CO1	Calculate unknown components of forces and displacements using stiffness and flexibility method.
	CO2	Perform the analysis of continuous beams by stiffness and flexibility method.
	CO3	Perform the analysis of two dimensional portal frames by stiffness and flexibility method.
	CO4	Analyse two dimensional pin jointed trusses by stiffness and flexibility method.
	CO5	Perform transformation of matrices from local to global coordinates using element stiffness matrix.
	CO6	Analyze structures by using different equation solvers.
	UNIT – I **INTRODUCTION TO MATRIX METHODS OF ANALYSIS:** Flexibility and stiffness matrices – Force displacement relationships for axial force, couple and torsional moments– Stiffness method of analysis and flexibility method of analysis. **UNIT – II** **ANALYSIS OF CONTINUOUS BEAMS:** Stiffness method and flexibility method of analysis – Continuous beams of two and three spans with different end conditions – Internal hinges.	

Course Content	**UNIT – III** **ANALYSIS OF TWO-DIMENSIONAL PORTAL FRAMES**: Stiffness and flexibility method of analysis of 2D portal frames with different end conditions – Plotting of bending moment diagrams. **UNIT – IV** **ANALYSIS OF TWO-DIMENSIONAL PIN JOINTED TRUSSES**: Stiffness and flexibility methods – Computation of joint displacement and member forces. **UNIT – V** **TRANSFORMATION OF COORDINATES:** Local and Global coordinate systems – Transformation of matrices from local to global coordinates of element stiffness matrix – Direct stiffness method of analysis – Assembly of global stiffness matrix from element stiffness matrices – Static condensation – Sub structuring**.** **UNIT – VI** **EQUATION SOLVERS**: Solution of system of linear algebraic equations– Direct inversion method – Gauss elimination method – Cholesky method – Banded equation solvers frontal solution technique.
Textbooks and References	**TEXTBOOKS:** 1. Structural Analysis by G.S. Pundit & S.P. Gupta 2. Structural Analysis by C.S.Reddy. 3. Structural Analysis by R.C.Hibbeler **REFERENCE BOOKS:** 1. Cotes, R.C., Couties, M.G., and Kong, F.K., Structural Analysis, ELBS. 2. M.C.Guire, Gallagher, R.H., Matrix Structural analysis, John Wiley and sons. 3. Intermeidate Structural Analysis by C.K.Wang.

17CE31E2 – INDUSTRIAL STEEL STRUCTURES

Course Category	Professional Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Steel Structural Design	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To provide coherent understanding to the students in the sector of advanced steel structural design. 2. To explain the design of liquid retaining structures using steel members. 3. To understand the analysis and design of transmission towers. 4. To give an experience to the students in design of framed steel structures. 5. To understand the analysis and design of chimneys and shells. 6. To understand the importance and behavior of light gauge steel structures.	
Course Outcomes	CO1	Analyze and design steel water tanks.
	CO2	Analyze and design transmission and communication towers.
	CO3	Analyze and design roof trusses.
	CO4	Analyze and design plate girders.
	CO5	Understand the basic concepts of light gauge structures.
	CO6	Understand the basic concept of plastic analysis and analyze fixed, continuous beams and portal frames.
Course Content	**UNIT – I** **DESIGN OF WATER TANKS:** Design of cylindrical steel tanks – Pressed steel tanks and rectangular steel tanks including staging. **UNIT – II** **TRANSMISSION AND COMMUNICATION TOWERS**: Types and configuration of towers – Analysis and design of transmission and communication towers. **UNIT – III** **DESIGN OF ROOF TRUSSES:** Loading on roof trusses – Design of purlins – Design of members of roof truss – Angular and tubular members – Design of connection of members.	

	UNIT – IV **DESIGN OF PLATE GIRDERS:** Plate Girder: Design consideration – IS code recommendations – Design of plate girder – Welded - Curtailment of flange plates stiffeners – Splicing and connections. **UNIT – V** **LIGHT GAUGE STEEL STRUCTURES:** Light gauge steel types of sections – Specifications – Basic allowable design stresses – Compression members – Local buckling of elements, stiffened and unstiffened compression elements – Computation of permissible stresses – Design of columns – Flexural members – Bending – Deflection – Local bucking of compression elements – Laterally supported and unsupported beams- Computation of permissible stresses – Design of beams. **UNIT – VI** **PLASTIC ANALYSIS:** Idealized stress – Strain diagram – Shape factors – Moment-Curvature relationships – Plastic hinges – Collapse mechanism – Analysis of fixed, continuous beams and portal frames.
Textbooks and References	**TEXTBOOKS:** 1. Design of Steel Structures by Ramchandra Vol. I&II. 2. Design of Steel Structures by S.K. Duggal. 3. Design of Steel Structures by S.S. Bhavikatti. **REFERENCE BOOKS:** 1. Design of Steel Structures by E.H. Gaylord, C.H Gaylord and J.E Stallmeyer. 2. Structural Design & Drawing Vol. III (Steel Structures) by Krishnamurthy. D. 3. Steel Structures: Design & Behaviour by Salmon. C. G & Johnson. J. E.

17CE31E3 – GROUND WATER HYDROLOGY

Course Category	Professional Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0- 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand occurrence of hydrological cycle and groundwater budgeting. 2. To analyze the hydraulic properties of the aquifer and its influence on occurrence and movement of ground water in wells. 3. To study the yield of wells in different types of aquifers by applying various groundwater theories. 4. To understand the various subsurface water exploration methods. 5. To understand various methods of artificial recharge and their importance, saline water intrusion and its controlling methods. 6. To study the aquifer behavior by applying various methods of analog modeling and understand the groundwater management methods.	
Course Outcomes	CO1	Understand the nature of groundwater and its role in the water cycle.
	CO2	Apply the concept of Darcy's law for estimating discharge and understand their characteristics and classifications.
	CO3	Familiar with the technology of water wells and groundwater monitoring.
	CO4	Familiar with the technology to investigation the surface and subsurface water.
	CO5	Understand the importance of artificial recharge and employ the artificial ground water recharge techniques and identify the saline water intrusion locations.
	CO6	Determine the characteristics of the aquifers with the help of modeling techniques.
Course Content	**UNIT – I** **INTRODUCTION:** Ground water utilization and historical background – Ground water in hydrologic cycle.Ground water budget and ground water level fluctuations and environmental influence – Literature – Data-Internet resources.	

UNIT – II

OCCURRENCE AND MOVEMENT OF GROUND WATER: Origin & age of ground water – Rock properties affecting groundwater – Groundwater column, zones of aeration & saturation, aquifers and their characteristics and classification – Groundwater basins & springs – Darcy's Law – Permeability & its determination – Dupuit's assumptions – Heterogeneity & anisotropy – Ground water flow rates & flow directions – General flow equations through porous media.

UNIT – III

ADVANCED WELL HYDRAULICS: Steady and unsteady uniform radial flow to a well in a confined, unconfined and leaky aquifer – Well flow near aquifer boundaries for special conditions, partially penetrating, horizontal wells & multiple well systems – well completion – Development protection – Rehabilitation – Testing for yield.

UNIT – IV

SURFACE SUB-SURFACE INVESTIGATION OF GROUND WATER: Geological – Geophysical Exploration – Remote Sensing – Electric Resistivity – Seismic refraction based methods for surface investigation of ground water – Test drilling & ground water level measurement – Sub-surface ground water investigation through geophysical – Resistivity – Spontaneous Potential – Radiation – Temperature – Caliper – Fluid Conductivity – Fluid Velocity – Miscellaneous Logging.

UNIT – V

ARTIFICIAL GROUND WATER RECHARGE: Concept and methods of artificial ground water recharge – Recharge mounds and induced recharge – Waste water recharge for reuse – Water spreading.

SALINE WATER INTRUSION IN AQUIFERS: Ghyben-Herzberg relation between fresh & saline waters – Shape & structure of the fresh and saline water interface – Upcoming of saline water – Fresh-saline water relations on oceanic islands – Seawater intrusion in karst terrains – Saline water intrusion control.

UNIT – VI

MODELING AND MANAGEMENT OF GROUND WATER: Ground water modeling through porous media analog, electric analog and digital computer models – Ground water basin management concept – Hydrologic equilibrium equation.

Ground water basin investigations – Data collection & field work – Dynamic equilibrium in natural aquifers – Management potential & safe yield of aquifers, stream– Aquifer interaction.

Textbooks and References	**TEXTBOOKS:** 1. D.K. Todd and L. F. Mays,"GroundWater Hydrology", John Wiley and sons. 2. K. R.Karanth,"Hydrogeology", TataMcGraw Hill Publishing Company. 3. S Ramakrishnan “Ground Water” Published by Scitech Publications (India) Pvt Ltd. **REFERENCE BOOKS:** 1. H. M. Raghunath “Ground Water” Wiley Eastern Ltd. 2. K.Subramanya“Engineering Hydrology” TataMcGraw Hill Publishing Company.

17CE31E4 – TRAFFIC ENGINEERING AND MANAGEMENT

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Transportation Planning	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To discuss the need and methods of traffic forecast. 2. To explain the basic concepts and design of rotary intersection. 3. To illustrate the relationship between traffic and environment. 4. To discuss the road safety concepts in transportation planning. 5. To explain traffic management methods. 6. To discuss road markings and traffic control aids.	
Course Outcomes	CO1	Apply methods of traffic forecast in transport planning.
	CO2	Calculate capacity of rotary intersection.
	CO3	Understand the different types environmental degradation due to vehicular traffic
	CO4	Apply the road safety concepts in different stages of highway planning.
	CO5	Understand different regulations and methods for effective traffic management.
	CO6	Understand different types of road markings and concepts of street furniture
Course Content	**UNIT – I** **TRAFFIC FORECAST:** Function of traffic engineering – Need for traffic forecast– Limitations of traffic forecasting – Types of traffic – Different methods of traffic forecasting – Forecast based on past trends cud extrapolation – Forecasts and mathematical models – Period of forecasting. **UNIT – II** **ROTARY INTERSECTIONS:** Design hourly volume, passenger car unit (PCU) – Factors affecting PCU values – Highway capacity – Factors affecting capacity – Level of service and types – Rotary intersection – Advantages and disadvantages. Guidelines for selecting a rotary type of intersection – Rotary design elements – Capacity of rotary intersection problems.	

	UNIT –III **TRAFFIC AND ENVIRONMENT:** Effects of traffic on environment, noise pollution, air pollution, vibration, visual intrusion and degrading the aesthetics. **UNIT –IV** **ACCIDENT STUDIES:** Causes of road accidents – Highway design and road safety – Road safety in various stages of highway system – Road safety incorporated at planning stage – Collection of accident data – Standard accident representing forms. **UNIT – V** **TRAFFIC MANAGEMENT**: Traffic management measures – Restrictions of turning movements – One way streets – Tidal flow operation– Closing side streets – Exclusive bus lanes. **TRAFFIC REGULATIONS:** Basic principles of regulation, regulation of speed, vehicles, driver, mixed traffic, parking regulations and enforcement of regulations. **UNIT – VI** **ROAD MARKINGS:** Introduction – Classification of road markings – Line markings – Centre line, transverse markings, arrow markings, facility markings, directional markings, object markings – Road studs. **MISCELLANEOUS:** Traffic control aids and street furniture – Speed breakers – Rumble strips – Guard rails. **TRAFFIC FLOW:** Traffic stream parameters – Space headway and time head way – Line occupancy – Density – Lane capacity – Types of traffic capacity.
Textbooks and References	**TEXT BOOKS:** 1. Traffic Engineering and Transport Planning by L.R. Kadiyali 2. Transportation Engineering, Vol I and VoII by Vazirani and Chandola. 3. Transportation Engineering Vol I Venkatramaiah. C **REFERENCE BOOKS:** 1. Transportation Engineering and planning by C.S. papacostas, P. D. Prevedouros. 2. A course in Highway Engineering by S.P. Bindra. 3. Introduction to Traffic Engineering by R Srinivasa kumar.

17CE31E5 – REMOTE SENSING & GIS

Course Category	Professional Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To introduce the basic principles of Remote Sensing and GIS techniques. 2. To learn about various types of sensors and platforms. 3. To learn concepts of visual and digital image analyses. 4. To understand the principles of spatial analysis. 5. To understand the elements of GIS. 6. To learn the applications of RS and GIS to civil engineering.	
Course Outcomes	CO1	Understand remote sensing terms and concepts of the physical applications of such a system.
	CO2	Understand the different technical aspects of a remote sensing network with special emphasis on India remote sensing technology.
	CO3	Compare different types of data obtained from a remote sensing network with tools specifically designed for the purpose.
	CO4	Understand about various methods of corrections applied to data to ensure maximum credibility and accountability to the data collected.
	CO5	Understand the basic concepts of Geographical Information System
	CO6	Apply RS and GIS in various fields on water resources engineering.
Course Content	**UNIT – I** **FUNDAMENTALS:** Definition – History – Physics of remote sensing – Electromagnetic radiation – Interaction of electromagnetic radiation with atmosphere, earth surface features – Vegetation, soil and water – Spectral signature – Atmospheric windows. **UNIT – II** **REMOTE SENSING SYSTEM:** Introduction – Platforms – Types – Satellites – Indian remote sensing satellites. **SENSORS:** Introduction – Types – Characteristics of sensors – IFOV – Indian remote sensing sensors – LISS – WIFS – PAN. **UNIT – III** **VISUAL DATA ANALYSIS:** Introduction – Types of data products – Image interpretation techniques – Detection, recognition, analysis, classification, deduction and idealization – Elements of image interpretation – Keys.	

	UNIT – IV **IMAGE PROCESSING:** Introduction – Overview – Preprocessing – Radiometric Correction – Geometric correction – Rectification – Enhancement techniques – Contrast stretch – Edge enhancement – Filtering techniques – Classification techniques – Supervised and unsupervised classification. **UNIT – V** **GEOGRAPHICAL INFORMATION SYSTEM:** Basic Principles – Definition – Components – Data structures – Raster and vector formats – Functioning of GIS – Data Input – Data manipulation – Data retrieval – Data analysis – Data display – Data base management systems. **UNIT – VI** **RS AND GIS APPLICATIONS GENERAL:** Land cover and land use – Agriculture – Forestry – Geology – Geomorphology – Urban applications. **APPLICATION TO HYDROLOGY AND WATER RESOURCES:** Flood zoning and mapping – Groundwater prospects and potential recharge zones – Watershed management.
Textbooks and References	**TEXTBOOKS:** 1. Bhatta B (2008), "Remote sensing and GIS", Oxford University Press 2. Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012. 3. Introduction to Geographic information system – Kang – TsurgCharg. Tata McGraw Hill Education Private Limited. 4. Remote sensing and Geographical information system – by M. Anji Reddy JNTU Hyderabad 2001, B.S. Publications. **REFERENCES:** 1. Basics of remote sensing & GIS by A. Kumar, Laxmi publications. 2. Remote sensing of the environment – An earth resources perspective – 2ndedition – by john R.Jensen, Pearson Education. 3. Principals of Geo physical Information system – Peter A Burragh and Rachael McDonnnell, Oxford Publications 2004.

17CE31P1 - MATERIAL TESTING LABORATORY

Course Category	Professional Core	**Credits**	2
Course Type	Laboratory	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	Strength of materials	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the characteristics and behavior of various materials used in buildings and infrastructure. 2. To select materials based on their properties and their proper use for a particular facility under prevailing loads and environmental conditions.	
Course Outcomes	CO1	Determine the strength and elastic modulus of various materials used in buildings and infrastructure.
	CO2	Evaluate the impact strength of mild steel.
	CO3	Compute the rigidity modulus of mild steel.
	CO4	Evaluate the hardness property of steel, copper and brass.
	CO5	Evaluate the stiffness property of the spring.
	CO6	Determine the elastic modulus and flexural rigidity of various types of beam.
Course Content	**LIST OF EXPERIMENTS** 1. Tension test on Mild Steel bar. 2. Tension test on HYSD bar. 3. Compression test on wood. 4. Direct shear test on Mild Steel. 5. Rockwell and Brinell Hardness tests. 6. Charpy and Izod Impact tests. 7. Bending test on Rolled Steel Joist. 8. Bending test on carriage springs. 9. Torsion test-Determination of Rigidity modulus (G). 10. Deflection test on simply supported beam-Determination of Elastic modulus(E). 11. Deflection test on fixed beam- Determination of Elastic modulus (E). 12. Deflection test on close-coiled helical springs. 13. Deflection test on over hanging beam - Determination of Elastic modulus (E).	

