Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

SCHEME AND SYLLABUS

FOR B.E. III SEMESTER AND IV SEMESTER

FOR THE ACADEMIC YEAR 2020-21

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr. Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

SEMESTER III

Code No.	Course	Hours/Week					Maximum Marks		
		Lecture	Tutorial	Practical	Self-study	Credits	CIE	SEE	Total
THEORY									
19MA31	MATHEMATICS-III	2	2	0	-	3	50	50	100
19CV32	STRENGTH OF MATERIAL	3	2	0	-	4	50	50	100
19CV33	FLUID MECHANICS – I	3	--	0	-	3	50	50	100
19CV34	BASIC SURVEYING	2	2	0	-	3	50	50	100
19CV35	BUILDING MATERIALS & CONSTRUCTION	3	--	0	-	3	50	50	100
19CV36	CIV (NCMC)	2	--	--		0	50	50	100
19KA37	KANNADA	01	---	---		01	50	50	100
PRACTICAL									
19CVL36	FM LAB	0	0	2	-	1	50	50	100
19CVL37	SURVEYING LAB – I	0	0	2	-	1	50	50	100
19CVL38	BUILDING PLANNING AND DRAWING	1	0	2		2	50	50	100
TOTAL		18	06	06	-	21	500	500	1000
Course prescribed to lateral entry									
19MAD031	(ADD MATHEMATICS-1) NCMC	03	--	--	-	03	50	50	100

SEMESTER IV

Code No.	Course	Hours/Week					Maximum Marks		
		Lecture	Tutorial	Practical	Self-study	Credits	CIE	SEE	Total
THEORY									
19CV41	STRUCTURAL ANALYSIS - I	3	2	0	-	4	50	50	100
19CV42	FLUID MECHANICS – II	3	2	0		4	50	50	100
19CV43	ADVANCED SURVEYING	3	---			3	50	50	100
19CV44	ENGINEERING GEOLOGY	3	--	0	-	3	50	50	100
19CV45	CONCRETE TECHNOLOGY	3	--	0	1	3	50	50	100
19HU46	CIP (NCMC)	2	--	--	-	0	50	50	100
PRACTICAL									
19CVL47	ENGINEERING GEOLOGY LAB	0	0	2	-	1	50	50	100
19CVL48	SOM LAB	0	0	2	-	1	50	50	100
19CVL49	ADVANCED SURVEY LAB	1	-	2	-	2	50	50	100
	TOTAL	18	04	06	1	21	450	450	900
Course prescribed to lateral entry									
19MAD41	(ADD MATHEMATICS-2) NCMC	03	--	--	-	00	50	50	100

THIRD SEMESTER (NC)

ENGINEERING MATHEMATICS – III		
Subject code	19MA31	Credit: 04
Hours/Week:	4 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Students should have knowledge of Differential calculus, Integral calculus and Differential equations.

Course objectives:

To enable the students to obtain the knowledge of Engineering Mathematics in the following topics

1. Numerical methods to solve algebraic and Transcendental equations and Eigen values and Eigen vectors
2. Interpolation methods and Numerical integration
3. Fourier Series and Fourier transformation and its application in engineering fields
4. Partial Differential equations and its applications**.**

MODULES	Teaching Hours
Module-I Introduction, numerical solutions of algebraic and Transcendental equations, Bisection method, Newton's Raphson and Regula falsi methods.	8 hours
Module-II Finite differences (Forward and Backward differences), Interpolation, Newton's Forward and Backward formulae. Langrange's interpolation and inverse interpolation formulae. Numerical differentiation using Newton's forward and backward interpolation formulae and problems.	9 hours
Module-III Numerical differentiation using Newton's forward and backward interpolation formulae and problems. Numerical integration: Trapezoidal rule, Simpsons $1/3^{rd}$ and $3/8^{th}$ rule, Weddle's rule (all formulae and rules without proof).	8 hours
Module -IV **Fourier series:** Periodic functions, Fourier series with periods $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2l)$ and $(-l, l)$. Half range Fourier series, Practical harmonic analysis and problems.	8 hours
Module-V **Applications of PDE:** Derivation of one-dimensional wave and heat equations. Various possible solutions of wave equation, heat equation Laplace equation by the method of separation of variables with given conditions and problems.	9 hours

Course Outcomes:

On completion of this course, students are able to:

CO	Course Objective	BL
CO1	Solve the numerical problems in algebraic, transcendental equations, Eigen values and Eigen vectors. Computation of interpolation polynomials and numerical integration	C1&C2).
CO2	Analyse discrete type system using convolution and the Z-transform	(C3&C4)
CO3	Determine Fourier transformation for continuous time signals and	(C1&C4)

	systems	
CO4	Construction of Fourier series for periodic signals and Fourier series to analyse circuits	(C2&C3)
CO5	Determine solution of wave, heat and Laplace equations	(C2&C4)

Text book:

1. Advanced Engineering Mathematics E. Kreyszig John Wiley & Sons 10th Edition, 2016
2. Higher Engineering Mathematics B. S. Grewal Khanna Publishers 44th Edition, 2017
3. Engineering Mathematics Srimanta Pal et al Oxford University Press 3 rd Edition, 2016

Reference books:

1. Advanced Engineering Mathematics C. Ray Wylie, Louis C. Barrett McGraw-Hill Book Co 6 th Edition, 1995
2. Introductory Methods of Numerical Analysis S. S. Sastry Prentice Hall of India 4 th Edition 2010
3. Higher Engineering Mathematics B.V. Ramana McGraw-Hill 11th Edition,2010
4. A Textbook of Engineering Mathematics N. P. Bali and Manish Goyal Laxmi Publications 6 th Edition, 2014
5. Advanced Engineering Mathematics Chandrika Prasad and Reena Garg Khanna Publishing, 2018
6. Higher Engineering Mathematics by B.S. Grewal, Khanna publishers; 40th Edition.2007

STRENGTH OF MATERIALS		
Course Code	19CV32	CREDIT: 04
Lecture Hours/Week	3 Hours (Theory) 2 Hours (Tutorial)	SEE: 50Marks
Total Hours:42	CIE: 50 Marks	SEE: 03 Hours

Prerequisite: Elements of civil engg and engg mechanics

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. To understand the behavior of materials under stress and strain.
2. To analyse an element subjected to compound stress to assess the various stresses in thin and thick cylinders.
3. To understand the concept of shear force and bending moments for beams subjected to various system.
4. To evaluate the bending and shear stress in beam to understand the behavior and design of columns.
5. Strength evaluation and design of circular shaft subjected to torsion and to evaluate the deflection of beams.