17CE31P2 - SOIL MECHANICS LABORATORY

Course Category	Professional Core	**Credits**	2
Course Type	Laboratory	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	Soil Mechanics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To determine index properties of soil in the field and laboratory. 2. To compute the compaction characteristics. 3. To determine the permeability of soils. 4. To determine the California bearing ratio value. 5. To determine shear parameters of the soil. 6. To apply the process of sedimentation for distribution of soil particles.	
Course Outcomes	CO1	Determine index properties of soils and classify them.
	CO2	Determine the compaction characteristics.
	CO3	Determine the permeability of soils.
	CO4	Determine the California Bearing Ratio value.
	CO5	Determine the shear parameters of the soil.
	CO6	Evaluate the distribution of soil particles by sedimentation process.

Course Content

LIST OF EXPERIMENTS

1. (a) Specific Gravity.
   (b) Grain Size Distribution by Sieve Analysis.
2. (a) Liquid Limit & Plastic Limit.
   (b) Shrinkage Limit.
3. (a) In-Situ density by core cutter method.
   (b) In-Situ density by Sand replacement method.
4. I.S. light Compaction Test.
5. California Bearing Ratio Test.
6. (a) Consolidation Test.
   (b) Free Swell Index Test.
7. Direct Shear Test.
8. Unconfined Compression Test.
9. Coefficient of Permeability by constant Head method.
10. Coefficient of Permeability by Falling Head method.
11. Hydrometer Analysis.

DEMONSTRATION

1. Triaxial Shear Test.
2. North Dakota Cone Test.

17CE31AC - PROFESSIONAL ETHICS & LIFE SKILLS

Course Category	Audit Course	**Credits**	0
Course Type	Theory	**Lecture-Tutorial-Practical**	2-0-0
Prerequisite	None	**Sessional Evaluation**	-
		Semester End Exam Evaluation	-
		Total Marks	-

Course Objectives	To improve the student's efficiency in Communicative English and quantitative ability can sharpen thinking ability and fasten their problem solving skills which will be helpful for the students personally and professionally.	
Course Outcomes	CO1	Formulate the problem quantitatively and use appropriate arithmetical, and/or statistical methods to solve the problem.
	CO2	Apply mathematical tools and methods to formulate relationships between different quantities, in fields such as the physical and social sciences.
	CO3	Understand core values that shape the ethical behaviour of an Engineer.
	CO4	Create positive impressions, increasing confidence and self-esteem and Enhancing communication skills.
	CO5	Learn the tips for professional interviews.
	CO6	Understand the verbal ability and reasoning.
Course Content	**UNIT – I** **QUANTITATIVE APTITUDE:** Number system – L.C.M & H.C.F – Find the Unit digit- Remainder Theorem – Problems on ages – Problems on Averages- Percentages – Simple interest – compound interest- Profit and loss, permutations and combinations, probability, boats and streams – Pipes and cisterns – Data interpretation – Table graph – Bar graph – Line graph – Pie chart. **UNIT – II** **REASONING:** Number and letter series- Coding and Decoding, Directions, Classifications – Venn Diagrams – Syllogism – seating arrangement – Analogy – Blood Relation – Clocks – Calendars – Puzzle Test – Coded inequality – Data Sufficiency. **UNIT – III** **PROFESSIONAL ETHICS AND HUMAN VALUES:** **Human values**: Morals, values and ethics - Integrity – Work Ethic – Service.	

	Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage - Valuing Time – Cooperation – Commitment – Empathy – Self-Confidence – Character – Spiritually. **UNIT – IV** **BUSINESS ETIQUETTE AND PERSONAL GROOMING:** **Making a Great first impression:** How to present yourself to people, Greetings, introductions. The art of small talk - How to make proper introductions, paying and receiving complaints, Small talk & Networking, Developing Professional and personal image, Personal Hygiene and polish interpersonal skill. **Etiquette of Dressing:** The do's and don'ts in dressing, Understanding various dress codes, clothes and corporate Culture. **UNIT – V** **Accent Neutralization:** P – Pitch, I – Inflection, C – Courtesy, T – Tone, U – Understanding, R – Rate of speech & E – Enunciation. **Identifying and dealing with mother tongue Influence (MTI).** **Preparation for interviews:** Conducting Research & Commonly asked questions, speaking up during interviews, GDs, Debate & Resume Building. **UNIT – VI** **VERBAL ABILITY**: Essay Writing, Comprehension, Email writing, Corrections of Sentences, Synonyms & Antonyms.
Textbooks & References	**TEXTBOOKS AND REFERENCE BOOKS:** 1. Quantitative Aptitude by R.S.Agarwal. 2. Non-Verbal reasoning by R.S.Agarwal. 3. Soft Skills - Know Yourself & Know the world by Dr.Alex 4. Communication by Meenakshi Raman and Sangeeth Sarma. 5. Charles D.Fleddermann, "Engineering Ethics", Pearson Education/Prentice Hall, New Jersey, 2004 (Indian Reprint).

N.B.K.R. INSTITUTE OF SCIENCE &TECHNOLOGY :: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

III YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – II SEMESTER

S.NO.	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation								
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test - I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max Marks		Duration In Hours	Max. Marks	
1	17CE3201	Environmental Engineering-I	3	2	0	4	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17CE3202	Water Resources Engineering	2	2	0	3	34	6	40	34	6	40		3	60	100
3	17CE3203	Engineering Ethics	3	0	0	3	34	6	40	34	6	40		3	60	100
4	17CE3204	Construction Planning & Management	2	2	0	3	34	6	40	34	6	40		3	60	100
5	17CE3205	Quantity Surveying & Valuation	3	2	0	4	34	6	40	34	6	40		3	60	100
6	17CE32EX	Core Elective II	3	0	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17CE32P1	Highway materials laboratory	0	0	3	2	-	-	-	-	-	-	Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17CE32P2	Environmental Engineering Lab	0	0	3	2	-	-	-	-	-	-		3	60	100
7	17CE32MP	Mini Project	0	0	0	2									60	100
		TOTAL				**26**										

Core Elective-II:

17CE32E1 : Advanced Structural Design
17CE32E2 : Finite Element Analysis
17CE32E3 : Integrated Watershed Management
17CE32E4: Urban Transportation Planning
17CE32E5: Advanced Foundation Engineering

17CE3201 – ENVIRONMENTAL ENGINEERING-I

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 2 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand about the water demand, design period depending upon population forecasting, different water sources, and intake works for collection. 2. To understand about the characteristics of water and different units in conventional treatment plant. 3. To understand about the suitability of different types of filters depends upon the characteristics of water 4. To understand about the suitability of disinfection depending upon the quantity of organic matter and type of bacteria. 5. To understand about the treatment of salt water and waste water by using advanced treatment methods. 6. To understand about the different types of water distribution networks, pipe networks depending upon the locality.	
Course Outcomes	CO1	Identify the sources of water and intake works for collection. Be able to forecast and calculate water demand.
	CO2	Determine the water quality and understand the conventional methods of water treatment.
	CO3	Understand the concepts of filtration.
	CO4	Understand the concepts of disinfection.
	CO5	Apply the advanced water treatment methods.
	CO6	Understand the various methods of conveyance and distribution of water. Be able to design pipe-networks by hardy-cross method. Understand various joints, valves and house service connections.
	UNIT – I **SOURCES, DEMAND AND COLLECTION OF WATER:** Sources of water – Source Selection – Water demand – Types – Factors affecting water demand – Fluctuations in water demand – Design period – Population forecasting methods and their suitability – Intake structures – Site selection.	

Course Content	**UNIT – II** **WATER QUALITY:** Need for protected water supply –Water quality – Characterization – Water quality standards – Water-borne diseases. **CONVENTIONAL TREATMENT OF WATER:** General outline of conventional water treatment units and their functions – Theory of aeration – Aeration methods – Principles and design of sedimentation – Coagulation, flocculation and clarification. **UNIT – III** **FILTRATION:** Theory of filtration – Types of filters – Working and design of slow and rapid sand filters – Operational troubles in filters. **UNIT – IV** **DISINFECTION:** Disinfection–Types of disinfectants – Theory of chlorination – Types of chlorination – Forms of application – Break point chlorination. **UNIT – V** **ADVANCED TREATMENT METHODS:** Removal of salinity – Adsorption technique – Removal of arsenic–Ion exchange process – Removal of hardness – Chemical oxidation and precipitation – Removal of Iron, manganese and fluorides – Membrane process. **UNIT – VI** **CONVEYANCE SYSTEM:** Systems of conveyance of water – Pipe materials Hydraulics of flow in pipes. **WATER DISTRIBUTION:** Requirements of water distribution–Components–Service reservoirs– Layout of distribution networks–Design of pipe networks–Hardy cross and equivalent pipe method–Pipe joints–Valves–House service connections.
Textbooks and References	**TEXTBOOKS:** 1. Water Supply Engineering by S.K. Garg. 2. Water Supply and Sanitary Engineering G. S. Birdie & J. S. Birdie 3. Water Supply Engineering by B.C.Punmia. **REFERENCE BOOKS:** 1. Environmental Engineering I Water Supply Engineering by Modi. P. N 2. Water Treatment Principles and Design by James M. Montgomery. 3. Environmental Engineering by H.S. Peavy et al.,

17CE3202 – WATER RESOURCES ENGINEERING

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the basic concept of the water resources engineering, hydrological cycle and occurrence of precipitation, runoff relationships. 2. To impart knowledge on evapotranspiration and infiltration concepts. 3. To understand the theory of developing various forms of hydrographs. 4. To study various methods to determine the frequency and intensity of floods. 5. To understand the aquifer parameters and its influence on movement and occurrence of groundwater. 6. To study about methods of irrigation and their efficiency based on availability of moisture and the practical conditions.	
Course Outcomes	CO1	Understand of the theories and principles governing the hydrologic processes.
	CO2	Determine loss due to evapotranspiration & infiltration.
	CO3	Determine the runoff due to precipitation and develop runoff hydrographs.
	CO4	Develop Unit hydrograph and synthetic hydrograph to estimate flood magnitude.
	CO5	Determine aquifer parameters and yield of wells.
	CO6	Explain the basic concepts of irrigation engineering.
Course Content	**UNIT – I** **INTRODUCTION:** Definition and scope– Hydrologic cycle– Sources of hydrological data. **PRECIPITATION:** Forms of precipitation – Measurement of precipitation –Rain gauge network – Preparation and presentation of rainfall data – Mean precipitation of rainfall data – Depth-Area-Duration relationship – Frequency of point rainfall Maximum Intensity/Depth-Duration-Frequency relationship – Probable maximum Precipitation (PMP). **UNIT – II** **ABSTRACTIONS FROM PRECIPITATION:** Evaporation process – Evaporimeters – Empirical evaporation equations – Analytical methods of evaporation Estimation – Transpiration.	

Evapotranspiration – Measurement of Evapotranspiration, Evapotranspiration equations – Potential evapotranspiration and Actual Evapotranspiration – Infiltration – Factors affecting infiltration – Infiltration indices.

UNIT – III

RUNOFF: Runoff characteristics – Factors affecting runoff – Catchment characteristics – Flow-duration curve – Flow-mass curve.

HYDROGRAPHS: Components of hydrograph – Base flow separations –Unit hydrograph – Derivation of Unit hydrograph – Unit hydrograph of different durations – Use and limitations of UH – Duration of the Unit hydrograph – S-Unit hydrograph – Instantaneous Unit hydrographs.

UNIT – IV

FLOODS: Introduction– Rational method– Empirical formulae – Unit hydrograph method – Flood frequency studies – Gumbel's method – Log-Pearson type III distribution – Partial duration series – Regional flood – Frequency analysis – Data for frequency studies – Design flood – Design storm – Risk, reliability and safety factor.

UNIT – V

GROUNDWATER: Introduction – Forms of subsurface water – Saturated formation – Aquifer properties – Geologic formations as aquifers – Equation of motion – Wells – Steady flow into a well – Open wells – Unsteady flow in a confined aquifer – Well loss – Specific capacity – Sea-water intrusion – Recharge.

UNIT – VI

IRRIGATION: Necessity and importance – Principal crops and crop seasons – Types – Methods of application – Soil-water – Plant relationship – Soil moisture constants – Consumptive use – Estimation of consumptive use – Crop water requirement – Duty and delta – Factors affecting duty – Depth and frequency of irrigation – Irrigation efficiencies – Water logging and causes – Standards of quality for irrigation water – Crop rotation.

Textbooks and References	**TEXTBOOKS:** 1. 'Engineering Hydrology' by Subramanya. K, Tata McGraw-Hill Education Pvt. Ltd, (2013), New Delhi. 2. 'Engineering Hydrology' by Jayarami Reddy P, Laxmi Publications Pvt. Ltd., (2013), New Delhi. 3. 'Irrigation water resources and water power engineering' by P.N.Modi, Standard book house publication. 4. 'Applied hydrology by Chow. V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt. Ltd., (2011), New Delhi. **REFERENCES:** 1. Duggal. K.N. and Soni. J.P., "Elements Of Water Resources Engineering", New Age International Publishers, 2005 2. Asawa, G.L., "Irrigation Engineering", NewAge International Publishers, New Delhi, 2000.

17CE3203 – ENGINEERING ETHICS

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To create awareness on engineering ethics providing basic knowledge about engineering ethics, professional ideals and virtues. 2. To provide basic familiarity about engineers as responsible experimenters, research ethics, Industrial standards. 3. To inculcate knowledge and exposure on safety and risk, risk benefits analysis. 4. To have an idea about the collegiality and loyalty, collective bargaining, confidentiality, occupational crime. 5. To explain concept of intellectual property rights. 6. To have an adequate knowledge about MNC's, business, environment, computer ethics, honesty, moral leadership and sample code of conduct.	
Course Outcomes	CO1	Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.
	CO2	Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
	CO3	Solve ethical problems.
	CO4	Aware of responsibilities of an engineer for safety and risk benefit analysis.
	CO5	Aware of professional rights and responsibilities of an engineer.
	CO6	Perform various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.
Course Content	**UNIT-I** Introduction to professional ethics: Basic concepts – Governing ethics – Thoughts of ethics, engineering ethics, ethics and law – case studies.	

	UNIT-II Professionalism and codes of ethics – Ethical problems. **UNIT-III** Techniques for solving ethical problems. **UNIT-IV** Risk, safety and accidents – Designing for safety – Case studies. **UNIT-V** Rights and responsibilities of engineers – Ethics in research – Computer ethics – Experimentation. **UNIT-VI** Global issues in professional ethics: Introduction – Current scenario – Business ethics and corporate governance – Media ethics – Bio ethics – War ethics – Intellectual property rights.
Textbooks and References	**TEXTBOOKS:** 1. Engineering Ethics - Charles B.Fleddermann. 2. Engineering Ethics (Includes Human Values) by M Govindarajan, PHI Publications (2004). 3. Professional Ethics and Human Values by M. Govindarajan, S. Senthilkumar, M.S. Natarajanv, PHI Publications (2016).

17CE3204 – CONSTRUCTION PLANNING & MANAGEMENT

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the significance of construction management. 2. To study the construction planning using CPM and PERT methods. 3. To study the various equipment of construction industry and their significance. 4. To understand the need of the inspection for quality control in construction project. 5. To perform ethical audit and prepare audit statement. 6. To understand the concept of safety and risk on construction planning and organizational structures and roles.	
Course Outcomes	CO1	Understand the basics of construction management.
	CO2	Schedule various components of project and apply CPM and PERT techniques.
	CO3	Know the working of various equipments in construction industries.
	CO4	Perform inspection for quality control.
	CO5	Perform ethical audit and prepare audit statement.
	CO6	Understand the importance of safety and risk in construction and organizational structures and roles.
Course Content	**UNIT - I** **INTRODUCTION:** Significance of construction management – Objectives and functions of construction management – Types of construction – Resources for construction industry – Stages of construction – Construction team – Engineering drawings. **UNIT - II** **CONSTRUCTION PLANNING:** Stage of planning – Scheduling – Preparation of material – Equipment – Labour and finance schedules – Bar charts – Mile stone charts.	