Modules	Teaching Hours
Module I **Simple stresses and strains**: Introduction to various strengths of material, concept and definition of stress and strain, types of stresses and strains, Assumptions in strength of materials, stress-strain diagrams for mil for mild steel, ferrous and non-ferrous materials, St Venant's Principle, Hook's Law, Modulus of Elasticity, Poisson's ratio, Deformation of bars of uniform cross section, varying cross section. Elongation due to self-weight. Compound bars, Temperature stresses, Elastic constants and their relationship, volumetric strain, application problems.	10 hours
Module II **Compound stresses:** Determination of stresses on oblique/inclined plane due to uniaxial, biaxial and general 2D stresses, (Analytical and Mohr's circle method), Determination of Principal Planes and Principal Stresses, Maximum Shear Stress and their plane (Analytical and Mohr's circle method) **Thin and thick cylinders:** Thin cylinders: Determination of Longitudinal and Circumferential/Hoop's stress, change in dimensions and volume Thick cylinders: Assumptions, Lami's equation derivation and problems, radial pressure and hoop stress distribution diagrams.	8 hours
Module III **Shear force and bending moment in beams:** Introduction to types of loads, beams and support with reaction. Definition of Shear force and bending moment, sign conventions. Relationship between load intensity, bending moment and shear force. Shear force diagram (SFD) and Bending moment diagram (BMD) for simply supported beams (both without overhang and with overhangs) and cantilever beams, beams subjected to point loads, UDL, UVL, Couples and their combinations.	8 hours

Module IV **Bending stresses and shear stresses in beams.** Bending stresses: Assumptions, Bernoulli's theory of Pure Bending, relationship between bending moment, bending stress and radius of curvature, Moment of Resistance, Section Modulus, flexural rigidity, Modulus of rupture. Bending stress diagram for rectangular, circular, 'I', 'T' and 'L' sections (simple problems) Shear stress: Expression for transverse shear stressing beams, Shear stress diagram for rectangular, circular, 'I', 'T' and 'L' sections. **Elastic stability of columns and struts.** Introduction to short and long columns. Definition of effective length, slenderness ratio, radius of gyration, buckling/critical load. Assumption and derivation of Euler's Buckling load for different end conditions. Problems and limitations of "Euler's theory. Rankine's theory, numerical problems.	8 hours
Module V **Torsion of circular shafts:** Equation for theory of pure Torsion, Assumptions, Torsion equation for circular shaft, Strength and stiffness, torsional rigidity, polar modulus, strengths of solid and hollow shafts, power transmitted by solid and hollow shafts. **Deflection of beams:** Definition of stiffness, elastic curve, deflection in simple bending, relation between curvature, slope and deflection. Double Integration method for cantilever and simply supported beams for point load, UDL, UVL and couple, Macaulay's method, numerical problems.	8 hours
Question paper pattern: Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.	
Text books: 1. B.S. Basavarajaiah, P. Mahadevappa "Strength of Materials" in SI Units, University Press (India) Pvt. Ltd., 3rd Edition,2010 2. Ferdinand P. Beer, E. Russell Johnston and Jr. John T. De Wolf "Mechanics of Materials", Tata McGraw-Hill, Third Edition, SI Units	
Reference Books: 1. D.H. Young, S.P. Timoshenko "Elements of Strength of Materials" East West Press Pvt. Ltd., 5th Edition (Reprint2014). 2. R K Bansal, "A Textbook of Strength of Materials", 4th Edition, Laxmi Publications, 2010. 3. S.S. Rattan "Strength of Materials" McGraw Hill Education (India) Pvt. Ltd., 2nd Edition (Sixth reprint2013). 4. Vazirani, V N, Ratwani M M. and S K Duggal "Analysis of Structures Vol. I", 17th Edition, Khanna Publishers, New Delhi.	
E books and online course materials: www.civilenggebooks.com	
Course outcomes: **On completion of the course, the student will have the ability to:**	

CO	Course Outcome (CO)	Blooms Level
CO1	Explain elastic constants and determine the simple stresses and strains due to applied loading in uniform and composite bars due to loads and temperature change.	C2
CO2	Determine stresses on oblique planes, principal stresses and strains for 2D elements and determine stresses acting on thin and thick cylinder due to fluid pressure	C2
CO3	Analyze and draw SFD and BMD for determinate beams for different loads.	C4
CO4	Determine the bending stress, and shear stress diagram in the beams and also determine the bulking loads for columns with different end conditions.	C6
CO5	Analyze stresses in a shaft due to torsion and determine the slope and deflection of beams subjected to various loads by double integration and Macaulay's method.	C5

FLUID MECHANICS-I		
Course Code	19CV33	CREDIT:03
Lecture Hours/Week	3 hrs (Theory)	SEE: 50 Marks
Total Hours: 42	CIE: 50 Marks	SEE:03Hours:

Prerequisite: Mathematics- I, Mathematics- II

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Distinction between solid, fluid, liquid and gas. Classify the fluids and measurements of pressure by various types of manometers.
2. Hydrostatic forces on vertical, inclined and curved surfaces.
3. Dynamics of fluid flow.
4. Types of flows in pipes and head loss in pipe due to friction and bends.
5. Measurement of flow through orifice, notches and weirs.

Modules	Teaching Hours
Module I **Scope and importance of the subject.** Definition of fluid, distinction between a solid and a fluid, distinction between a liquid and a gas, Fluid continuum. Fluid properties and classification of Fluids: Mass density, specific volume, specific weight, relative density, viscosity, Newton's Law, compressibility, vapor pressure, surface tension and capillarity and their units (SI systems) **Classification of fluids** – Ideal and real fluids, Newtonian and Non-Newtonian fluids compressible and incompressible fluids. Problems on above fluid properties. Pressure at a point in a static fluid – Pascal's law – Hydrostatic Pressure law, Atmospheric pressure, Absolute, gauge, and vacuum pressure, Simple U-tube manometer, U-tube Differential manometers, inverted U-tube monometer.	10 hours
Module II **Hydrostatics:** Hydrostatics Forces on vertical & inclined plane surfaces, (rectangular, square, triangular, trapezoidal, circular plane surfaces) Hydrostatic forces on curved surfaces and center of pressure, pressure diagrams. Applications of total pressure and center of pressure on Dams, Roller gates, Tainter gates, sector gates, Sluice gates and pressure diagrams.	8 hours
Module III **Dynamics of Fluid Flow**: Euler's equation of motion in one dimension – Integration of Euler's equation, Bernoulli's equation, Limitations and modifications of Bernoulli's equation – Applications of Bernoulli's equation Pitot tubes, Venturi meter – Momentum equation & its application on pipe bend.	8 hours
Module IV **Flow Through pipes:** Types of flows in pipes, Reynolds's experiments – Reynold's number Laminar & turbulent flows, fluid friction in pipes - Head loss due to friction (Darcy Welsbach equation) Friction factors for commercial pipes, Minor losses in pipes – pipes in series, equivalent pipe and pipes in parallel.	8 hours

Module V **Flow measurements:** Flow through a small orifice. Hydraulic coefficients and experimental methods of determination. Flow through large rectangular orifices, submerged orifices. Flow through mouth pieces, external cylindrical mouth piece, hydraulic co-efficient, flow through internal or re-entrant Borda's mouth piece. Classification of Notches & weirs, Flow over rectangular Notch, Triangular Notch or weir Trapezoidal Notch, stepped Notch, Velocity of approach, Francis formula Flow Cipolletti weir or Notch, Broad crested, ogee weir submerged weir effect on discharge over a rectangular weir due to error in the measurement of head.	8 hours

Question paper pattern:
Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi

Reference Books:

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed).
2. K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Publishing Co. Ltd.
3. K Subramanya, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd.
4. J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition.
5. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Identify basic properties of Fluids.	C1
	CO2	Analyze fluid pressure forces and design sluice gates, roller gates etc.	C4
	CO3	Apply Bernoulli' s equation & its application on fluid flow problems.	C3
	CO4	Analyze fluid flow through pipes.	C2
	CO5	Apply fluid flow phenomenon in flow measurement through orifices, mouth piece, notches and weirs.	C3

BASIC SURVEYING-1		
Subject Code	19CV34	Credit 03
Number of Lecture Hours/Week	2Hours (Theory) 2 Hours Tutorial	SEE: 50
Total Hours:52	CIE: 50	SEE Hours: 03
Prerequisite: none		

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Introduction to Surveying and measurement of horizontal distances.
2. Chain surveying and compass surveying.
3. Principles of leveling.
4. Different types of leveling and contouring.

Modules	Teaching Hours
Module-1 **Introduction**: Surveying – Definition, Objects and classification. Units of Measurements, Plane and Map, Basic principles of surveying, Precision and Accuracy, Ranging of lines – Direct and Indirect, Survey of India topographical numbering and scales. **Chain surveying**: Chain and types, Tape and types, Measurement of distances over sloping ground, Chain and tape corrections (No-derivations), Numerical problems. Booking of chain survey work, Field Book-entries, conventional symbols. Obstacles in chain survey - numerical problems. Error in chain survey and precautions to be taken, corrections (chain and tape).	11 Hours
Module-2 **Compass surveying**: Types of compasses, Difference between prismatic compass and surveyor's compass. Types of Meridians and Bearings Numerical problems. WCB and RB and conversions, Dip and Declination, Determination of true bearings. Computation of included angles of closed traverse. **Compass traversing**: Local attraction-determination and correction, Latitude and departure, Dependent and Independent coordinates, Checks for Closed traverse and determination of closing error and its direction Bowditch's graphical method Analytical methods – Bowditch' rule and transit rule, Omitted measurements. (Length and bearing of the same line).	11 Hours
Module-3 **Levelling - 1**: Principles and basic definition, fundamental axes and part of a dumpy level, Types of adjustment and objectives, Temporary adjustment of a dumpy level, Sensitiveness of bubble tube. Inter relationship between fundament axes for instrument to be in adjustment problem on two peg methods for calibration of dumpy level.	10 Hours

Module-4 **Leveling – 2**: Curvature and refraction correction, Type of leveling, Simple leveling, Reciprocal leveling, Fly leveling, profile leveling, Cross Sectioning and check leveling. **Reduction of Leveling**: Booking of levels, Rise on fall method and height of instrument method, comparison and arithmetic checks, Fly back leveling, Errors and precaution. (Above related problems)	10 Hours
Module-5 **Contouring**: Contours and their characteristics, Method of contouring Interpolation techniques, Uses of contours. Direct and indirect method. **Areas and volumes**: Calculation of area from cross staff surveying, Calculation of area of closed traverse by coordinates method, Planimeter principle, working and use, Digital Planimeter, Volumes by Trapezoidal and Prismodial rule, Capacity contours.	10 Hours

Text books:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I, Pune Vidyarthi Griha Prakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, NewDelhi
4. A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., NewDelhi

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Possess a sound knowledge of principles of surveying, measurements and surveying methodologies	**C2**
	CO2	Describe the technique for solution in measurement compass surveying and traversing.	**C3**
	CO3	Able to understand the parts of leveling instruments.	**C3**
	CO4	Describe the technique for leveling operations and its applications.	**C3**
	CO5	Knowledge about contouring and calculate the areas and volumes.	**C2**

BUILDING MATERIALS AND CONSTRUCTION		
Course Code	19CV35	CREDIT: 03
Number of Lecture Hours/Week	3 hrs (Theory)	SEE: 50
Total Hours: 42	CIE: 50	SEE: 03 Hours

Prerequisite: None

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Properties and preservation for stone and timber.
2. Properties of bricks and bonds in brickwork
3. Types of stone masonry, materials and methods of damp proofing courses.
4. Types of stairs and design of doglegged stair.
5. Roof, insulating materials and types of plastering.
6. Types of doors, windows, flooring and paints,

Modules	Teaching Hours
Module I **Building Stones:** Common building stones and their uses, quarrying of stones, qualities of good building stones, deterioration of stones, Preservation of stones, dressing of stones, tests on building stones. **Timber:** Important varieties and uses, defects in timber, tests for good timber, seasoning of timber, ply wood and its uses.	8 hours
Module-II **Bricks:** Classification and composition of bricks, qualities of good bricks, tests on bricks. **Brick Masonry:** Definition of terms used in masonry, bonds in brick work, English bond, Flemish bond, Reinforced brick work, Sand lime brick	7 hours
Module III **Stone Masonry:** Rubble Masonry, Coursed and Un-coursed rubble masonry, Ashlar masonry, Shoring, Under Pinning and Scaffolding. **Damp Proof Course:** Materials used for damp proof course, D.P.C Treatment in building methods of treatment to foundations, treatment to floors, walls and slabs, Concrete paver blocks.	5 hours 3 hours
Module IV **Stairs:** Types (classifications) and technical terms in stairs, requirements of a good stair, geometric design of R.C.C dog legged and open well stairs (Plan and Sectional elevation of stairs). **Roofs& Miscellaneous Materials:** Sloped roof(R.C.C and tile roof), Requirements of good roofs, Adhesives, Asbestos, Thermopolis, Fibers, Heat insulating materials, Sound insulating materials, Geosynthetics **Plastering:** Purpose of plastering, materials of plastering, lime	3 hours 3 hours 3 hours

mortar, cement mortar, masonry mortar, methods of plastering, Stucco plastering, Lath plastering.	
Module V **Doors:**Types, Paneled doors, glazed doors, flush doors. **Windows:** Types, Paneled Window, glazed Window. **Floors:** Types of flooring (materials and methods of laying), Granolithic, mosaic, ceramic, marble and polished granite, Linoleum. **Painting:** Purpose of painting, types of paints, application of paints to new and old surfaces, distemper, plastic emulsion, enamel, polishing of wood surface.	3 hours 3 hours 4 hours