NETWORK TECHNIQUES IN CONSTRUCTION MANAGEMENT: Critical Path Method (CPM) – Programe Evaluation and Review Technique (PERT) – Network techniques breakdown structures – Classification of activities – Rules for developing networks – Network development – Network analysis – Critical activities and critical path – Cost optimization.

UNIT - III

CONSTRUCTION AND EQUIPMENT MANAGEMENT: Equipment requirement in construction industry – Heavy earth moving equipment: Bulldozer, scrapers, loaders, excavator, shovels and cranes – Compaction equipment – Grading equipment – Aggregate production equipment – Asphalt mixing plant – Asphalt laying equipment – Hauling equipment – Concrete mixing equipment – Material handling devices – Pneumatic equipment – Bridge construction equipment – Drilling and blasting equipment – Pumping and dewatering equipment.

UNIT – IV

INSPECTION: Need for inspection and quality control – Principals of inspection– Enforcement of specifications – Stages of inspection and quality control.

UNIT – V

QUALITY CONTROL: Ethical Audit: Introduction – Aspects of project realization – Ethical audit procedures – The decision makers – Variety of interests – Formulation of briefs – The audit statement – The audit reviews.

UNIT – VI

SAFETY AND RISK: Introduction – Safety and risk – Concept and importance of safety – Types of risk – Safety and engineers – Safety measures in construction works – Design for safety – Risk benefit analysis – Accidents.

ORGANISING CONSTRUCTION: Principals of organization – Communication – Leadership and human relations – Types of organization – Organization for a construction firm – Temporary services – Job layout**.**

Textbooks and References	**TEXTBOOKS:** 1. Construction Planning and Management by P.S. Gahlot and B.M Dhir. 2. Construction Equipment and its Management by S.C. Sharma. 3. Construction Management and Machinery by B.L Gupta and Amit Gupta. **REFERENCE BOOKS:** 1. Engineering Ethics by M. Govinda Rajan. 2. Construction Engineering and Management by S. Seetharaman. 3. Construction Management and Accounts by Haripal Singh.

17CE3205 - QUANTITY SURVEYING AND VALUATION

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 2 - 0
Prerequisite	Building Technology	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To prepare an estimate for civil engineering works. 2. To understand the significance of specifications. 3. To perform the rate analysis of various items of work. 4. To generate the contract and contract documents. 5. To prepare the tenders and arbitration of tenders. 6. To prepare the valuation document.	
Course Outcomes	CO1	Prepare approximate and detailed estimates of simple buildings.
	CO2	Understand the specifications of various components of simple buildings.
	CO3	Carry out the rate analysis for sub structure and super structure works of simple buildings.
	CO4	Perform rate analysis for roofing, plastering, pointing and wood works of simple buildings.
	CO5	Prepare contracts, tenders and arbitration of tenders.
	CO6	Prepare valuation document.
Course Content	**UNIT – I** **INTRODUCTION:** General items of work in buildings – Standard units – Principles of working out quantities for detailed and abstract estimates – Approximate and detailed estimates of simple buildings and road works. **UNIT – II** **SPECIFICATIONS:** Types – Standard specifications for different items of building construction – Earth work for foundations – Sand– Cement – Kankar – Mortars– Foundation concrete – Reinforced concrete – Brick work – Stone masonry – Lime– Mosaic Flooring – RCC roof and GI sheet roof – Plastering – Pointing – Painting and wood works.	

UNIT – III

RATE ANALYSIS-I:

Earth work for foundations and basement of buildings.

Mortars: Lime mortar (1:1.5) and Cement Mortar (1:4).

Foundation Concrete: Lime concrete (1:2:4) and Cement Concrete (1:5:10).

Reinforced Concrete: Lintels, Slabs, Beams and Columns (1:2:4).

Brick work : Constructed with first class bricks with L.M. (1:1.5) and C.M.(1:6)

Stone Masonry: C.R.S. – 1st sort constructed with C.M. (1:2) and R.R.Masonry.

Mud: Lime mortar (1:1.5) and C.M. (1:2).

Flooring:

a) With Cuddapah or Shahbad slabs.
b) Ellis pattern flooring with 10cm concrete and 20mm cement concrete surface
c) Mosaic flooring.

UNIT – IV

RATE ANALYSIS-II:

Roofing:	a) R.C.C. roof 10cm thick, 2 courses of flat tiles to top.
	b) A.C. corrugated sheet roofing on steel purlins.
Plastering :	a) With L.M. (1:1.5) 2 coats (20mm thick)
	b) C.M. (1:4) 12mm thick.
Pointing:	a) With C.M. (1:3) flush pointing to R.R. Masonry.
	b) C.M. (1:3) for brick masonry.
Painting:	a) White washing and colour washing of walls: 2 coats.
	b) Painting iron and wood work: 3 coats.
Wood work:	a) Panelled doors and windows.
	b) W.B.M. road with bituminous carpet 20mm thick.

UNIT –V

CONTRACTS: Types of contracts– Contract document – Conditions of contracts– Contract procedure – Termination of contracts – Specifications – Important conditions of contract – Arbitration and tenders.

	UNIT – VI **VALUATION:** Introduction–Technique of valuation–Elements of valuation and Factors affecting valuation–Methods of valuation of land property and building property– Rate of interest for sale– Purchase– Mortgage– Capital gain– Tax– Estate duty and death duty – Types of valuation – Valuation for renewal of lease– Extension of lease– Standard rent– Easement rights– Preparation of feasibility reports– Valuation of reports– Awards.
Textbooks and References	**TEXTBOOKS:** 1. A Text book of Estimating and Costing by B.N. Dutta. 2. Estimating and Costing in Civil Engineering by G.S.Birdie. 3. Estimating, Costing and Valuation by Rangwala. **REFERENCE BOOKS:** 1. A.P.D.S.S. Standard data book Vol. II. 2. A.P. Department standard specifications. 3. Professional practice by Roshan Namvati.

17CE32E1 – ADVANCED STRUCTURAL DESIGN

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 -0 - 0
Prerequisite	R.C.C Structural designs I & II, Steel Structural Design & Analysis of Structures.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To explain advanced structural design of concrete members. 2. To analyze and design multi storey building frames including floors and slabs. 3. To apply the most recent BIS code of practices relevant to the design structural steel members. 4. To acquire the knowledge of plastic design of frames. 5. To perform the analysis of prestressed concrete members. 6. To design of various prestressed concrete beams and slabs.	
Course Outcomes	CO1	Understand the design of slender reinforced concrete columns and concrete walls under loads.
	CO2	Analyze and design of multi storey building frames including floors and slabs.
	CO3	Perform the plastic design of beams and columns.
	CO4	Design structural members using BIS codes.
	CO5	Perform the analysis and design of prestressed concrete beams by using limit state design.
	CO6	Perform the design of prestressed concrete slabs, pressure pipes and railway sleepers.
Course Content	**UNIT – I** **REINFORCED CONCRETE-I:** Design of slender columns – Deep beams – Concrete walls under vertical loads. **UNIT – II** **REINFORCED CONCRETE-II:** Design of Multistorey building frames – Grid floors – Flat slabs.	

	UNIT – III **STRUCTURAL STEEL-I:** Plastic design of simply supported and continuous beams – Columns. **UNIT – IV** **STRUCTURAL STEEL-II:** Plastic design of frames – Steps/process to as per the most recent BIS code of practices – Design of purlins, trusses, bracings and gantry girders. **UNIT – V** **PRESTRESSED CONCRETE-I:** Design of beams for strength in limit state in flexure and shear – Limit state strength at transfer conditions – Limit state of deflection and cracking. **UNIT – VI** **PRESTRESSED CONCRETE-II:** Design of reinforcement in anchor zones – Design of rectangular slabs – Design of pressure pipes – Design of railway sleepers.
Textbooks and References	**TEXTBOOKS:** 1. Advanced Reinforced Concrete Design by P.C. Varghese. 2. Design of Steel Structures by Ram chandra. 3. Prestressed Concrete by N. Krishna Raju. **REFERENCES:** 1. Prestressed Concrete by G.S.Pandit & S.P.Gupta. 2. Advanced Reinforced Concrete Design by N. Krishna Raju. 3. E. H. Gaylord, C. N. Gaylord and J. E. Stellmeyer, "Design of Steel Structures", McGraw Hill.

17CE32E2 - FINITE ELEMENT ANALYSIS

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	3-0-0
Prerequisite	None	**Sessional Evaluation**	40
		External Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the basic principles of finite element methods. 2. To understand the shape functions and discretization of elements. 3. To analyze one dimensional elements using finite element methods. 4. To analyze plane trusses using finite element approach. 5. To develop stiffness matrices for analysis of beams. 6. To understand the analysis of different types of iso-parametric elements.	
Course Outcomes	CO1	Identify the application and characteristics of elements such as bars, beams, plane and iso parametric elements, and 3-D element using finite element methods.
	CO2	Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
	CO3	Apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
	CO4	Develop skills needed to effectively evaluate finite element analyses performed by others.
	CO5	Develop finite element formulation for beam elements
	CO6	Identify model complex geometry problems and solution techniques.
Course Content	**UNIT –I** **INTRODUCTION TO FINITE ELEMENT METHOD:** Introduction – Finite Difference Method – Advantages and disadvantages – Basic steps – Limitations. **UNIT – II** **FINITE ELEMENT MODELING AND DISCRETIZATION:** Finite element modeling and discretization – Interpolation and shape functions – Types of elements – Nodes and degrees of freedom.	

	UNIT – III **ONE DIMENSIONAL FINITE ELEMENT:** Introduction – Bar element – Beam element – Bar and beam elements of arbitrary orientation – Assembly of elements – Stiffness matrices – Boundary conditions – Loads – Applications. **UNIT – IV** **TRUSSES:** Plane trusses – Local and global coordinate systems – Direction cosines – element stiffness matrix – Assembly of global stiffness matrix – Stress calculation. **UNIT – V** **FINITE ELEMENT FORMULATION:** Introduction beam stiffness – Assembly of beam stiffness matrix – Loading – Boundary conditions – Plane stress – Plane strain analysis. **UNIT – VI** **ISOPARAMETRIC ELEMENTS AND FINITE ELEMENT MODELLING:** Mesh requirements – Material properties – Loads and reactions – Boundary conditions – checking the model – Analysis and design software (for practice purpose only).
Textbooks & Reference books	**TEXT BOOKS:** 1. Finite Element Analysis by C.S.Krishnamoorthy. 2. Finite Element Analysis – S. S. Bhavikatti. 3. Introduction to Finite Elements Engineering. – Chandrupatla & Belegundu. **REFERENCE BOOKS:** 1. The Finite Element Method - Zienkiewicz. 2. Concepts and Applications of Finite Element Analysis - Robert Cook Davis Mallcus. 3. Theory and Problems of Finite Element Analysis. - George Buchanan.

17CE32E3 – INTEGRATED WATERSHED MANAGEMENT

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Water Resources Engineering	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand different watershed behaviour 2. To discuss different aspects of water resource development and management on watershed basis. 3. To understand land use classification. 4. To study the impact of land use changes on hydrological cycle parameters. 5. To know the relation between soil erosion and soil water relationship. 6. To provide inputs for various modeling methods for integrated watershed management.	
Course Outcomes	CO1	Understand the basic concepts of watersheds.
	CO2	Apply the principles of watershed management in planning of a watershed.
	CO3	Identify the importance of participatory rural appraisal in watershed management.
	CO4	Explain the causes of soil erosion and imply the remedial measures.
	CO5	Distinguish various methods of natural drain management in a watershed.
	CO6	Apply the basics of the watershed modeling in watershed development
Course Content	**UNIT - I** **CONCEPTS OF WATERSHED MANAGEMENT:** Introduction – Concept of watershed management – History of watershed management and its relevance to India – Watershed characteristics – Causes of watershed deterioration – Effect of watershed on the community – Water resources region of india. **UNIT II** **PRINCIPLES OF WATERSHED MANAGEMENT:** Introduction – Integrated watershed management approach (IWMA) – Objectives of IWMA – Envisaged results – Success criteria – Selection of watershed village – Equity issues – Benchmark survey – RS in watershed management – Land capability classification.	

	UNIT III **PRATICIPATORY RURAL APPRAISAL IN WATERSHED PROGRAMME:** Introduction – Participatory rural appraisal – Basic principles – Assumptions and basics of PRA – Tips for PRA practitioners – Myths of PRA techniques – Benefits of participatory rural appraisal – Different tools of PRA. **UNIT IV** **SOIL EROSION AND SOIL WATER RELATIONSHIP:** Introduction – Soil erosion – factors affecting soil erosion –Different types and causes of erosion – Cost of soil erosion – Estimation of loss of soil from erosion – Control of soil erosion – Soil salinity – Soil water relationship and different types of soil – Water requirement of crop – Methods of water application to crop or plants. **UNIT V** **MANAGEMENT OF NATURAL DRAINAGE IN WATERSHED:** Introduction – Check dams –Structures for gully stabilization and storage of water –Rivers or stream Bank management measures –River training works –Methods of river training works – Channel improvement –River training for navigation –Sediment control –Retards – revetments –Gabion retaining wall –Reservoir system in watershed. **UNIT VI** **WASTELAND, LANDUSE AND LAND DRAINGAE MANAGEMENT:** Introduction – Causes of wasteland – Remedial measures – Landslides – Land drainage management – Types of tile drain layouts – Urban storm water management. **WATERSHED MODELLING:** Introduction – Data of watershed for modeling – History and evolution – Application – Comparison – Model calibration and validation – Emerging trends in watershed models.
Textbooks and References	**TEXTBOOKS:** 1. Watershed Management by Madan Mohan Das, Mimi Das Saikia, PHI publications. 2. Watershed Management by JVS MURTHY, New Age International Publishers. **REFERENCES:** 1. Hydrology and the Management of Watersheds by Kenneth N. Brooks, Peter F. Folliott, Joseph A. Magner NCE, Wiley-Blackwell publications. 2. GIS for Water Resource and Watershed Management edited by John G. Lyon, CRS. 3. Integrated watershed management – Principles and Practice by Isobel W. Heathcote, Published by John Willey & Sons.

17CE32E4 - URBAN TRANSPORTATION PLANNING

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Transportation Engineering – I and II	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To discuss transport planning process. 2. To explain different types of transportation surveys. 3. To predict trip generation for transport planning. 4. To present trip distribution concepts. 5. To discuss methods of traffic assignment and also model split. 6. To discuss evaluation of different plans and also preparation of transportation plan for small and medium towns.	
Course Outcomes	CO1	Understand the basic concepts of transportation planning along with method of traffic forecast analysis.
	CO2	Able to conduct transportation surveys which are essential in urban transportation planning.
	CO3	Explain the basic concepts, factors affecting Trip generation and also use multiple linear regression analysis for Trip generation calculations.
	CO4	Understand methods of trip distribution.
	CO5	Understand the concepts of assignment techniques and model spilt analysis.
	CO6	Perform evaluation of transportation plans and also prepare transportation plan for a small town.
Course Content	**UNIT – I** **TRANSPORT PLANNING PROCESS:** Scope of the Subject – Interdependence of the land use and traffic – Systems approach to transport planning – Urban morphology – urbanization and stages in transport planning – Survey and analysis of existing conditions – Forecast analysis of future conditions and plan synthesis – Evaluation – Programme adoption and implementation – Continuing study – Citizen participation – Difficulties in the transport planning process.	

UNIT – II

TRANSPORTATION SURVEY: Introduction – Definition of the study area – Zoning – Type of Surveys – Home interview surveys – Commercial vehicles surveys – Taxi surveys – Roadside interview surveys – Postcard questionnaire – Registration number plate surveys – tags on vehicles – Public transport surveys – Inventory of transport facilities – Inventory of land use and economic activities – Expansion of data from samples.

UNIT – III

TRIP GENERATION: Introduction and definitions – Trip purpose – Factors governing trip classification –Trip generation and attraction rates – Multiple linear regression analysis – Category analysis – Trip based and activity based approach – Urban transport planning – goals – Objectives and constraints.

UNIT – IV

TRIP DISTRIBUTION: What is trip distribution – Methods of trip distribution – Growth factor methods - Uniform (Constant) factor method – Average factor method – Synthetic methods – Gravity model.

UNIT – V

TRAFFIC ASSIGNMENT: Purpose of traffic assignment – General principles – assignment techniques – All-or-nothing assignment – Multiple route assignment – Capacity restraint assignment – Capacity restraint assignment – Diversion curves.

MODEL SPLIT: General considerations – Factors affecting model split – Model split in the transport planning process. Recent development in model split analysis.

UNIT – VI

EVALUATION: Need for Evaluation – Several plans to be formulated – Testing – Considerations in evaluation – Economic evaluation. Land use transportation models-introduction – selection of land use transport model

TRANSPORT PLANNING FOR SMALL AND MEDIUM SIZED CITIES: Introduction – Difficulties in transport planning for small and medium cities – Quick response techniques.

Textbooks and References	**TEXTBOOKS:** 1. Traffic Engineering and Transport Planning by L.R. Kadiyali. 2. Transportation Engineering, Vol I and VoII by Vazirani and Chandola. 3. Transportation Engineering Vol I Venkatramaiah. C. **REFERENCE BOOKS:** 1. Transportation Engineering and planning by C.S. papacostas, P. D.Prevedouros. 2. A course in Highway Engineering by S.P. Bindra. 3. Introduction to Traffic Engineering by R Srinivasa kumar.

17CE32E5 - ADVANCED FOUNDATION ENGINEERING

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	3-0-0
Prerequisite	Foundation Engineering	**Sessional Evaluation**	40
		External Evaluation	60
		Total Marks	100

Course Objectives	1. To analyse the pressure distribution for bulk heads. 2. To understand the design of anchored bulk heads by various methods. 3. To demonstrate the design of various components of bracing. 4. To analyse the design of mat foundation by conventional method. 5. To study the behaviour of laterally loaded vertical and batter piles. 6. To explain the concept of ground improvement for expansive soils.	
Course Outcomes	CO1	Estimate the pressure distribution for bulk heads.
	CO2	Design anchored bulk heads by various methods.
	CO3	Design various components of bracing.
	CO4	Design of mat foundations by conventional method.
	CO5	Analyse laterally loaded pile and batter piles.
	CO6	Understand the concept of ground improvement for expansive soils.
Course Content	**UNIT – I** **BULKHEADS:** Uses of sheet piling walls – Common types of sheet piling walls – Common sheet pile sections – Cantilever sheet piling walls in cohesionless soils – cantilever sheet piling walls in cohesive soils (Approximate analysis only). **UNIT – II** **ANCHORED BULKHEADS:** Anchored bulkhead design by free earth support method – Anchored bulkhead design by fixed earth support method – Methods of reducing lateral pressure – Types of anchorage.	

	UNIT – III **BRACED EXCAVATIONS:** Braced cut – Apparent pressure diagrams for cuts in both sands and clays – Types of bracing systems – Design of various components of bracing – Bottom heave of cuts in soft clays – Piping failure of cuts in sands. **UNIT – IV** **MAT FOUNDATIONS:** Allowable bearing pressure for mat foundations – conventional design of mat foundations – Modulus of sub-grade reaction. **UNIT – V** **BEHAVIOUR OF LATERALLY LOADED VERTICAL BATTER PILES:** Introduction – Winkler's Hypothesis – Differential equation – Non-dimensional solutions for vertical piles subjected to lateral loads – P-Y curves – Broom's solutions – Case studies for laterally loaded vertical piles in sand and clay – Behavior of laterally loaded batter piles in sand. **UNIT – VI** **EXPANSIVE SOILS**: Problems of expansive soils – Tests for identification – methods of determination of swell pressure – Improvement of expansive soils – Foundation techniques in expansive soils – Under reamed piles.
Textbooks & References	**TEXTBOOKS:** 1. Soil mechanics and Foundation Engineering by V.N.S. Murthy. 2. Modern geotechnical engineering by Alam Singh. 3. Foundation Engineering by Brahma. S.P. 4. Analysis and Design of Foundation and Retaining Structures by Shamsher Prakash, Gopal Ranjan and Swami Saran. 5. Basic and Applied Soil Mechanics by Gopal Ranjan& A.S.R. Rao. 6. Geotechnical Engineering by C. Venkatramaiah. **REFERENCE BOOKS:** 1. Foundation Analysis and design by Bowles. J.E. 2. Foundation Engineering by Teng. W.C. 3. Foundation Engineering by Peck, Honson, Thornburn.

17CE32P1 – HIGWAY MATERIALS LABORATORY

Course Category	Professional Core	**Credits**	2
Course Type	Laboratory	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	Transportation Engineering – I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To assess the quality of bitumen and its suitability for highway construction works. 2. To learn the testing procedure of aggregate and able to judge its suitability as highway construction material.	
Course Outcomes	CO1	Determine various properties of bitumen.
	CO2	Conduct various tests on bitumen.
	CO3	Assess the quality of bitumen.
	CO4	Determine various properties of aggregate.
	CO5	Evaluate the quality of the aggregate and judging its suitability for highway construction.
	CO6	Choose the required materials based on field conditions.
Course Content	**CYCLE – I: TESTS ON AGGREGATES** 1. Specific Gravity and Water Absorption Test. 2. Aggregate Impact Test 3. Elongation Index Test 4. Flakiness Index Test 5. Angularity Number Test 6. Los Angles Abrasion Test 7. Aggregate Crushing Test **CYCLE – II: TESTS ON BITUMEN** 1. Flash & Fire Point Test 2. Softening Point Test 3. Specific Gravity Test 4. Penetration Test 5. Ductility Test 6. Stripping Value Test	

17CE32P2 -ENVIRONMENTAL ENGINEERING LABORATORY

Course Category	Program Core	**Credits**	2
Course Type	Laboratory	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	Environmental Engineering – I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To introduce students how the common environmental experiments related to water and waste water quality are performed. 2. This course will help students know which tests are appropriate for given environmental problems and write technically reports and apply the laboratorial results to problem identification, quantification and basic environment design and technical solutions.	
Course Outcomes	CO1	Perform common environmental experiments relating to water and waste water availability and know which tests are appropriate for given environmental problems.
	CO2	Apply the laboratorial results to problem identification quantification and basic environment design and technical solutions.
	CO3	Understand and use the water and waste water sampling procedures and sample preservations.
	CO4	Demonstrate the ability to write clear technical laboratorial reports.
	CO5	Understand the impact of water and waste water treatment on people and environment.
Course Content	**LIST OF EXPERIMENTS** 1. Determination of Colour 2. Determination of Turbidity 3. Determination of total and dissolved solids 4. Determination of Settleable solids 5. Determination of pH 6. Determination of Acidity 7. Determination of Alkalinity 8. Determination of Hardness 9. Determination of Chlorides	

	10. Determination of Sulphates 11. Determination of BOD 12. Determination of Chlorine Demand 13. Determination of Optimum Coagulant Dose
Textbooks and References	**TEXTBOOKS:** 1. Environmental Laboratory Manual by Dr. Kotaiah and Dr. N. Kumara Swamy 2. Standards Methods for Analysis of water and Wastewater-APHA **REFERENCE BOOKS:** 1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999 2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993.

17CE32MP - MINI PROJECT

Course Category	Program Core	**Credits**	2
Course Type	Theory	**Lecture - Tutorial - Practical**	0 - 0 - 0
Prerequisite	-	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Outcomes	CO1	Critically examine available literature relevant to the given problem and showcase self-learning ability of concepts beyond curriculum.
	CO2	Demonstrate the ability to formulate / design or evaluate a given problem either individual as a team.
	CO3	Demonstrate the ability to innovatively apply mathematics, science and engineering/design concepts.
	CO4	Design and conduct experiments, interpret data and draw use full inferences.
	CO5	Apply modern tools in analysis/design.
	CO6	Prepare technical reports and present the same and also be able to explain societal impact of the work.

N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY :: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

IV YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – I SEMESTER

S.NO.	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test-I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max Marks		Duration In Hours	Max. Marks	
1	17CE4101	DDIS	3	2	0	4	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17CE4102	Environmental Engineering -II	3	2	0	4	34	6	40	34	6	40		3	60	100
3	17SH4101	Economics & Accountancy**	3	0	0	3	34	6	40	34	6	40		3	60	100
4	17CE4103	Concrete Technology	2	2	0	3	34	6	40	34	6	40		3	60	100
5	17CE41EX	Core Elective-III	3	0	0	3	34	6	40	34	6	40		3	60	100
6	17XX41OX	Open Elective-I	3	0	0	3	34	6	40	34	6	40		3	60	100
		PRACTICALS														
1	17CE41P1	Concrete Technology lab	0	0	3	2	-	-	-	-	-	-	Day-to-day Evaluation and a test (40 marks)	3	60	100
2	17CE41P2	CAAD Lab	0	0	3	2	-	-	-	-	-	-		3	60	100
		TOTAL				**24**										

**Common to ALL

Core Elective-III:

17CE41E1: Prestressed Concrete

17CE41E2: Bridge Engineering

17CE41E3: Pavement Construction & Management

17CE41E4: Ground Improvement Techniques

17CE41E5: Solid Waste Management

17CE4101 – DESIGN AND DRAWING OF IRRIGATION STRUCTURES

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 2 - 0
Prerequisite	Hydrology & Advanced Hydraulics	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the elements of surplus wire and their importance in irrigation engineering. 2. To understand the elements of tank sluice with tower head, and their importance in irrigation engineering. 3. To understand the elements of canal drop and their importance in irrigation engineering. 4. To understand the elements of canal regulator and their importance in irrigation engineering. 5. To understand the elements of syphon well drop and their importance in irrigation engineering. 6. To understand the elements of syphon aqueduct and their importance in irrigation engineering.	
Course Outcomes	CO1	Design and draw the components, sections of surplus weir.
	CO2	Design and draw the components, sections of tank sluice with tower head.
	CO3	Design and draw the components, sections of canal drop.
	CO4	Design and draw the components, sections of canal regulator.
	CO5	Design and draw the components, sections of syphon well drop.
	CO6	Design and draw the components, sections of syphon aqueduct.
Course Content	**Design and Drawing of** 1. Surplus weir 2. Tank sluice with a tower head 3. Canal drop-notch type 4. Canal regulator	

	5. Syphon well drop 6. Syphon Aqueduct (Type – II) (Under tunnel)
Textbooks and References	**TEXTBOOKS:** 1. "Water Resources Engineering Principles and Practice" by C.S. Murthy. 2. "Irrigation Engineering Structures" by Elhis. 3. "Irrigation Engineering and Hydraulic Structures" by Sharma R.K.

17CE4102 – ENVIRONMENTAL ENGINEERING -II

Course Category	Professional Core	**Credits**	4
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 2 - 0
Prerequisite	Environmental Engineering-I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand about the source of wastewater and hydraulic design of sewers depending upon the different sewer materials 2. To understand about the characteristics of wastewater mainly about BOD and its importance in wastewater analysis. 3. To understand about the functions, design of each unit in the conventional treatment plant. 4. To understand about the characteristics of different types of sludges and different sludge treatment processes. 5. To understand about different tertiary treatment methods. 6. To understand about the effluent disposal methods and self-purification capacity of natural water streams.	
Course Outcomes	CO1	Identify the sources of wastewater and materials for sewer design.
	CO2	Determine the characteristics of domestic wastewater.
	CO3	Explain the principles and design of preliminary, primary treatment of domestic wastewater.
	CO4	Explain the principles and design of secondary treatment of domestic wastewater.
	CO5	Explain the sludge processing and management and importance of the tertiary sewage treatment.
	CO6	Demonstrate the principles of waste disposal.

UNIT – I

WASTEWATER COLLECTION AND ESTIMATION: Sanitation – Systems of sanitation Sewerage – Systems of sewerage – Sources of wastewater – Sewage and storm water estimation – Hydraulic design of sewers – Different materials used for sewers – Shapes of sewer – Sewer appurtenances.

Course Content	**UNIT – II** **CHARACTERISTICS OF DOMESTIC WASTEWATER:** Characteristics of sewage –Physical, chemical and biological –BOD equation –Factors affecting the BOD rate of reaction Population equivalent –Relative stability. **UNIT – III** **PRELIMINARY AND PRIMARY SEWAGE TREATMENT:** Layout and general outline of wastewater treatment plant –Function of each unit –Principles and design of screens –Grit chambers –Primary setting tanks. **UNIT – IV** **SECONDARY SEWAGE TREATMENT:** Principles and nutritional requirement of biological treatment system –Factors affecting biological treatment –Working principles and constructional details of High Trickling filter –Activated sludge process –Oxidation/Stabilization pond –Oxidation ditch. **UNIT – V** **SLUDGE MANAGEMENT:** Sludge –Characteristics and types – Sludge treatment – Thickening –Stabilization –Conditioning –Dewatering –Drying/Incineration – Sludge utilization and disposal. **TERTIARY SEWAGE TREATMENT:** Removal of nitrogen and phosphorus – Refractory organic –Heavy metals –Suspended solids and pathogenic bacteria. **UNIT – VI** **EFFLUENT DISPOSAL:** Methods – Dilution – Self-purification of surface water bodies –Oxygen sag curve –Marine disposal –Land disposal –Sewage farming Working principle and design of septic tank – Septic tank effluent disposal system – Disposal standards.
Textbooks and References	**TEXTBOOKS:** 1. Sewage Disposal and Air Pollution Engineering by S.K. Garg. 2. Wastewater Engineering by B.C.Punmia. 3. Waste Water Treatment For Pollution Control by Arceivala S J. **REFERENCE BOOKS:** 1. Water Supply and Sanitary Engineering by G. S. Birdie & J. S. Birdie. 2. Environmental Engineering by H.S. Peavy et al. 3. Wastewater Engineering, Treatment, Disposal and Reuse by Metcalf and Eddy.

17SH4101 – ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

Course Category	Professional Core	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective	To make the student learn about 1. Causes of economic problems. 2. Behavior of a Consumer while purchasing and consuming various commodities and services. 3. Various production and cost concepts used in managerial decision making process. 4. Formation of different types of business organizations in India. 5. Banking system and business concepts. 6. Application of the basic accounting concepts.	
Course Outcomes	CO1	Demonstrate an ability to define, analyze and identify the appropriate solution to a business problem using sound economic and accounting principles.
	CO2	Know the role of various cost concepts in managerial decisions and also the managerial uses of production function.
	CO3	Understand to take price and output decisions under various market structures.
	CO4	Know in brief formalities to be fulfilled to start a business organization.
	CO5	Analyse the firm's financial position with the techniques of economic aspects as well as financial analysis.
	CO6	Evaluate and select profitable investment proposals.
Course Content	**UNIT – I** **BASIC CONCEPTS OF ECONOMICS**: Definition of economics and basic micro and macro-economic concepts (including GDP/GNP/NI/Disposable Income) – The concept of Demand –Law of demand – Elasticity of Demand –Types and measurement –Consumer's equilibrium – Marginal utility analysis. **UNIT – II** **THEORY OF PRODUCTION AND COST**: Production function– Cobb –Douglas production function and its properties – Law of variable proportions – Law of returns to scale – Cost concepts – Revenue curves – Break-Even analysis.	

	UNIT – III **THEORY OF PRICING**: Classification of markets – Pricing under perfect Competition – Pricing under Monopoly – Price discrimination – Monopolistic Competition. **UNIT – IV** **TYPES OF BUSINESS ORGANIZATIONS:** Sole proprietorship –Partnership and joint stock company – Shares and debentures. **BANKING SYSTEM**: Central bank, commercial banks and their functions – Impact of technology in banking sector. **UNIT – V** **FINANCIAL ACCOUNTING**: Concepts and principles – Journal and Ledger – Trial Balance –Final Accounts – Trading account –Profit and Loss account and Balance sheet –Simple problems. **UNIT-VI** **FUNDAMENTAL CONCEPTS OF CAPITAL BUDGETING AND WORKING CAPITAL:** Meaning –Process and Methods (Payback period, NPV, ARR and IRR simple problems) – Working Capital: Operating cycle, factors and sources.
Textbooks and References	**TEXTBOOKS:** 1. Varshney&Maheswari: Managerial Economics, S. Chand Publishers 2. Business Organizations: C.B.Gupta , S.Chand Publishers 3. Managerial Economics and Financial Accounting: A.R.Arya Sri, Tata McGraw Hills publishers. **REFERENCE BOOKS:** 1. Economic Analysis: S.Sankaran, Margham Publications. 2. S.N.Maheswari& S.K. Maheswari, Financial Accounting, Vikas Publishers. 3. S. A. Siddiqui& A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.