Question paper pattern:
Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text books:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I, Pune VidyarthiGrihaPrakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi
4. A. Bannister, S. Raymond, R. Baker, "Surveying", Pearson, 7th ed., New Delhi

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Understand the properties of Stone sand Timber materials.	C2
	CO2	Explain the ingredients of brick, different tests on brick and brick masonry.	C2
	CO3	Compare different types of stone masonry and explain different types of DPC.	C3
	CO4	Design the R.C.C dog legged stair case and explain roofing materials, miscellaneous materials.	C4
	CO5	Explain doors, windows, floors, and paints.	C2

FLUID MECHANICS LAB		
Course Code	19CVL36	CREDIT: 01
Number of Lecture Hours/Week	2 hrs (Practical)	CIE: 50Marks
Total hours: 28	CIE: 50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Calibration of various notches.
2. Calibration of plug sluice. Broad crested ad ogee weir.
3. Determination of constants of Parshall minor flume, losses through pipes and friction through pipes.
4. Determination of hydraulic coefficients of small circular orifice and external cylindrical mouth piece.
5. Determination of coefficient of discharge of venturi meter study of performance of centrifugal pump.

Experiments	Teaching Hours
1. Calibration of rectangular notch	2hours
2. Calibration of triangular notch	2hours
3. Calibration of Cipolletti notch	2hours
4. Calibration of broad crested weir	2hours
5. Calibration of ogee weir	2hours
6. Calibration of plug sluice	2hours
7. Determination of constants of Parshall flume	2hours
8. Determination of minor losses through pipes	2hours
9. Determination of hydraulic coefficient of small circular orifice.	2hours
10. Determination of friction loss through pipes	2hours
11. Determination of hydraulic coefficients of external cylindrical mouth piece.	2hours
12. Determination coefficient of discharge of venturi meter.	2hours
13. Study of performance of centrifugal pump	2hours
14. Study of performance of Francis turbine	2hours
or	
Study of performance of Pelton wheel turbine	
15. Demonstrate of open channel flow	

Question paper pattern:

Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Text books:

Papers from the international journals (Scopus index and web of science).

Reference Books:

Papers from the international journals (Scopus index and web of science).

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the concepts of SOM theory course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the experiments and determine Calibration of notches, rectangular, triangular, Cipolletti notch, plug sluice, broad crested and ogee weir, determination of Parshall minor flume, losses through pipes cylindrical mouthpiece, centrifugal pump, small circular orifice, friction loss through pipes, external cylindrical mouth piece, venturi meter, study on centrifugal pump, francis turbine, Pelton wheel turbine, demonstrate of open channel flow parameters.	C3
	CO4	Analyse the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

SURVEYING LAB-1		
Course Code	19CVL37	CREDIT: 01
Number of Lecture Hours/Week	2 hrs (Practical)	SEE: 50 Marks
Total Number of Lecture Hours: 18	CIE: 50Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:
To enable the student to acquire the knowledge in the following topics

Experiments	Teaching Hours
1.a) To Measure distance between two points by direct Ranging	2 Hours
1.b) To Set out perpendiculars at various points on a given line by linear methods.	2 Hours
2. Setting out of rectangle, pentagon and hexagon by compass and Chain	2 Hours
3. Determination of distance between two inaccessible points using compass and accessories.	2 Hours
4.Closed traverse of a small area using chain and compass &adjustment of closing error by Bowditch's rule	2 Hours
5. Determination of reduced level of points using dumpy level/auto level (simple leveling)	2 Hours
6. Determination of reduced level of points using dumpy level/auto level (differential leveling and inverted leveling)	2 Hours
7. To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error.	2 Hours
8. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale.	2 Hours
9) To Determine the difference in elevation between two points by conducting Fly Levelling Also Carryout Fly Back Levelling calculate the RL of Points by RISE and FALL method	2 Hours

Question paper pattern:
Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Text books:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I, Pune VidyarthiGrihaPrakashan,1988

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2010

3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi
4. A. Bannister, S. Raymond, R. Baker, “Surveying”, Pearson, 7th ed., New Delhi

E books and online course materials:

www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the concepts of Survey theory course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the various experiments on survey	C3
	CO4	Analyse the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

BUILDING PLANNING AND DRAWING		
Course Code	19CVL38	CREDIT:02
Number of Lecture Hours/Week	1 Hours (Lectures) 2 Hours (Practical)	SEE: 50 Marks
Total Hours: 28 Hours	CIE: 50Marks	SEE 03 Hours

Prerequisite: none

Course objectives:
To enable the student to acquire the knowledge in the following topics

	Teaching Hours
PART-I	
1. To prepare working drawing of component of buildings i) Stepped wall footing and isolated RCC column footing, ii) Fully paneled and flush doors, iii) Half paneled and half-glazed window.	3hours
2. Functional design of building (Residential, Public and Industrial), positioning of various components of buildings, orientation of buildings, building standards, bye laws, set back distances and calculation of carpet area, plinth area and floor area ratio.	4hours
3. Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building:	
i) Primary health center, ii) Primary school building iii) Residential building	6hours
ii) For a given single line diagram, preparation of water supply, Sanitary and electrical layouts. Rain water harvesting elements **Solid edge**: preparation of building plan, elevation and typical sections by solid edge of single storied two bed room residential building	1 hours
PART-II	
Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Two-bedroom Residential building, ii) Two storied building.	4 hours 10hours

Question paper pattern:

Reference Books:

1 Shah M.H and Kale C.M "Building Drawing", Tata Mc Graw Hill Publishing co. Ltd., New Delhi.
2 Gurucharan Singh "Building Construction", Standard Publishers & distributors , New Delhi.
3 National Building Code, BIS, New Delhi.