17CE4103 – CONCRETE TECHNOLOGY

Course Category	Professional Core	**Credits:**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	2 - 2 - 0
Prerequisite	Building materials	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the properties of ingredients of concrete. 2. To interrelate the properties of conventional concreting materials. 3. To study the behaviour of concrete at its fresh and hardened state. 4. To study about the concrete design mix. 5. To study the short term and long term effects of concrete. 6. To understand the types of special concrete and their use.	
Course Outcomes	CO1	Identify different ingredients and additives used in concrete.
	CO2	Determine the properties of aggregates used in concrete.
	CO3	Identify the properties of concrete in the fresh state and the effects of minerals and chemical admixtures in concrete.
	CO4	Perform destructive and non-destructive tests on concrete.
	CO5	Understand the durability requirements of concrete.
	CO6	Design the concrete mix using various codes and special concretes for their specific applications.
Course Content	**UNIT– I** **PORTLAND CEMENT :** Composition – Physical properties – Rapid Hardening Portland cement – Portland Blast Furnace Cement – Low heat Portland Cement – Sulphate resisting Portland cement – White Portland Cement – Coloured Portland Cement – High Alumina Cement – Super Sulphate Cement – Masonry Cement – Expansive Cements – Oil Well Cements. **ADDITIVES:** Classifications – Accelerators – Retarders – Plasticizers – Super Plasticizers – Water Proofers – Pigments – Air entraining agents – Pozzolans.	

UNIT – II

CONCRETE AGGREGATES : Classifications – Heavy aggregates – Normal weight aggregates – Strength and other mechanical properties – Moisture content and its effects – Deleterious substances – Alkali-Aggregate reaction – Thermal properties – Grading curves and Grading requirements – Gap-graded aggregate – Maximum aggregate size – Use of 'Plums' – Handling of aggregates.

UNIT – III

FRESH CONCRETE: Workability – Factors affecting workability – Measurements of workability – Comparison of tests – Effect of time and temperature – Segregation – Bleeding – Mixing of concrete – Concrete mixers – Vibration of concrete – Types of vibrators – Ready mixed concrete – Pumped concrete –Pre-packed concrete and vacuum processed concrete.

CURING OF CONCRETE: Methods of curing – Maturity – Influence of temperature – Steam curing at atmospheric pressure – High pressure steam curing.

UNIT – IV

HARDENED CONCRETE: Water/Cement ratio – Abram's law – Gel space ratio – Effective water in mix – Nature of strength of concrete – Strength in tension and compression – Griffith's hypothesis – Factors affecting strength – Relation between compression and tensile strength – Testing of Hardened concrete – Compression tests – Tension tests – Flexure tests – Splitting tests – Nondestructive testing methods.

UNIT – V

ELASTICITY, SHRINKAGE AND CREEP: Modulus of elasticity – Factors affecting modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Mechanism of shrinkage – Factors affecting shrinkage – Drying shrinkage – Plastic shrinkage – Carbonation shrinkage – Autogenous shrinkage – Moisture movement – Creep of concrete – Factors influencing creep – Relation between creep and time – Nature of creep – Effect of creep.

DURABILITY: Permeability – Chemical attack of Concrete – Efflorescence – Air entrained concrete – Measurements – Effects – Thermal properties – Resistance of concrete to fire.

UNIT – VI

CONCRETE MIX DESIGN AND QUALITY CONTROL: Basic consideration – Factors in the choice of properties – Method of calculation by absolute volume method.

	Simple example of mix design – Design of high strength mixes – ACI & IS methods of mix design. **SPECIAL CONCRETE:** Light weight concrete – Lightweight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fiber reinforced concrete – Different types of fibers – Factors affecting properties of F.R.C – Applications of polymer concrete – Types of polymer concrete – Properties of polymer concrete – Applications – Self compacting concrete.
Textbooks and References	**TEXTBOOKS:** 1. Concrete Technology by M.S. Shetty. 2. Properties of Concrete by A.M. Neville. 3. Concrete Practice by R.H. Elvery. **REFERENCE BOOKS:** 1. Concrete Technology & Practice by W.H.Taylor. 2. Concrete Manual by U.S. Bureau of Reclamation. 3. Concrete Technology by P.H. Mehta.

17CE41E1 - PRESTRESSED CONCRETE STRUCTURES

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	RCC Structural Design-I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the basic concepts and analysis of prestressed concrete structures. 2. To perform the design of prestressed concrete structures. 3. To understand the design of pre-tensioned members. 4. To understand the concept and analyse post-tensioned members. 5. To understand and analyse the composite prestressed concrete members. 6. To understand the concept of design of pre stressed concrete slabs.	
Course Outcomes	CO1	Calculate the resultant stresses in rectangular prestressed concrete.
	CO2	Analyse the losses and design the prestressed concrete sections.
	CO3	Design Pre-tensioned members.
	CO4	Analyse and design partially post-tensioned members.
	CO5	Analyse and design composite prestressed concrete members.
	CO6	Design prestressed concrete slabs.
Course Content	**UNIT – I** **INTRODUCTION:** Basic concepts of prestressing –Historical development –Advantages of prestressed concrete –High strength concrete –High tensile steel. **PRESTRESSING SYSTEM:** Introduction –Tensioning devices –Pretensioning and post tensioning systems –Thermo-electric and chemical prestressing. **ANALYSIS OF PRESTRESSED CONCRETE SECTIONS:** Basic assumptions – analysis of prestress –Resultant stress at a section –Pressure line –Concept of load balancing –Stress in tendons and cracking moment. **UNIT – II**	

	LOSSES OF PRESTRESS: Nature of losses of prestress – Loss due to elastic deformation of concrete – Shrinkage of concrete – Creep of concrete – Relaxation of stress in steel – Friction and anchorage slip – Total losses allowed for design. **DESIGN OF PRESTRESSED CONCRETE SECTIONS:** Design of sections for Flexure – Axial tension – Compression bending and for shear – Design of members for bond and the sections for bearing. **UNIT – III** **DESIGN OF PRE- TENSIONED MEMBERS:** Dimensioning of flexural members – Estimation of self-weight of beams –Ultimate flexure strength –Ultimate shear strength – Limit state of design. **UNIT – IV** **DESIGN POST-TENSIONED MEMBERS:** Ultimate moment and shear –Cross sectional dimensions –Moment and shear forces – Minimum section modules – permissible tendon zone – Deflection and serviceability – Design of partially prestressed members. **UNIT – V** **COMPOSITE CONSTRUCTION OF PRESTRESSED AND IN SITU CONCRETE:** Composite structural members –Types of composite construction –Analysis of stress – differential shrinkage –Deflection of composite members –Flexural strength of composite sections and design of composite sections. **UNIT – VI** **PRESTRESSED CONCRETE SLABS**: Types of prestressed concrete floor slabs – Design of prestressed concrete one way slabs –Two way slabs & simple flat slabs.
Textbooks & References	**TEXTBOOKS:** 1. Prestressed concrete by N.Krishna Raju. 2. Prestressed concrete structures by P. Dayaratham. 3. Prestressed concrete by S. Ramamrutham. **REFERENCE BOOKS:** 1. Fundamentals of Prestressed Concrete by N.C.Sinha and S.K.Roy. 2. Modern Prestressed Concrete by James R.Libby. 3. Design of Prestressed Concrete Structures by T.Y. Lin & N.H. Burns.

17CE41E2 – BRIDGE ENGINEERING

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Structural Analysis – II RCC Structural Design – I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To study about various categories of IRC loadings. 2. To illustrate railway bridge rules for detailed calculation of loadings. 3. To design the basic components of bridge structures like bridge deck slabs and box culvert. 4. To design plate girder bridges and composite bridges 5. To design piers and abutments. 6. To study various types of bridge bearings, joints.	
Course Outcomes	CO1	Understand the concept of bridge construction as per IRC Standards.
	CO2	Design box culvert and deck slab.
	CO3	Design Reinforced Cement Concrete T- beam bridge using Pigeaud's method.
	CO4	Design plate girder bridges and composite bridges.
	CO5	Design Pier and abutments.
	CO6	Understand the types and importance of bridge bearings.
Course Content	**UNIT - I** **INTRODUCTION:** General – Classification of bridges – Importance of site investigation in Bridge design – Site selection – Economical span – Location of piers and abutments – Subsoil exploration – Scour depth – Traffic projection – Choice of bridge type. **IRC STANDARDS:** Highway Bridge loading standards–Impact factor–Railway Bridge loading standards (B.G. ML Bridge) various loads in bridges. **UNIT – II** **BOX CULVERT:** General aspects – Design loads, Design of Box culvert subjected to RC class AA tracked vehicle only.	

DECK SLAB BRIDGE: Introduction – Effective width method analysis– Design of deck Slab Bridge (Simply supported) subjected to class AA Tracked Vehicle only.

UNIT - III

BEAM & SLAB BRIDGE (T-BEAM BRIDGE): General features – Design of interior panel of slab – Pigeaud's method – Design of a T-beam bridge subjected to class AA tracked vehicle only.

UNIT - IV

PLATE GIRDER BRIDGE: Introduction – elements of a plate girder and their design. Design of a Deck type welded plate girder – Bridge of single line B.G.

COMPOSITE BRIDGES: Introduction – Advantages – Design of Composite Bridges consisting of RCC slabs over steel girders including shear connectors

UNIT - V

PIERS & ABUTMENTS: General features – Bed Block – Materials for Piers & Abutments–Types of piers – Forces acting on piers – Stability analysis of piers – General features of Abutments – Forces acting on abutments – Stability analysis of abutments – Types of wing walls – Approaches – Types of Bridge foundations (excluding Design).

UNIT - VI

BRIDGE BEARINGS: General features – Types of Bearings – Design principles of steel Rocker & Roller Bearings – Design of a steel Rocker Bearing – Design of Elastomeric pad bearing – Joints – Expansion joints.

Textbooks and References	**TEXTBOOKS:** 1. Bridge Engineering by Ponnu Swamy, TATA Mcgraw Hill Company, New Delhi. 2. Design of Bridges by N.Krishna Raju, Oxford & IBH, Publishing Company Pvt.ltd. Delhi. 3. Bridge superstructure by N.Raja gopalan, Narosa Publishing House, New Delhi 2006. **REFERENCE BOOKS:** 1. Design of Bridges Structure by D.J.Victor. 2. Design of Steel structures by Ramachandra. 3. Design of R.C.C. structures B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain. 4. Relevant – IRC & Railway bridge Codes.

17CE41E3 – PAVEMENT CONSTRUCTION AND MANAGEMENT

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Transportation Engineering - I	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To explain construction of different types of flexible pavements. 2. To discuss bituminous and cement concrete pavements. 3. To explain concepts of soil stabilization pavement layer. 4. To discuss soil-cement stabilization and also soil-bitumen stabilization. 5. To differentiate maintenance works for different types of pavements. 6. To explain strengthening of existing pavements.	
Course Outcomes	CO1	Understand the construction procedure of embankment, gravel road and WBM road.
	CO2	Able to explain the construction procedure of bituminous and cement concrete pavements.
	CO3	Understand different methods of soil stabilization.
	CO4	Acquire knowledge about stabilization of soil with cement and also bitumen.
	CO5	Understand the need and methods of maintenance of different types of pavements.
	CO6	Understand methods of evaluation of different types of existing pavements and also different techniques to strengthen them.
Course Content	**UNIT – I** **FLEXIBLE PAVEMENT CONSTRUCTION:** typical components of highway on embankments and in cutting, steps for construction of new highway on embankments and in cutting, functions and design elements of embankment – construction of subgrade – materials, construction method and quality control check. Method of compaction of soil and equipment - construction of embankment – construction of gravel road and WBM road. **UNIT – II** **CONSTRUCTION OF BITUMINOUS AND CEMENT CONCRETE PAVEMENTS:** Construction of bituminous roads – Interface treatments, Bitumen surface dressing and penetration macadam – Built up spray grout – Premix methods construction of cement concrete pavements – Construction of joints in cement concrete pavements – Types of joints, arrangement of joints, joint filler and scalar.	

UNIT – III

SOIL STABILIZED PAVEMENT LAYERS: Objectives, application of soil stabilization techniques, mechanics of stabilization and investigations for soil stabilized roads and soil stabilization methods. Mechanical soil stabilization properties of soil – Aggregate mixtures –Factors affecting mechanical stabilization – Minimum design in mechanical stabilization, construction procedure – Stabilization using soft aggregates – Mehras's method of stabilization.

UNIT – IV

SOIL CEMENT STABILIZATION: Principle and applications – Factors influencing properties of soil – Cement – construction precedence of soil – Cement base course – application soil-cement and cement treated soils, factors affecting properties of soil-lime mix-soil-lime stabilization- principles and applications – Factors affecting properties of soil-lime construction procedure of soil-lime sub base course, stabilization of soil using Bituminous materials – principles and application – factors affecting properties of soil-bitumen mix – construction of Bituminous stabilized layer. Stabilization of black cotton soil and desert sand.

UNIT – V

HIGHWAY MAINTENANCE: Need – Causes of pavement failures – Classification of maintenance works maintenance management system – Failures in flexible pavements – Failures in sub grade – Failures in sub base or base course – Typical flexible pavement failures – Failures in cement concrete pavement – Typical rigid pavement failures – Different types of maintenance for Bituminous surfaces – Special repairs in flexible pavements – Waves and corrugations – Skidding of pavement surfaces – Maintenance of cement concrete pavements.

UNIT – VI

PAVEMENT EVALUATION: Structural evaluation of pavements – need and application of structural evaluation studies- different methods- factors affecting pavement deflection, general principle deflection approach, principle of structural evaluation of flexible pavements - Evaluation of pavement surface condition – Strengthening of existing pavements -objectives – Flexible overlay over flexible pavement by conventional design method – Overlay design by Benkelman beam deflection studies- rigid overlay over rigid pavement – Flexible overlay over rigid pavement.

Textbooks and References	**TEXTBOOKS:** 1. Highway Engineering – S.K. Khanna & C.E.G. Justo. 2. Transportation Engineering Vol I Venkataramaiah C. 3. Analysis of pavements – Animesh Das. **REFERENCE BOOKS:** 1. Transportation Engineering, Vol I and VolI byVazirani and Chandola. 2. A course in Highway Engineering by S.P. Bindra. 3. Pavement engineering principles and practice Rajib B.Mallik and Tahar E korchi.

17CE41E4 – GROUND IMPROVEMENT TECHNIQUES

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Foundation Engineering and Water Resources Engineering.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To explain the emerging trends in ground improvement and to demonstrate the various methods of compaction by mechanical stabilization. 2. To analyse the various methods of dewatering. 3. To understand the ground modification by admixtures. 4. To study the various methods of grouting under difficult conditions. 5. To explain the various methods of grouting techniques. 6. To study the various case studies of ground improvement projects.	
Course Outcomes	CO1	Apply in-situ densification methods for soils.
	CO2	Understand dewatering methods.
	CO3	Demonstrate the ground modification by admixtures.
	CO4	Demonstrate the grouting techniques under different conditions.
	CO5	Analyse in situ soil treatment methods.
	CO6	Evaluate case studies of ground improvement projects.
Course Content	**UNIT – I** **INTRODUCTION:** Need for Ground Improvement – Different types of problematic soils – Emerging trends in ground Improvement. **MECHANICAL STABILIZATION:** Shallow and deep compaction requirements – Principles and methods of soil compaction – Shallow compaction and methods. Properties of compacted soil and compaction control – Deep compaction and Vibratory methods Dynamic compaction.	