E books and online course materials:
www.civilenggebooks.com

Course outcomes: **On completion of the course, the student will have the ability to:**			
Course Code	**CO #**	**Course Outcome (CO)**	**Blooms Level**
	CO1	Understand the concepts of Principles of Planning and theory course through series of Drawings.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for planning and drawing.	C3
	CO3	Perform the Drawings of Residential Building	C3
	CO4	Suitable dimensions are data and interprete the Drawings.	C4
	CO5	Prepare set of Drawings relevant to the Course.	C3

IV SEMESTER

Course Title **STRUCTURAL ANALYSIS-1**		
Course Code	19CV41	Credit: 04
Number of Lecture Hours/Week	3 Hours (Theory) 2 Hours Tutorial	SEE: 50 Marks
Total Number of Lecture :52 Hours	CIE: 50 Marks	SEE: 03 Hours

Prerequisite: Elements of civil engg, Strength of material

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Determine the degree of freedom and degree of redundancy and analyse trusses.
2. Analysis of coplanar structures for displacements using strain energy methods.
3. Analysis for displacements by using classical methods and analyse the unknown reactions and internal forces in arches.
4. Analysis of cables and indeterminate arches, C-programming of trusses.
5. Analysis for moving loads.

Modules	**Teaching Hours**
Module I **Structural systems:** Forms of structures, conditions of equilibrium, degree of freedom, linear and non-linear structures, one, two, three dimensional structural systems, determinate and indeterminate structures [static and kinematics], principle of superposition. **Plane trusses:** Introduction, analysis by method of joints, analysis by method of sections.	10 hours
Module-II **Strain energy:** Strain energy and complimentary strain energy. Strain energy due to axial load, bending and shear, theorem of minimum potential energy, Law of conservation of energy, Principle of virtual work, the first and second theorem of Castigliano, betti`s law, Clarke -Maxwell`s theorem of reciprocal deflection. Numerical examples on beams, trusses, frames.	12 hours
Module -III **Deflection of beams:** Moment area method, Conjugate beam method. **Arches:** Three hinged circular and parabolic arches with supports at same levels and different levels, Determination of thrust, shear and bending	10 hours
Module IV **Arches and cables:** Two hinged parabolic arch, two hinged circular arch, Analysis of cables under point loads and UDL, length of cables (support at same levels and different levels). **Development of c-programming:** For analysis of trusses by method	10 hours

of joints.	
Module -V **Rolling loads:** Rolling load analysis for a simply supported beam for several concentrated loads, rolling load analysis for simply supported beam for fractional UDL, ILD for reaction, shear force, bending moment at a given section. Derivation of condition for absolute bending moment under a chosen wheel load and for UDL moving on a span of a simply supported girder. Numerical on absolute maximum bending moment**.**	10 hours

Question paper pattern:
Two questions to be set from each module by inter-mixing the syllabus of respective module. Students have to answer any five full questions by selecting minimum one question from each module.

Text books:
1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.

Reference Books:
1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.
2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Describe different types of structural systems and analyze plane trusses	C2 C3
CO2	Analyze the beams, trusses and frames using energy principles	C4
CO3	Determination of slope and deflection by moment area method and conjugate beam method and analyse two hinged and three hinged arches.	C4
CO4	Analyze arches and cables for shear and bending moments	C4
CO5	Determine bending moment and shear force due to rolling loads	C3

FLUID MECHANICS-II		
Course Code	19CV42	CREDIT:04
Number of Lecture Hours/Week	3 Hrs (Theory) 2 Hrs (Tutorial)	SEE: 50
Total Number of Lecture :42 Hours	CIE: 50	SEE: 03Hours

Prerequisite: Fluid mechanics-I

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Classify types of flow in open channels and design most economical section.
2. Analysis of dimensions and model study y using different non-dimensional numbers.
3. Impulse-momentum equation, its applications and force exerted by jet on various surfaces of vanes.
4. Types, design parameters and working principles of turbine.
5. Classify and describe the pumps.

Modules	Teaching Hours
Module I **Open channel flow**: Definition of open channels, classification, difference between pipe flow & open channel flow, types of flow, geometric properties of open channels, Uniform flow in open channels, Chazy's and Manning's formulae, Problems on uniform flow, Most economical section of open channel flow, Derivation of conditions for most economical rectangular, triangular and trapezoidal sections. Problems on most economical sections. Most economical circular channels derivations and problems, Specific energy, definitions, specific energy curve, conditions for minimum specific energy and maximum discharge, Critical flow in rectangular channels, problems Hydraulic jump in rectangular channels, derivations with Froude numbers concept. Problems of Hydraulic Jump, Venturi flume.	10 hours
Module-II **Dimensional analysis & model similitude**: Introduction to Dimensional Analysis unit & dimensions, Table of Dimensions Dimensional Homogeneity, Methods of Analysis, Rayleigh's & Buckingham's method. Problems on Rayleigh's & Buckingham's methods, Model Studies, Introduction, Similitude, Dimensionless parameters. Types of models. Froude's models theory & problems. Reynolds models, Problems, Scale effects.	6 hours
Module –III **Impact of jets on vanes**: Introduction to Impulse – momentum equation and its applications, Force exerted by a jet on a fixed target, Derivations. Force exerted by a jet on a moving target, Derivations. Force exerted by a jet on a series of curved vanes. Force exerted on a by a jet on hinged plate. Concept & of velocity triangles. Equation for work done & efficiency. Problems on above.	8 hours
Module IV **Hydraulic turbines:** Introduction, Types and classifications, Pelton Wheel, theory. Expression for work done and efficiency, design parameters. Problems on Pelton Wheel; Francis Turbine – Theory, equation for work done and efficiency,	8 hours

design parameters. Problems on Francis turbine, Problems on Kaplan turbine.	
Module –V Draft tube theory and problems. Specific speed of a turbine, Equation for the specific speed, problems, Unit quantities of a turbine, definitions, equations and problems Characteristics curves of turbine, general layout of hydroelectric plants. Definition of pump, difference between pump & a turbine, classification, Description & general principle of working, priming & methods. Work done & efficiencies of a centrifugal pump.	10 hours

Question paper pattern:
Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Text books:

1. P N Modi and S M Seth, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", 20th edition, 2015, Standard Book House, New Delhi
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi
3. S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill, New Delhi

Reference Books:

1. Victor L Streeter, Benjamin Wylie E and Keith W Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co Ltd., New Delhi, 2008(Ed).
2. K Subramanya, "Fluid Mechanics and Hydraulic Machines", Tata McGraw HillPublishing Co. Ltd.
3. K Subramanya, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd.
4. J. F. Douglas, J. M. Gasoriek, John Swaffield, Lynne Jack, "Fluid Mechanics", Pearson, Fifth Edition.
5. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", Oxford University Press.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Identify basic principles of flow through open channels and impact of jets on fluid machines.	C1
	CO2	Analyze the flow problems by solving the examples of open channel flow and fluid machines.	C4
	CO3	Organize computation design of conveyance system in open channels also design of fluid machines.	C4
	CO4	Analyse the efficiency of different hydraulic machines and their suitability to the desired situations.	C2
	CO5	Understand working, construction and suitability of pumps to the desired situations.	C3

ADVANCED SURVEYING		
Subject Code	19CV43	Credit: 03
Number of Lecture Hours/Week	3 (Theory)	SEE: 50 Marks
Total Number of Lecture 52Hours	CIE: 50Marks	SEE: 03 Hours

Modules	Teaching Hours
Module -1 **Theodolite:** classification, part of vernier Transit Theodolite (VTT), fundamental lines and their relations, temporary adjustments **Basic Measurement Using VTT: Measurement** of horizontal angle by repetition and reiteration method, measurement of vertical angle. **Trigonometric Surveying**: Determination of Heights and Distances: of an accessible object, Inaccessible object by single plane and double plane methods	10 Hours
Module - 2 **Tachometry**: Definition, instruments used, Characteristics, Advantages, and Applications of Tachometry. Types of tachometry- Stadia method (Fixed Hair and Movable Hair) Fixed Stadia Hair Method: principle-determination of constant (Horizontal Line of Sight), Derivation of height and distance formula-staff held vertical, Analectic lenses, Numerical problems. **Movable Hair**: working Principle, Tangential Method-Principle, height & distance formula (All 3 Cases), Numerical Problems.	10 Hours
Module -3 **Simple Curves**: Definition, Designation-Elements of curves (No Derivations) Setting out of Simple curves–Linear methods- Perpendicular offsets from long chord, Chords Produced method, Radial and Perpendicular Offsets form tangent, Instrumental method - Rankin's method. **Compound Curves**: Definitions, Elements, Derivation, Setting and Numerical problems on case-1 type, Reverse Curves: Definition, Elements, Reverse curve between Parallel Straights (Numerical problems on Equal Radius method).	11 Hours
Module-4 **Vertical curve** –Definition, Need & Types. Determination of length of vertical curves-summit & valley curves (No Derivations), Numerical Problems on Setting Out of Vertical Curve by Tangent Correction Method (only), **Transition Curves**: Definition, Need, Requirement of Transition curves. **Aerial Photogrammetry**: Introduction, Basic Terms, Aerial Camera (AC), Vertical Photographs-Definition, Determination of Focal length of AC, Scale of aerial photograph, Height of flight, Ground	11 Hours

coordinates- Numerical Problems. **Flight Planning for Aerial Photography**: Objectives and Numerical Problems.	
Module-5 **Advanced Surveying Instruments**: Total Station, parts of total station, capabilities of a total station, components of total station and their functions, salient features of total station, calculation of reduced level of the prism station, coordinate measurement by total station, advantages and disadvantages of total station, GPS--Working Principle and Application.	10 Hours

Question paper pattern

1.Answer Any 5 Full Questions Selecting At least One Question from Each Unit.
2. In Each Unit, 2 questions of 20 marks each should be set, covering full syllabus of each unit.Each Question Should Not Have More Than 4 bits. (Sub Divisions)

Text books:

1. B.C. Punmia, Surveying Volume-11, Jain Publications, New Delhi-2009 Publications, New Delhi, 2009.,
2. Bhavikatti, Surveying and Leveling, 3rd Edition, Hubli, 2008
3. Dr. K. R. Arora, Plane and Advanced Surveying, Standard Book House, New Delhi, 7th Edition-2009.
4. GIS and Remote Sensing by Angered- 3rd Edition, Indian Publications, Hyderabad-2014.
5. Plane surveying by Dr. A M Chandra, New age international publications.

Reference Books:

1. Advanced Surveying and Applications-.K. R. Arora-VOL-II, Standard Book House, New Delhi, 9TH Edition-2015
2.Fundamentals and Applications of Remote Sensing-Lilly Sand and Keifer 4th Edition-2011
3.Geographic Information Systems- Albert Young and C.P. Lo-Preintice Hall Publications, 5th Edition-2013.

E books and online course materials: www.civilenggebooks.com

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the knowledge of different theodolite in execution of different civil engineering problems	
	CO2	Knowledge about principles of tachometer and problems on tachometer survey**.**	
	CO3	Able to understand the simple curves and its methods. and to solve the problems on compound curves.	
	CO4	Knowledge about vertical curves, transition curves, To solve problems on aerial photogrammetry	
	CO5	To acquire knowledge of total station and its operations, functions and applications. GPS working principles	

ENGINEERING GEOLOGY		
Course Code	19CV44	CREDIT:03
Number of Lecture Hours/Week	3 Hrs (Theory)	SEE: 50
Total Number of Lecture Hours :42	CIE: 50	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. The scope of geology in terms of its academic significance.
2. Types of geological agents, and details of weathering of rocks.
3. Importance of rock forming minerals, advantage of the physical properties in identification.
4. Salient features of rocks.
5. Common types of structures such as folds, faults, joints and unconformities.
6. Relation between geology and geophysics.
7. Source of water to meet the increasing demand of water.

Modules	Teaching Hours
Module I **Introduction**: Definition and Branches of geology, Internal structure of the Earth and its composition. Importance of geology in civil engineering. **Mineralogy**: Definition of the mineral, deference between ore forming and rock forming minerals, Important physical properties of the minerals, such as Color, Streak, Lustre, Diaphaneity, Hardness, Specific gravity, Cleavage, Fracture, and Tenacity. Description of the following minerals, Quartz and its verities, Calcite, Talc, gypsum, Fluorite. Apatite. Corundum, Assebestose, Kainite, Beryl, Mica, Garnet, Barite, etc. Ore forming minerals like Hematite, Pyrolsite, Magnetite, Limonite magnsite, Gybbsite, Bauxite, Banded hematite quartzite etc.	8 hours
Module-II **Petrology:** Definition of the rocks, formation and general classification of the rocks. igneous rocks, sedimentary rocks metamorphic rocks. **Igneous rocks**: Definition, Forms, Texture, Structure, and Classification of the Igneous rocks. Description and physical properties of the following rocks. Granite, Syanite, Diorite. Dolerite, Basalt, Felsites, Pumice, Pegmatite, Trachite etc. **Sedimentary rocks**.: Definition, Structure, and Classification of the Sedimentary rocks. Description and Physical properties of the following rocks. Conglomerate, Breccias, sandstone, shale, Limestone, laterite, coal, etc. **Metamorphic rocks**: Definition, Agents and kinds of metamorphic rocks. Description and physical properties of the following rocks. Gneiss, Marble, Schist, Quartzite, Slate, Charnokite, Phyllite etc.	8 hours
Module –III **Geomorphology and geodynamics:** Hypo genetic and Epigenetic agents **Weathering**: Definition, Deferent kinds of weathering with examples. **Soil**: Definition, Soil profile, Classification, Erosion, and Conservation of the Soil. **Earthquake**: Causes, Effects, Classification, Concept of plate tectonics	8 hours