	UNIT – II **HYDRAULIC MODIFICATION:** Ground Improvement by drainage – Dewatering methods – Design of dewatering systems – Preloading – Vertical drains – vacuum consolidation – Electro-kinetic dewatering – design and construction methods. **UNIT – III** **MODIFICATION BY ADMIXTURES:** Cement stabilization and cement columns – Lime stabilization and lime columns – Stabilization using bitumen and emulsions – Stabilization using industrial wastes Construction techniques and applications. **UNIT – IV** **GROUTING:** Permeation grouting – Compaction grouting – Jet grouting – Different varieties of grout materials – Grouting under difficult conditions. **UNIT – V** **IN SITU SOIL TREATMENT METHODS:** Soil nailing – Rock anchoring – Micro-piles – Design methods – Construction techniques. **UNIT – VI** **CASE STUDIES:** Case studies of ground improvement projects.
Textbooks and References	**TEXTBOOKS:** 1. Manfired R. Hausmann, Engineering Principles of Ground Modification, McGraw-Hill Pub, Co.1990. 2. M C. R. Davies, F.Schlosser Ground improvement geosystems. 3. Koerner, R. M. Designing with geosynthetics, Prentice Hall Inc. 1998. **REFERENCE BOOKS:** 1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA. 2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons, New York, USA. 3. Robert M. Koerner, Designing with Geosynethetics, Prentice Hall Jercy, USA.

17CE41E5 – SOLID WASTE MANAGEMENT

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the need of solid waste management. 2. To understand the characteristics of municipal solid waste from different sources. 3. To understand the on land processing and storage mainly from commercial sources. 4. To understand the collection, transport techniques of solid waste from different sources. 5. To analyse the segregation of different materials in solid waste such as reusable, recyclable and disposable. 6. To study about the characteristics, treatment methods and disposable options for hazardous wastes.	
Course Outcomes	CO1	Know the impacts of solid waste generation.
	CO2	Learn about different sources of solid waste.
	CO3	Learn how to store, collect and transfer the solid waste from generation place to disposal site.
	CO4	Learn the processing and product recovery from solid waste.
	CO5	Learn study various disposal techniques and management options for solid waste.
	CO6	Study about special wastes and to learn how to deal with them.
Course Content	**UNIT – I** **INTRODUCTION:** Goals and objectives of solid waste management – Impacts of solid waste generation in a technological society – Principle of solid waste management – Social and economic aspects – Public awareness – Quantities of solid wastes – Challenges and opportunities – Data on Indian city wastes.	

UNIT –II

SOURCES AND TYPES OF MUNICIPAL SOLID WASTES: Sources and types of solid wastes – Factors affecting generation of solid wastes – Characteristics – Methods of sampling and characterization – Effects of improper disposal of solid wastes – Public health effects.

UNIT – III

ONSITE HANDLING – STORAGE AND PROCESSING: Onsite handling – Methods used at residential and commercial sources –Onsite storage dust bins – Community containers container locations onsite processing methods –Public health & economic aspects of storage.

COLLECTION AND TRANSFER: Methods of Collection – Types of vehicles – Manpower requirement – Collection routes –Transfer stations – Selection of location –Operation & maintenance –Options under Indian conditions.

UNIT – IV

PROCESSING TECHNIQUES AND EQUIPMENT: Purpose of processing paling shredding and incineration and types of incinerators.

RECOVERY OF PRODUCTS AND ENERGY: Material processing and recovery systems –Recovery of chemical conversion products –Recovery of biological conversion products recovery of energy from conversion products.

UNIT – V

DISPOSAL OF SOLID WASTES: Sanitary landfills – General considerations –Site selection – Operational management systems in land fill – Gas and leachate control – construction –Ocean disposal of solid wastes – Application of GIS in Land Fill.

UNIT – VI

HAZARDOUS WASTES: Special wastes - Hazardous wastes –Hospital wastes – Sewage sludges –Industrial solid wastes –Methods of disposal.

Textbooks and References	**TEXTBOOKS:** 1. Industrial Solid Waste Management & Land Filling Practice by Datta.M Parida B S Guha B.K.and Sreekrishna. T. R. 2. Solid Waste Management in developing by Bhide, A.D. and Sundaresam B.B. 3. George Tchobanoglouset.al.,Integrated Solid Waste Management, McGraw-Hill Publishers, 1993. 4. B.Bilitewski,G.HardHe, K.Marek, A.Weissbach and H.Boeddicker, Waste Management, Springer,1994. **REFERENCE BOOKS:** 1. Liquid waste of Industry by New Merow. 2. Water and Waste Water Technology by Mark J. Hammer and Mark J. Hammer (Jr.). 3. Waste Water Treatment & Use in Agriculture by Pescond.M,B.R.E.Landreth and P.A.Rebers.

17CE41P1 -CONCRETE TECHNOLOGY LABORATORY

Course Category	Professional Core	**Credits**	2
Course Type	Laboratory	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	Concrete Technology, Building Technology	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To know the concept and procedure of different types of tests conducted on cement, aggregate and finished concrete. 2. To understand the procedure of designing the concrete mix of given specification of its ingredients along with appropriate water cement ratio and admixtures.	
Course Outcomes	CO1	Evaluate the physical properties of cement.
	CO2	Determine the physical properties of aggregates.
	CO3	Evaluate the fresh and hardened properties of concrete.
	CO4	Assess the physical and mechanical properties of bricks.
Course Content	**LIST OF EXPERIMENTS** **CEMENT** 1. Fineness by dry sieving 2. Normal consistency, initial & final setting times 3. Specific gravity 4. Compressive Strength **AGGREGATES** 5. Specific gravity and water absorption of coarse and fine aggregates 6. Sieve analysis of coarse and fine aggregates 7. Bulking of sand by volume method 8. Bulking of sand by weight method 9. Bulk density **CONCRETE** 10. Workability of fresh concrete by slump test 11. Workability of fresh concrete by compaction factor test 12. Workability of fresh concrete by Vee-Bee test 13. Workability of fresh mortar by flow table test 14. Compressive strength **BRICKS** 15. Compressive strength 16. Water absorption 17. Efflorescence	

17CE41P2 – COMPUTER AIDED ANALYSIS AND DESIGN LABORATORY

Course Category	Professional Core	**Credits**	2
Course Type	Laboratory	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	Structural Analysis, RCCSD and Building Planning and Drawing	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objective	To know the concepts and procedure to create civil engineering drawings using available drafting and graphic techniques	
Course Outcomes	CO1	Know how to apply Engineering drawing using computers.
	CO2	Understand about the scope of AUTOCAD software.
	CO3	Use STAAD Pro for analysis of simple beam and truss problem.
	CO4	Use STRAP for analysis of a pin jointed frame, multi storeyed and multi bay portal frame.
	CO5	Execute solution of system of linear simultaneous equations of large system.
Course Content	**LIST OF EXPERIMENTS** 1. Elementary Graphics in civil engineering. 2. Elements of Auto CAD and its applications in civil engineering. 3. Solution of beam problem by STAAD Pro. 4. Solution of truss problem by STAAD Pro. 5. Analysis of simple Pin jointed frame using STRAP. 6. Analysis of multi storeyed, multi bay portal frame by STRAP. 7. Solution of system of linear simultaneous equations of large system.	

N.B.K.R. INSTITUTE OF SCIENCE &TECHNOLOGY :: VIDYANAGAR

(AUTONOMOUS)

CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EVALUATION

(With effect from the batch admitted in the academic year 2017-2018)

IV YEAR OF FOUR YEAR B.TECH. DEGREE COURSE – II SEMESTER

S.NO.	Course Code	Course Title	Contact Hours/ Week			Credits	Evaluation									
							Sessional Test-I			Sessional Test-II			Total Sessional Marks (Max. 40)	Semester End Examination		Max. Total Marks
		THEORY	L	T	P		Test-I (2 hrs.)	Assignment-I	Max. Marks	Test-II (2 hrs.)	Assignment-II	Max Marks		Duration In Hours	Max. Marks	
1	17CE42EX	Core Elective-IV	3	0	0	3	34	6	40	34	6	40	0.8(Better of two sessional tests) + 0.2(Other)	3	60	100
2	17XX42OX	Open Elective-II	3	0	0	3	34	6	40	34	6	40		3	60	100
3	17CE42MO	MOOCS	0	0	0	3	34	6	40	34	6	40		3	60	100
4	17CE42IS	Internship	0	0	0	2	-	-	-	-		-	Day-to-day Evaluation and a test (100 Marks)	-	-	100
		PROJECT														
1	17CE42PR	Project Work	0	0	3	11	-	-	-	-	-	-	Continuous assessment and seminar (80 marks)	-	120	200
		TOTAL				**22**										

**Common to ALL

Core Elective-IV:

17CE42E1:	Repair and Rehabilitation of Structures
17CE42E2:	CAAD in Civil Engineering
17CE42E3:	Structural Health Monitoring
17CE42E4:	Geo Synthetics and Reinforced Soil Structures
17CE42E5:	Environmental Impact and Project Management

17CE42E1 – REPAIR AND REHABILITATION OF STRUCTURES

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Concrete Technology	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the concept of repair and rehabilitation. 2. Gain-in knowledge of durability of concrete. 3. Gain-in knowledge of special concretes. 4. To access the deterioration of concrete structures. 5. To understand different techniques of repair and rehabilitation. 6. To understand the concept of retrofitting of structures.	
Course Outcomes	CO1	Understand the repair and rehabilitation of structures.
	CO2	Understand the durability aspects of concrete.
	CO3	Know the types of special concretes.
	CO4	Evaluate the causes of deterioration and assessment of distressed structures.
	CO5	Gain the knowledge of repairing of structures and demolition procedures.
	CO6	Gain knowledge of corrosion of embedded steel in concrete.
Course Content	**UNIT I** **MAINTENANCE AND REPAIR STRATEGIES:** Maintenance – Repair and rehabilitation – Facets of maintenance – Importance of maintenance – Various aspects of inspection – Assessment procedure for evaluating a damaged structure – Causes of deterioration. **UNIT II** **STRENGTH AND DURABILITY OF CONCRETE:** Quality assurance for concrete – Strength – Durability and thermal properties of concrete – Cracks – Different types – Causes – Effects due to climate – Temperature – Sustained elevated temperature – Corrosion – Effects of cover thickness. **UNIT III** **SPECIAL CONCRETES:** Polymer concrete – Sulphur infiltrated concrete – Fibre reinforced concrete – High strength concrete – High performance concrete – Vacuum	

	concrete – Self-compacting concrete – Geopolymer concrete – Reactive powder concrete – Concrete made with industrial wastes. **UNIT IV** **TECHNIQUES FOR REPAIR AND PROTECTION METHODS**: Non-Destructive Testing Techniques – Epoxy Injection – Shoring – Underpinning – Corrosion Protection Techniques – Corrosion Inhibitors – Corrosion Resistant Steels – Coatings to Reinforcement – Cathodic Protection. **UNIT V** **REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES**: Strengthening of Structural Elements – Repair of structures distressed due to corrosion – fire – Leakage and earthquake – Demolition techniques – Engineered demolition methods – Case studies. **UNIT VI** **CORROSION OF EMBEDDED STEEL IN CONCRETE:** Corrosion of embedded steel in concrete – Mechanism – Stages of corrosion damage – Repair of various corrosion damaged of structural elements (slab, beam and columns). **JACKETING:** Jacketing – Column jacketing – Beam jacketing – Beam Column joint jacketing – Reinforced concrete jackets – Steel jacketing – FRP jacketing. **STRENGTHENING**: Strengthening of beam: Shear strengthening and Flexural strengthening.
Textbooks and References	**TEXTBOOKS:** 1. Denison Campbell, Allen And Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific And Technical UK, 1991. 2. Allen R.T. & Edwards S.C, Repair Of Concrete Structures, Blakie And Sons, UK, 1987. 3. Gambhir.M.L "Concrete Technology", McGraw Hill, 2013. **REFERENCES:** 1. Dov Kominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001. 2. Ravi shankar.K and Krishna moorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004. 3. CPWD and Indian Buildings Congress, Hand Book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

17CE42E2 – CAAD IN CIVIL ENGINEERING

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Computer Aided Engineering and Drawing	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand the concept of computer aided design in civil engineering. 2. To draw 1-D, 2-D and 3-D drawings using C-Graphics. 3. To apply the principles of computer graphics for drawing a line, circle and ellipse. 4. To prepare excel sheets for matrix multiplication. 5. To prepare excel sheet for step by step analysis of beams using stiffness method. 6. To understand the concept of data base management.	
Course Outcomes	CO1	Understand importance of CAD.
	CO2	Draw line, circle and ellipse using C- Graphics.
	CO3	Draw 2-D and 3-D Drawings using C-Graphics.
	CO4	Prepare the Excel sheet for stiffness method.
	CO5	Analyse beams using Excel sheets.
	CO6	Prepare database management.
Course Content	**UNIT-I** **INTRODUCTION TO COMPUTER AIDED DESIGN**: Reasons for implementing CAD – Design process – Applications of computers to design – Benefits of computer Aided design. **UNIT-II** **PRINCIPLES OF COMPUTER GRAPHICS**: Introduction – Graphic primitives – point plotting –Drawing of lines – Bresenham's Algorithm – C programme to draw a line – Circle – Ellipse using Breasenham's algorithm.	

	UNIT-III **TRANSFORMATION IN GRAPHICS:** Coordinate system used line graphics & windowing –View port – 2-D transformations – Clipping – 3-D transformation – C-Graphics. **UNIT-IV** **STIFFNESS METHOD**: Microsoft excel procedure for stiffness method of analysis step by step procedure using excel – examples using excel. **UNIT-V** **ANALYSIS OF BEAMS USING STIFFNESS METHOD**: Long hand solution of single span beams –Continuous beams solution of single span beams –Continuous beams using excel. **UNIT-VI** **DATABASE:** Introduction – Concept of a database – Objectives of databases – Design of data base – Design consideration of data base.
Textbooks and References	**TEXTBOOKS:** 1. Introduction to C^{++} Programming and Graphics by Pozrikidis, C, Springer 2. Graphics under C by Yashavant, P. Kanetkar. 3. An Introduction to the C Programming Language and Software Design by Tim Bailey. **REFERENCES:** 1. Computer Graphics C version by Donald Hearn. 2. Data analysis and business modeling using Microsoft excel by Manohar hansa Lysander. 3. Microsoft Excel Data Analysis by Etheridge D.

17CE42E3 – STRUCTURAL HEALTH MONITERING

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To understand basic concepts of structural health monitoring in civil engineering. 2. To interpret structural heath failure in bridge structure. 3. To overview the Non Destructive Test techniques for detecting the defects in concrete structures. 4. To understand the concept of condition survey. 5. Gain-in knowledge in quality control of concrete structures. 6. Gain-in knowledge of Rehabilitation of concrete structures.	
Course Outcomes	CO1	Understand basic concepts of structural health monitoring and analyse between system of a man and a structure with structural health monitoring.
	CO2	List out structural failures in bridge structure.
	CO3	Overview the non-destructive test techniques and methods for concrete structures.
	CO4	Perform condition survey for evaluation of concrete structures.
	CO5	Evaluate the non-destructive test techniques of concrete structures and case studies.
	CO6	Develop sustainable maintenance and rehabilitation of concrete structures.
Course Content	**UNIT-I** **INTRODUCTION TO STRUCTURAL HEALTH MONITORING (SHM):**Definition & motivation for SHM – SHM – A way for smart materials and structures – SHM and Biomimetic – Analog between the nervous system of a man and a structure with SHM – SHM as a part of system management – Passive and Active SHM – NDE – SHM and NDECS – Basic components of SHM – Materials for sensor design. **UNIT-II** **APPLICATION OF SHM IN CIVIL ENGINEERING:** Introduction to capacitive methods – Capacitive probe for cover concrete – SHM of a bridge – Applications for external post tensioned cables – Monitoring historical buildings.	