Geomatics and environmental geology: Application of Remote Sensing and GIS techniques in civil Engineering works. impacts of mining, Quarrying, dams, reservoirs.	
Module IV **Structural geology:** Elements of structural geology, dip, strike, Clinometer's compass Description Classification, and engineering importance of folds, faults, unconformities and joints. **Groundwater geology**: Hydrological cycle, water bearing properties of rocks. Aquifers, types of Aquifers Aquiclude, Aquitar etc. brief description about geological and geophysical methods of ground water investigation. detail study of electrical resistivity method.	5 hours 5 hours
Module –V **Geological site investigation**: Geological consideration and brief description about Dams, Reservoirs, Tunnels, Highways, Bridges, Rocks as materials for construction, Flooring, Foundation, Roofing Decoration, and road materials.	8 hours
Question paper pattern: Two questions to be set from each module. students have to answer each question from every module.	
Text books: 1) Garg S.k " physical and engineering geology "Khanna publication new Delhi. 2) Parbinsingh "Engineering and general geology" kaston publication house. 3) p. k. Mukharjee: A text book of geology.	
Reference Books: 1) Legeet, "Geology of engineers" McGraw hill company 1998 2) Blyth : geology of engineers ELBS 1995 3) m .t marutesh reddy "Elements of geology practical's ". new age international pvt ltd 2003 4) H.H READ "rutleys Elements of mineralogy". CBS PUBLISHER 2003 5) billings " Structural geology, 6) Pradeep kumarghua ." Remote sensing for bingers " east west press ltd	
E books and online course materials: www.civilenggebooks.com	
Course outcomes: **On completion of the course, the student will have the ability to:**	

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	IDENTIFY THE different types of minerals with respect to their physical properties.	C2
	CO2	IDENTIFY THE DIFFERENT TYPES OF ROCKS THAT IS IGNEOUS, SEDIMENTARY & METAMORPHIC	C2
	CO3	Select the suitable area for the particular construction with reference to their geological structures i.e., folds, faults, and joints etc.	C2
	CO4	Understand the subsurface strata's with respect to water table and saturated zone	C3
	CO5	Describe the applications of geological background to some civil engineering work, which required for the design of civil engineering work.	C2

Course Title **CONCRETE TECHNOLOGY**		
Course Code	19CV45	Credit: 03
Number of Lecture Hours/Week	3 Hrs (Theory)	SEE:50 Marks
Total Number of Lecture Hours: 42	CIE:50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Hydration of cement and physical properties of cement and types of cement.
2. Physical properties of course and fine aggregate.
3. Design of concrete mix.
4. Fresh and hardened state property of concrete.
5. Destructive and Non-destructive testing of concrete.

Modules	**Teaching Hours**
Module I **Cement:** Manufacture of OPC by dry and wet process (Flow charts only). Oxide composition, compound composition of cement, hydration of cement, capillary pore, gel pore. Tests on cement- Fineness by sieve test and Blaine's air permeability test, normal consistence test, setting time, soundness, compressive strength of cement. Types of Cement	7 hours
Module-II **Aggregate:** Coarse aggregate, importance of size, shape, texture, grading of aggregates-sieve analysis, specific gravity, moisture content, bulk density, bulking of fine aggregate, flakiness and elongation index, crushing, ten percent fine value test, impact and abrasion tests, deleterious materials. Grading requirements, practical grading, gap grading.	7 hours
Module -III **Concrete Mix Design:** Factors to be considered in mix design, different methods of mix design. Mix design by IS method and Current British method. **Fresh Concrete:** Workability- factors affecting, measurement of workability-slump, compaction factor, Vee-bee consistometer, flow tests. Segregation and bleeding, mixing, placing and compaction. Curing and methods of curing, accelerated curing. SCC	5 hours 5 hours
Module IV **Fresh Concrete:** Chemical admixture-plasticizer, superplasticizer, accelerators, retarders and air entraining agents. Mineral admixtures- fly ash and silica fume. **Hardened Concrete:** Factors affecting strength- w/c, degree of compaction, age, aggregate/cement ratio, aggregate properties, maturity concept. Elasticity, factors affecting modulus of elasticity, relation between modulus of elasticity and Poisson's ratio.	5 hours 5 hours

Shrinkage- types of shrinkage, factors affecting shrinkage. Creep-factors affecting creep, effect of creep. Durability-importance, permeability, sulphate attack, chloride attack, carbonation, freezing and thawing. Factors contributing to cracks in concrete shrinkage, settlement cracks construction joints	
Module -V **Testing:** Relation between tensile strength and compressive strength. Destructive testing-compressive strength, flexural strength, split tensile strength, factors influencing strength test results. Failure criteria, fracture mechanics. Nondestructive testing-types, principles, application and limitations of rebound hammer and ultrasonic pulse velocity tests.	8 hours

Question paper pattern:
Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Textbooks:

1. Neville A.M. "Properties of Concrete"-4th Ed., Longman.
2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
3. Kumar Mehta. P and Paulo J.M. Monteiro "Concrete-Microstructure, Property and Materials", 4th Edition, McGraw Hill Education, 2014
4. A.R. Santha Kumar, "Concrete Technology", Oxford University Press, New Delhi (New Edition).

Reference Books:

1. M L Gambir, "Concrete Technology", McGraw Hill Education,2014.
2. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
3. Job Thomas, "Concrete Technology", CENGAGE Learning,2015.
4. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete BMTPC.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Explain manufacturing of cement and the significance of physical properties of cement.	C2
	CO2	Describe and identify the requirements of good quality fine aggregate and coarse Aggregate.	C3
	CO3	Design a concrete mix and Explain the fresh state property requirements of concrete and	C4
	CO4	Evaluate the influence of different parameters on the properties of hardened concrete	C3
	CO5	Analyze the quality of hardened concrete using the results of different types of destructive and non-destructive method of tests.	C2

CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS		
Course Code	19HU46	Credit: 00
Number of Lecture Hours/Week	2 Hrs (Theory)	SEE:50 Marks
Total Number of Lecture Hours: 28	CIE:50 Marks	SEE: 02 Hours

Prerequisite: none

Course objectives:
To enable the student to acquire the knowledge in the

1. The Constitution of India and Professional Ethics in the following topics: -
2. Introduction and Fundamental Rights
3. Directive Principles of the State Policy and the State Executive
4. The Union Executive
5. Constitutional Provisions for women, Children & SC/ST 'S , Emergency
6. Provisions and Election Process
7. Engineering Ethics