	UNIT-III **NON DESTRUCTIVE TESTING OF CONCRETE STRUCTURES:** Introduction to NDT – Situations and contexts – where NDT is needed – Classification of NDT procedures –Visual Inspection – Half-Cell electrical potential methods – Schmidt Rebound Hammer Test – Resistivity measurement –Electromagnetic methods – Radiographic Testing – ultrasonic testing – Infrared thermography – Ground penetrating radar – Radio isotope gauges – Other methods. **UNIT-IV** **CONDITION SURVEY & NDE OF CONCRETE STRUCTURE:** Definition – Objective of condition survey – Stages of condition survey (Preliminary – Planning – Inspection and Testing stages) – Possible defects in concrete structures. **UNIT-V** **QUALITY CONTROL OF CONCRETE STRUCTURES**: Definition and need – Quality control applications in concrete structures – NDT as an option for Non-Destructive Evaluation (NDE) of Concrete structures – Case studies of a few NDT procedures on concrete structures. **UNIT-VI** **REHABILITATION AND RETROFITTING OF CONCRETE STRUCTURE:** Repair rehabilitation & retrofitting of structures –Damage assessment of concrete structures – Materials and methods for repairs and rehabilitation – Modeling of repaired composite structure –Structural analysis and design – Importance of re-analysis –Execution of rehabilitation strategy – Case studies.
Textbooks and References	**TEXTBOOKS:** 1. Smart Materials and Structures, Gandhi and Thompson. 2. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang. 3. Ravi shankar.K and Krishna moorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004. **REFERENCES:** 1. Shetty M.S., "Concrete Technology – Theory and Practice", S.Chand and Company, 2008. 2. Dov Kominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001. 3. CPWD and Indian Buildings Congress, Hand Book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

17CE42E4 – GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Soil Mechanics, Foundation Engineering & RCC Structural Design-II	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To explain the various types of geosynthetics and their manufacturing methods and to demonstrate the various testing methods for geosynthetics. 2. To understand design and construction methods of different types of reinforced soil retaining walls. 3. To analyse slope stability of reinforced soil slopes using different methods. 4. To understand the applications of geosynthetics in foundations and selection of geotextiles based on flow characters of soils and geotextiles. 5. To study the use of geosynthetics in the construction of pavements. 6. To study the use of geosynthetics in the construction of landfills.	
Course Outcomes	CO1	Demonstrate types of geosynthetics and various testing methods.
	CO2	Perform the design of reinforced soil retaining wall.
	CO3	Analyse the slope stability of reinforced soil slopes using different methods.
	CO4	Analyse drainage and filter applications of geosynthetics.
	CO5	Demonstrate the use of geosynthetics in the construction of pavements.
	CO6	Identify the geosynthetics in the construction of landfills.
Course Content	**UNIT – I** **INTRODUCTION:** Historical background of reinforced soil – Principles of reinforced soil through Mohr circle analysis – Types of geosynthetics like geotextiles, geogrids, geonets, geocells, geo-composites and their manufacturing methods. **TESTING METHODS FOR GEOSYNTHETICS:** Techniques for testing of different index properties – strength properties – Apparent Opening Size – In-plane and cross-plane permeability tests – Assessment of construction induced damage and extrapolation of long term strength properties from short term tests.	

UNIT – II

REINFORCED SOIL RETAINING WALLS: Different types of walls like wrap-around walls – Full-height panel walls and discrete-facing panel walls – Modular block walls – Design methods as per BS-8006 and FHWA methods – Construction methods for reinforced soil retaining walls.

UNIT – III

REINFORCED SOIL SLOPES: Basal reinforcement for construction on soft clay soils – Construction of steep slopes with reinforcement layers on competent soils – Different slope stability analysis methods like planar wedge method – Bi-linear wedge method and circular slip methods – Erosion control on slopes using geosynthetics.

UNIT – IV

APPLICATIONS IN FOUNDATIONS: Binquet and Lee's approach for analysis of foundations with reinforcement layers.

DRAINAGE AND FILTRATION APPLICATIONS OF GEOSYNTHETICS: Different filtration requirements – Filtration in different types of soils and criteria for selection of geotextiles – Estimation of flow of water in retaining walls – Pavements and selection of geosynthetics.

UNIT – V

PAVEMENT APPLICATION: Geosynthetics for separation and reinforcement in flexible pavements – Design by Giroud-Noiray approach – Reflection cracking and control using geosynthetics – Use of geosynthetics for construction of heavy container yards and railway lines.

UNIT – VI

CONSTRUCTION OF LANDFILLS USING GEOSYNTHETICS: Different components of modern landfills – Collection techniques for leachate – Application of different geosynthetics like geonets – Geotextiles for drainage in landfills – Use of geomembranes and Geosynthetics Clay Liner (GCL) as barriers.

Textbooks and References	**TEXTBOOKS:** 1. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004. 2. Soil Mechanics and Foundation Engineering by K.R.Arora. 3. Geotechnical Engineering by C. Venkatramaiah. **REFERENCES:** 1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999. 2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.

17CE42E5 – ENVIRONMENTAL IMPACT AND PROJECT MANAGEMENT

Course Category	Core Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Environmental Studies	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To carry out scoping and screening of developmental projects for environmental and social assessments 2. To explain different methodologies for environmental impact prediction and assessment 3. To explain impact of development activities and land use. 4. To plan Environmental impact assessments and environmental management plans 5. To evaluate environmental impact assessment reports 6. To know the problems related to environment because of industries.	
Course Outcomes	CO1	Carry out scoping and screening of developmental projects for environmental and social assessments.
	CO2	Explain different methodologies for environmental impact prediction and assessment.
	CO3	Explain impact of development activities and land use.
	CO4	Plan Environmental impact assessments and environmental management plans.
	CO5	Evaluate environmental impact assessment reports.
	CO6	Know the problems related to environment due to industries.
Course Content	**UNIT – I** **INTRODUCTION TO EIA:** Environmental ethics – Need of EIA for Engineering projects – Classification of environmental parameters – Purposes of EIA – Goals of EIA – Environmental indices and indicators. **UNIT – II** **EIA METHODOLOGIES:** Introduction – Criteria for the selection of EIA methodology – Categorization of methodologies – Matrix methods – Network	

	method – Environmental Media quality index method – Cost / benefit analysis. **UNIT – III** **IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE:** Introduction and methodology for the assessment of soil and ground water – delineation of study area – identification of activities – Procurement of relevant soil quality – Impact prediction – Assessment of impacts. **UNIT – IV** **METHODOLOGY FOR THE ASSESMENT OF IMPACTS OF SOME ATTRIBUTES:** Surface water – Air and biological environment – Methodology and generalized approach for the assessment of impact of development activities on vegetation and wildlife – Environmental impact of deforestation and incorporation of mitigation measures. **UNIT – V** **EIA DOCUMENTATION AND PROCESSES:** Preliminary Stages of EIA (Project screening, Scoping, Consideration of alternatives, Establishing the environmental base line, Impact identification) – Impact Prediction–Impact on Decisions – Public participation – Requisites for a good EIS – Review of EIA report. **UNIT – VI** **CASE STUDIES:** Environmental impact of large scale water resources projects – environmental impact of thermal and nuclear power plants and on oil refineries.
Textbooks and References	**TEXTBOOKS:** 1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996. 2. Shukla, S.K. And Srivastava, P.R., "Concepts In Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992. **REFERENCES:** 1. John G. Rau and David C Hooten "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990. 2. "Environmental **A**ssessment Source Book", Vol. I, II & III. The World Bank, Washington, D.C., 1991. 3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II". Blackwell Science, 1999.

N.B.K.R INSTITUTE OF SCIENCE &TECHNOLOGY: VIDYANAGAR

(Autonomous)

Department of Civil Engineering

(With effect from the batch admitted in the academic year 2017-2018)

List of Open electives for 2017-18 admitted batch to be offered by CED:

S.No	Course Code	Course Name
1	17CE4XO1	Air Pollution and Control
2	17CE4XO2	Disaster Mitigation and Management
3	17CE4XO3	Remote Sensing & GIS
4	17CE4XO4	Building Planning and Construction Techniques
5	17CE4XO5	Cost Effective Housing Techniques
6	17CE4XO6	Building Plumbing Services

17CE4XO1 - AIR POLLUTION AND CONTROL

Course Category	Open Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Environmental Studies	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To know the various sources of air pollution and their effect on human beings, materials and vegetation. 2. To learn about dispersion of air pollutant. 3. To study processes, approaches, and devices used to control air pollution. 4. To familiarize with control of gaseous pollutant. 5. To know about standards, monitoring, and indices of air quality with case studies of some industries.	
Course Outcomes	CO1	Understand the concepts of air pollution.
	CO2	Assess the sources and classification of air pollutants.
	CO3	Estimate the quantity of air pollutant.
	CO4	Develop the control technologies for particulate pollutants.
	CO5	Develop control technologies for Gaseous pollutants.
	CO6	Understand the fundamental concept of environmental management and its relationship with sustainable development of our community.
Course Content	**UNIT I** **INTRODUCTION TO AIR POLLUTION:** Definition of Air Pollution - Sources & Classification, Source inventory of Air Pollutants - Air Quality and Emission standards - Sampling of Pollutants in ambient air - Stack sampling. **UNIT II** **EFFECTS OF AIR POLLUTANTS:** Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.	

	UNIT III **METEOROLOGY AND AIR POLLUTION:** Elements of atmosphere- Factors influencing air pollution, Wind rose, Mixing Depths, Lapse rates and dispersion. Atmospheric stability, Plume rise and dispersion. **UNIT IV** **CONTROL OF PARTICULATE POLLUTANTS:** Properties of particulate pollution - Particle size distribution - Control mechanism - Dust removal equipment – working principle and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP. **UNIT V** **CONTROL OF GASEOUS POLLUTANTS:** Process and equipment for the removal by chemical methods - Design and operation of absorption and adsorption equipment - Combustion and condensation equipment. **UNIT VI** **AIR QUALITY MANAGEMENT** Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality.
Textbooks and References	**TEXT BOOKS:** 1. Anjaneyulu, D., Air Pollution and Control Technologies, Allied Publishers, Mumbai, 2002. 2. Rao, C.S., Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996. 3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996. **REFERENCES:** 1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New Yark, 1997 2. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991. 3. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985. 4. Garg, S.K., Environmental Engineering, Vol. II", Khanna Publishers, New Delhi 5. Colls, J., Air Pollution: Measurement, Modeling and Mitigation, CRC Press, 2009. 6. Noel, D. N., Air Pollution Control Engineering, Tata McGraw Hill Publishers, 1999. 7. Stern, A.C., Fundamentals of Air Pollution, Academic Press, 1984.

17CE4XO2 –DISASTER MITIGATION AND MANAGEMENT

Course Category:	Open Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Environmental Studies	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To give the basic knowledge of Environmental Hazards and disasters. 2. To understand the basics of Endogenous and Exogenous hazards 3. To distinguish various concepts of soil erosion. 4. To give a suitable picture on the different types of hazard and disaster mitigation methods. 5. To indicate emerging approaches in disaster mitigation. 6. To know some case studies related to disasters.	
Course Outcomes	CO1	Hazards and disasters and different approaches to disaster and their mitigation.
	CO2	Types of disasters, exogenous disasters and their effects.
	CO3	Endogenous disasters and their effects.
	CO4	Man induced disasters and their effects.
	CO5	Disaster management through engineering applications.
	CO6	Case study on disasters in national and international level.
Course Content	**UNIT-I** **ENVIRONMENTAL HAZARDS & DISASTERS:** Meaning of Environmental hazards – Environmental Disasters Environmental stress – Concept of Environmental Hazards – Different approaches and relation with human Ecology - Landscape Approach –Ecosystem Approach – Perception approach – Human ecology & its application in geographical researches. **UNIT –II** **TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS:** Natural hazards and Disasters – Man induced hazards & Disasters – Natural Hazards – Planetary Hazards/ Disasters – Extra Planetary Hazards/ disasters Planetary Hazards – Endogenous Hazards – Exogenous Hazards Endogenous Hazards. Volcanic Eruption – Earthquakes – Landslides – Volcanic Hazards/ Disasters.	

Causes and distribution of Volcanoes – Environmental impacts of volcanic eruptions – Earthquake Hazards/ Disasters – Causes of Earthquakes – Distribution of earthquakes – Hazardous effects of earthquakes – Human adjustment – Perception & mitigation of earthquake.

UNIT –III

EXOGENOUS HAZARDS AND DISASTERS: Infrequent events – Cumulative atmospheric hazards/ disasters Infrequent events – Cyclones – Lightning – Hailstorms.

CYCLONES: Tropical cyclones & Local storms – Destruction by tropical cyclones & local storms – Causes – Distribution human adjustment – Perception & mitigation)Cumulative atmospheric hazards and disasters – Floods – Droughts – Cold waves – Heat waves. Floods: – Causes of floods – Flood control measures (Human adjustment – Perception & mitigation) – Droughts: – Impacts of droughts – Drought control measures – Extra Planetary Hazards/ Disasters.

UNIT –IV

SOIL EROSION: Mechanics & forms of Soil Erosion – Factors and causes of Soil Erosion – Conservation measures of Soil Erosion. Chemical hazards/ disasters – Release of toxic chemicals – nuclear explosion – Sedimentation processes. Sedimentation processes: – Global Sedimentation problems – Regional Sedimentation problems – Sedimentation and Environmental problems – Corrective measures of Erosion and Sedimentation. Biological hazards/ disasters: – Population Explosion.

UNIT –V

EMERGING APPROACHES IN DISASTER MANAGEMENT:

Three Stages

1. Pre- disaster stage (preparedness).
2. Emergency Stage.
3. Post Disaster stage-Rehabilitation.

UNIT – VI

CASE STUDIES:

1. Bhuj Earthquake – Gujarat 2001.
2. Indian Ocean earthquake and Tsunami, 2004.
3. Chernobyl disaster, Ukraine 1986.
4. Bhopal Gas tragedy, 1984.
5. Kerala Floods, 2018.

Textbooks and References	**TEXTBOOKS:** 1. Disaster Management by Rajib Shah, Universities Press, India, 2003 2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications. 3. Disaster Mitigation: Experiences and Reflections by Pardeep Sahni. 4. Natural Hazards and Disasters by Donald Hyndman and David Hyndman – Cengage Learning. **REFERENCES:** 1. The Environment as Hazards by Kates, B.I and White, G.F, Oxford Publishers, New York, 1978. 2. Disaster Management by R.B. Singh (Ed), Rawat Publication, New Delhi, 2000. 3. Disaster Management by H.K. Gupta (Ed), Universities Press, India, 2003. 4. Technology for Disaster Mitigation in India (INCED) by R.B. Singh,, University of Tokyo, 1994.

17CE4XO3 – REMOTE SENSING & GIS

Course Category	Professional Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	None	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	7. To introduce the basic principles of Remote Sensing and GIS techniques. 8. To learn about various types of sensors and platforms. 9. To learn concepts of visual and digital image analyses. 10. To understand the principles of spatial analysis. 11. To understand the elements of GIS. 12. To learn the applications of RS and GIS to Civil Engineering.	
Course Outcomes	CO1	Understand remote sensing terms and concepts of the physical applications of such a system.
	CO2	Understand the different technical aspects of a remote sensing network with special emphasis on India remote sensing technology.
	CO3	Compare different types of data obtained from a remote sensing network with tools specifically designed for the purpose.
	CO4	Understand about various methods of corrections applied to data to ensure maximum credibility and accountability to the data collected.
	CO5	Understand the basic concepts of Geographical Information System
	CO6	Apply RS and GIS in various fields on water resources engineering.
Course Content	**UNIT – I** **FUNDAMENTALS:** Definition – History – Physics of remote sensing – Electromagnetic radiation – Interaction of electromagnetic radiation with atmosphere, earth surface features – Vegetation, soil and water – Spectral signature – Atmospheric windows. **UNIT – II** **REMOTE SENSING SYSTEM:** Introduction – Platforms – Types – Satellites – Indian remote sensing satellites. **SENSORS:** Introduction – Types – Characteristics of sensors – IFOV – Indian remote sensing sensors – LISS – WIFS – PAN.	

	UNIT – III **VISUAL DATA ANALYSIS:** Introduction – Types of data products – Image interpretation techniques – Detection, recognition, analysis, classification, deduction and idealization – Elements of image interpretation – Keys. **UNIT – IV** **IMAGE PROCESSING:** Introduction – Overview – Preprocessing – Radiometric Correction – Geometric correction – Rectification – Enhancement techniques – Contrast stretch – Edge enhancement – Filtering techniques – Classification techniques – Supervised and unsupervised classification. **UNIT – V** **GEOGRAPHICAL INFORMATION SYSTEM:** Basic Principles – Definition – Components – Data structures – Raster and vector formats – Functioning of GIS – Data Input – Data manipulation – Data retrieval – Data analysis – Data display – Data base management systems. **UNIT – VI** **RS AND GIS APPLICATIONS GENERAL:** Land cover and land use – Agriculture – Forestry – Geology – Geomorphology – Urban applications. **APPLICATION TO HYDROLOGY AND WATER RESOURCES:** Flood zoning and mapping – Groundwater prospects and potential recharge zones – Watershed management.
Textbooks and References	**TEXTBOOKS:** 5. Bhatta B (2008), "Remote sensing and GIS", Oxford University Press 6. Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012. 7. Introduction to Geographic Information System – Kang – Tsurg Charg. Tata McGraw Hill Education Private Limited. 8. Remote sensing and Geographical Information System – by M. Anji Reddy JNTU Hyderabad 2001, B.S. Publications. **REFERENCES:** 4. Basics of remote sensing & GIS by A. Kumar, Laxmi publications. 5. Remote sensing of the environment – An earth resources perspective – 2nd edition – by john R.Jensen, Pearson Education. 6. Principals of Geo physical Information system – Peter A Burragh and Rachael McDonnnell, Oxford Publications 2004.

17CE4XO4 – BUILDING PLANNING AND CONSTRUCTION TECHNIQUES

Course Category	Open Elective	**Credits**	3
Course Type	Theory	**Lecture - Tutorial - Practical**	3 - 0 - 0
Prerequisite	Building Materials	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks	100

Course Objectives	1. To study about the basic building materials, properties and their applications. 2. To study the various cementitious materials. 3. To understand different types of smart construction materials and their applications. 4. To know the various types of the building components. 5. To understand the techniques of damp proofing and finishing works of the building. 6. To understand the various factors considered in planning and construction of buildings.	
Course Outcomes	CO1	Understand various types of stones and methods of manufacturing of bricks and tiles.
	CO2	Identify the importance of ingredients of lime, cement and concrete.
	CO3	Identify the properties of smart construction materials alternative for cement and also be able to understand various types of masonry construction.
	CO4	Understand various building components and their various types.
	CO5	Understand the techniques and importance of damp proofing and finishing works of the building.
	CO6	Identify the factors to be considered in planning and construction of buildings and Plan a building following the bye-laws

Course Content	**UNIT – I** **BUILDING MATERIALS -I:** **Stones:** Properties of building stones – Relation to their structural requirements – Classification of stones. **Bricks:** Composition of good brick earth, various types of bricks. **Tile**: Characteristics of good tile and types of tiles. **UNIT – II** **BUILDING MATERIALS–II:** **Lime:** Various ingredients of lime –Constituents of lime stone – Classification of lime. **Cement:** Portland cement – Chemical Composition – Hydration, setting and fineness of cement – Various types of cement and their properties – Various field and laboratory tests for Cement – Various ingredients of cement concrete and their importance – Various tests for concrete. **UNIT – III** **WOOD:** Introduction– Classification of timber (IS: 399) – Characteristics of good timber– Defects in timber – Types and Uses of Ply-wood and Engineered wood. – Uses of materials like Aluminum, Gypsum, Glass and Bituminous materials. **SMART CONSTRUCTION MATERIALS:** Overview and use of Fly ash, Silica fume, Carbon fibers, Self-healing materials and Fiber reinforced plastics – Benefits of Nano-technology in construction industry. **BUILDING STRUCTURES–I:** **Masonry:** Types of masonry – English and Flemish bonds – Cavity, partition and shear walls. **UNIT – IV** **BUILDING STRUCTURES–II:** **Building Components:** Lintels – Arches – Vaults – Stair cases. **Floors:** Different types of floors – Concrete – Mosaic and Terrazzo floors. **Roofs:** Pitched roofs – Lean to roof – Coupled Roofs – Trussed roofs – King and Queen post Trusses – Flat roofs – R.C.C Roofs – Doors and windows.

	UNIT – V **BUILDING FINISHES:** Damp Proofing and water proofing materials and uses. Plastering – Pointing – White washing and distempering. **Paints:** Constituents of paint – Types of paints –Painting of new/old wood – Varnish. **UNIT – VI** **BUILDING PLANNING :** Terms used in building drawing as per NBC – Factors affecting in selection of site – Functional requirements of a residential building – Minimum size requirements as per NBC – Standard sizes of Door – Windows and ventilators. **PLANNING:** Principles of planning – Factors to be considered in Planning – Planning of residential – Buildings – Preliminaries of vaastu. Municipal bye – Law – List of documents to be submitted for building plan approval.
Textbooks and References	**TEXTBOOKS:** 1. Engineering Materials by S.C. Rangwala. 2. Building Construction by B.C. Punmia. 3. Building Planning and Drawing by Dr. N. Kumara Swamy & A. Kameswara Rao. **REFERENCE BOOKS:** 1. Building Materials by S.K. Duggal. 2. A Text Book of Building Construction by S.K. Sharma & B.K.Kaul. 3. Building Construction by Sushil Kumar. 4. Indian Standard Institution, National Building Code of India, ISI, 1984, New Delhi.

17CE4XO5 – COST EFFECTIVE HOUSING TECHNIQUES

Course Category	Open elective	**Credits**	3
Course Type	Theory	**Lecture-Tutorial-Practical**	3-0-0
Prerequisite	Building Materials	**Sessional Evaluation**	40
		External Evaluation	60
		Total Marks	100

Course Objectives	1. To understand and apply the basic concepts of housing. 2. To understand the basics concepts of housing programmes. 3. To plan for design, evaluation, construction and financing of housing projects. 4. To plan for cost effective construction materials and methods. 5. To understand and apply the basic concepts of rural housing. 6. To apply the concept of housing in disaster prone areas.	
Course Outcomes	CO1	Acquire basic knowledge in housing.
	CO2	Acquire basic knowledge in housing programmes.
	CO3	Able to design, evaluation, construction and financing of housing projects.
	CO4	Familiar with the innovative construction materials.
	CO5	Be in position to adopt the suitable techniques in rural areas.
	CO6	Be in position to adopt the suitable techniques in disaster prone areas by using locally available materials.
Course Content	**UNIT – I** **INTRODUCTION TO HOUSING:** Definition of Basic Terms: House – Home – Household – Apartments – Multi storied Buildings – Special Buildings – Objectives and strategies of national housing policies including slum housing policy – Principle of sustainable housing – Integrated approach on arriving holding capacity and density norms – All basic infrastructure consideration – Institutions for housing at national – State and Local levels. **UNIT – II** **HOUSING PROGRAMMES:** Basic Concepts – Contents and standards for housing programmes – Sites and services – Neighborhoods – Plotted land development programs – Open development plots – Apartments – Gated	

communities – Townships – Rental housing – Co-operative housing – Slum housing programmes – Slum improvement – Slum redevelopment relocation.

Use of GIS and MIS in Slum Housing Projects – Role of public housing agencies – Private sector in supply – Quality – Infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT – III

DEVELOPMENT AND ADOPTION OF LOWCOST HOUSINGTECHNOLOGY: Introduction – Adoption of innovative cost effective construction techniques – Adoption of precast elements – Adopting of total prefabrication of mass housing in India – General remarks on pre-cast rooting/flooring systems – Economical wall system – Single brick thick loading bearing wall – 19cm thick load bearing masonry walls – Half brick thick load bearing wall – Fly ash gypsum thick for masonry – Stone block masonry – Adoption of precast R.C. plank and join system for roof/floor in the building.

UNIT – IV

ALTERNATIVE BUILDING MATERIALS FOR LOW COST HOUSING AND INFRASTRUCTURE SERVICES: Introduction – Substitute for scarce materials – Ferrocement – Gypsum boards – Timber substitutions – Industrial wastes – Agricultural wastes – Low cost infrastructure services: Introduce – Present status – Technological options – Low cost sanitation – Domestic wall – Water supply – Energy.

UNIT – V

RURAL HOUSING: Introduction traditional practice of rural housing continuous – Mud housing technology – Mud Roofs – Characteristics of mud – Fire treatment for thatch roof – Soil stabilization – Rural housing programs.

UNIT – VI

HOUSING IN DISASTER PRONE AREAS: Introduction – Earthquake – Damages to houses – Traditional prone areas – Type of damages and railways of Non-engineered buildings – Repair and restore action of earthquake damaged non - engineered buildings recommendations for future constructions – Requirements of structural safety of thin pre-cost roofing units against earthquake forces – Status of R& D in earthquake strengthening measures – Floods – Cyclone – Future safety.

Textbooks & References	**TEXTBOOKS:** 1. Hand Book of Low Cost Housing by A.K.Lal – New Age International Publishers. 2. Low Cost Housing – G.C. Mathur, IBH Publishers. 3. Housing in India by Francis Cherunilam and Odeyar D Heggade, Himalaya Publishing House, Bombay, 1997. **REFERENCES:** 1. Disaster Management by Rajib Shaw, Universities Press, India. 2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications. 3. Building Materials for Low-Income Houses - International Council for Building Research Studies and Documentation. 4. Modern Trends In Housing In Developing Countries – A.G. Madhava Rao, D.S. Rama Chandra Murthy & G.Annamalai. 5. Properties of Concrete – Neville A.M. Pitman Publishing Limited, London. 6. Light Weight Concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.

17CE4XO6 – BUILDING PLUMBING SERVICES

Course Category	Open Elective	**Credits:**	3
Course Type	Theory	**Lecture - Tutorial - Practical:**	3 - 0 - 0
Prerequisite	Environmental Engineering – I & II, Water Resources Engineering and Solid Waste Management.	**Sessional Evaluation**	40
		Semester End Exam Evaluation	60
		Total Marks:	100

Course Objectives	1. To know the different types of plumbing systems, fixtures, pipe fittings and water treatment methods. 2. To learn the about study of internal and external drainage system of various buildings. 3. To study various disposal techniques and treatment methods for waste water. 4. To study various principles of storm water drainage and rain water harvesting system. 5. To learn how to store, collect and transfer the solid waste from generation place to disposal site. 6. To study the layout design and details of sewage and drainage systems for different building types.	
Course Outcomes	CO1	Estimate the water requirements for various building types based on Indian Standards.
	CO2	Analyze the internal and external drainage system of various buildings.
	CO3	Understand disposal systems and modern types of sewage treatment plants.
	CO4	Understand the principles of storm water drainage and recycling of water.
	CO5	Analyze solid waste management practices and modern renewable energy systems.
	CO6	Design sewage and drainage system for different building types.
	UNIT - I **WATER SUPPLY:** Sources, demand, treatment and distribution of water. Sources of water supply, Plumbing system types for various buildings. Quality of potable water. Calculation of water requirements for various building types based on Indian standards (BIS). Water treatment methods– Screening, Aeration, Sedimentation,	

Course Content	Filtration, Disinfection, Softening. Storage and distribution of water. Choice of pipe materials, types of fixtures and fittings. **UNIT - II** **SANITATION I:** Sanitary pipes, fittings and fixtures- Layout and design Principles of sanitation, Study of Indian standards and plumbing by-laws (NBC). Introduction to various sanitary Pipes, joints, fittings and fixtures, their function, placement and constructional details. Study of internal & external drainage system of various buildings including small residences, apartments, public buildings etc. Single stack system, one pipe and two pipe systems, testing of house drains, Gradients used in laying drains and sewers, Self-cleaning and non-scoring velocities for drain pipes, **UNIT - III** **WASTE WATER TREATMENT AND DISPOSAL METHODS:** Study of Traps, Inspection chambers, Manholes, Septic tanks, Soak pits, and Public sewage line. Study of Disposal systems for domestic effluent from fitting to sewer line. Study of low cost sanitary systems (sulabh complexes) and other CBRI details. Waste water – Sewage disposal, primary treatment, secondary treatment and tertiary treatment. Modern types of Sewage Treatment Plants. **UNIT - IV** **STORM WATER DRAINAGE & RAIN WATER HARVESTING:** Principles of storm water drainage. Types of drain pipes. Storm water gutter / Storage sumps. Study of storm water disposal at site and settlement level. Rain water harvesting system. Recycling of water. **UNIT - V** **SOLID WASTE MANAGEMENT:** Solid waste, collections, treatments and disposal Prevalent SWM practices and deficiencies: Storage of waste at source, collection, segregation, transportation of waste. Disposal of solid wastes: Sanitary land filling, Composting, Incineration, Pyrolysis – advantages and limitations. Biogas system and Modern renewable energy system. **UNIT - VI** **APPLICATIONS:** Layout design and construction Layout design and details of water supply distribution system in a Campus. Layout design and details of sewage and drainage system for different building types. Storm water drainage and rain water harvesting system design for a building project.

Textbooks and References	**TEXT BOOKS AND REFERENCES:** 1. B.C. Punmia, "Waste Water Engineering", Laxmi Publications. 2009 2. S.J. Arceivala, "Waste Water Treatment for Pollution Control", Tata McGraw Hills Publication.2008. 3. K.N. Duggal,"Elements of Environmental Engineering", Chand & Co. 2010 4. "Uniform Illustrated Plumbing Code – India (UIPC-I)", Indian Plumbing Association 2014. 5. Charanjeet S. Shah; Water Supply and Sanitation; Galgotia Publication 2015 6. H.S. Bhatia; Environmental Services (Plumbing); Galgotia Publication.

17CE42IS – INTERNSHIP

Course Category	Program Core	**Credits**	2
Course Type	-	**Lecture - Tutorial - Practical**	0 - 0 - 0
Prerequisite	-	**Continuous Assessment**	100
		Semester End Exam Evaluation	-
		Total Marks	100

Course Outcomes	CO1	Understand working of an industry.
	CO2	Gain practical knowledge in engineering and managerial aspects and learn concepts beyond curriculum as per the need.
	CO3	Work in a team and also display leadership qualities with professional integrity.
	CO4	Examine how theoretical concepts are used in industry to solve real world problems.
	CO5	Identify technical and non-technical problems and contribute effectively for their solutions.
	CO6	Refine interpersonal communication skills and report writing skills.

17CE42PR – PROJECT WORK

Course Category	Program Core	**Credits**	11
Course Type	-	**Lecture - Tutorial - Practical**	0 - 0 - 3
Prerequisite	-	**Continuous Assessment and Seminar**	80
		Semester End Exam Evaluation	120
		Total Marks	200

Course Outcomes	CO1	Critically examine available literature relevant to the given problem and showcase self-learning ability of concepts beyond curriculum.
	CO2	Demonstrate the ability to formulate / design or evaluate a given problem either individual as a team.
	CO3	Demonstrate the ability to innovatively apply mathematics, science and engineering/design concepts.
	CO4	Design and conduct experiments, interpret data and draw use full inferences.
	CO5	Apply modern tools in analysis/design.
	CO6	Prepare technical reports and present the same and also be able to explain societal impact of the work.

N.B.K.R INSTITUTE OF SCIENCE &TECHNOLOGY: VIDYANAGAR

(Autonomous)

(With effect from the batch admitted in the academic year 2017-2018)

LIST OF OPEN ELECTIVES TO BE OFFERED

BY OTHER DEPARTMENTS

I. Computer Science Engineering.

1. Fundamentals of Data Structures (FDS)
2. Database Management Systems (DBMS)
3. Java Programming (JP)
4. Network Management (NM)
5. C++ Programming (CPP)
6. Python Programming (PP)
7. Software Engineering (SE)
8. Web Design and Management (WDM)

II. Electrical and Electronics Engineering

1. Energy Conversion Techniques
2. Introduction to Control Systems
3. MATLAB and its Applications in Engineering
4. Basics of Power Systems
5. Electrical Energy conservation & auditing
6. Electrical & Hybrid Vehicles
7. Industrial Electrical systems

III. Electronics and Communication Engineering.

1. VLSI Design.
2. DSP Processors & Architecture.
3. Neural Networks and Fuzzy Logic.
4. Telecommunication & Switching Networks.
5. Microprocessors and Micro Controllers.
6. Optoelectronics.
7. Embedded Systems.
8. Cellular Mobile Communication.

III. Mechanical Engineering.

1. Operations Research.
2. Power Plant Engineering
3. Robotics.
4. Thermal Engineering.
5. Automobile Engineering.
6. Total Quality Management.

LIST OF E-RESOURCES

1. https://www.edx.org/learn/structural-engineering
2. https://www.coursera.org
3. https://www.udemy.com/topic/civil-engineering/
4. https://nptel.ac.in/courses/
5. https://onlinecourses.nptel.ac.in/noc19_ma01/preview (Mathematics)
6. https://www.accessengineeringlibrary.com
7. https://www.courses.com
8. https://www.class-central.com
9. https://lecturenotes.in/course/all/btech/civil-engineering
10. https://freevideolectures.com
11. https://ekeeda.com
12. https://www.btechguru.com
13. engineeringvideolectures.com
14. https://cosmolearning.org
15. https://www.khanacademy.org/