Modules	Teaching Hours
Module I **Introduction and Fundamental Rights**: The Constitution of India. Evolution of the Constitution. The Constituent Assembly of India. Sources and Features of the Indian Constitution. Preamble to the Constitution of India. Salient Features of Fundamental Rights and their classification. General exercise of Fundamental Rights and their limitations. RTI (Right to Information Act of 2005 Under Article 19(1)) and The Right of Children to Free and Compulsory Education Act or Right to Education Act (RTE) Under Article 21-A of the Constitution. Article 371(J) of the Constitution applicable to Hyderabad Karnataka Area	6 hours
Module-II **Directive Principles of the State Policy and The State Executive**: Under Article 36 to 51 of The Constitution and their Relevance. Fundamental Duties Under Article 51A of The Constitution and their Relevance. State Government - The Governor- Appointment, Powers and Functions of the Governor. The Appointment of Chief Minster, his Powers and Functions. The State Council of Ministers and their Functions. The State legislature and The State Council. The High Court of the State, its Powers and Jurisdiction. Appointment and Qualifications of High Court Judges.	6 hours
Module -III **The Union Executive**: Central Government. The President of India, his Election, Powers and Functions. The Vice-President of India, his Election, Powers and Functions. The Supreme Court of India and its Structure. Appointment and Qualification of Supreme Court Judges. Their Powers and Functions. The Structure of Judiciary in India. The	6 hours

Parliament of India. The Prime Minister, his Appointment, Powers and Functions. The Union Council of Ministers their Powers and Responsibilities. Concept of Public Interest Litigation (PIL)	
Module IV **Constitutional Provisions and Emergency Provisions and Election Process:** Constitutional for Women, Children, Backward Classes and Scheduled Caste and Scheduled Tribes under different Article of The Constitution. Different types of Emergencies under Article 352, 356 and 360 of the Constitution of India. The Election Commission of India- its Powers and Functions. The State Election Commission	6 hours
Module -V **Engineering Ethics:** Its Aims and Scope, Responsibilities of Engineers, Impediments to their Responsibilities, Honesty, Integrity, Reliability, Risk and Safety Measures, Liabilities of Engineers.	6 hours

Question paper pattern:
Two questions to be set from each Module by intermixing (in total 10). Students have to answer any five full questions by selecting one question from each module.

Textbooks:
1. An introduction to the constitution of India and Profession Ethics. By B. R. Venkatesh and Merunandan K. B. Publisher: Idea International Publication Bangalore.
2. The Constitution of India and Professional Ethics. By K. R. Phaneesh. Publisher: Sudha Publication Bangalore.
3. Professional Ethics. By S. Chand. Publisher: S. Chand & Company Ltd. Ram Nagar, New Delhi - 110055

Reference Books:
1. Constitution of India and Professional Ethics By: M Raja Ram. Publisher: New Age International(P) Limited, New Delhi.
2. The Constitutional law of India By: J. N. Pandhey . Publisher: Central Law agency, Allahabad.

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Explain the evolution and features of constitution, fundamental rights and their classification	C2
	CO2	Describe the directive principles of state policy, fundamental duties and The State Executive	C2
	CO3	Describe about The Union Executive and concept of Public Interest Litigation	C2
	CO4	Explain the Constitutional Provisions for women, children, SC/ST'S, Emergency Provisions and Election Process	C2
	CO5	Identifies the qualities required for an professional engineers to be ethical	C4

ENGINEERING GEOLOGY LAB		
Course Code	19CVL47	CREDIT:01
Number of Lecture Hours/Week	2 hrs (Practical)	SEE: 50 Marks
Total Number of Lecture Hours: 28	CIE: 50Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the

1. Various types, of minerals with their physical properties.
2. Various types of Rocks, and their Physical properties.
3. Dip and strike of various structural features.
4. Drawing the geological section maps.

Experiments	Teaching Hours
1) Hardness test	3 Hrs.
2) Detail study of the physical properties of the following minerals Rock forming minerals quartz and its verities, feldspar and its verities, gypsum, calcite, fluorite, apatite, topaz, corundum, beryl, asbestoses, kyanite, biotite, muscovite, talc, kaolin, garnet, **Ore forming minerals**, such as hematite, magnetite, magnasite, limonite, gibbsite, chalcopyrite, pyrite, chromite's, pyrolsite, psyllomelane, bauxite, banded hematite quartzite, graphite.	6 Hrs
3) Detail study of the physical properties of the following rocks in hand specimens. **Igneous rocks:** description and engineering use of the following rock. Granite, syenite, dolerite, diorite, felsite, trachyte, pumice, basalt, pegmatite, rhyolite. Etc	3 Hrs
Sedimentary rocks: description and engineering use of the following rock. Limestone, sandstone, laterate, shale, conglomerate, breccias etc.	3 Hrs
Metamorphic rocks: description and engineering use of the following rocks. Marble, schist, quartzite, slate, genesis, phyllite, charnokiteetc.	
4) Dip and stike problems.	3 Hrs
5) Thickness problems.	3 Hrs
6) Three-point bore hole problems.	3 Hrs
7) Geological section map drawing	4 Hrs

Question paper pattern:

Q1. Identification of the given mineral's minimum no 12-14.

Q2. Identification off given rocks minimum no 12-14.

Q3. Draw the given geological section map and explain geology of that area.

Q4. Solve each problem on dip and strike, thickness, three-point borehole

problems.

Text books:
Papers from the international journals (Scopus index and web of science).

Reference Books:
Papers from the international journals (Scopus index and web of science).

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the concepts of Geology theory course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the experiments and determine Hardness test, detail study on physical properties of rock and ore minerals, igneous rock, sedimentary rock, metamorphic rock, determine problems on dip and strike, thickness, three-point borehole and geological section map drawing parameters.	C3
	CO4	Analyse the data and interprete the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

STRENGTH OF MATERIALS LAB		
Course Code	19CVL48	CREDIT:01
Number of Lecture Hours/Week	2 hrs (Practical)	SEE: 50 Marks
Total Number of Lecture Hours: 28	CIE: 50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Determine tensile, compressive, torsional, shear and Impact strength of steel samples and interpret the results.
2. Determine compressive strength and bending strength of wood samples and interpret the results
3. Determine strength properties of brick and tile and interpret the results.

		Teaching Hours
1.	Tension test on Mild Steel.	02 Hrs
2.	Tension test on HYSD bar	02 Hrs
3.	Torsion test on Mild Steel circular sections.	02 Hrs
4.	Bending test on Wood under two-point loading.	02 Hrs
5.	Compression test of Mild Steel, Cast iron and Wood.	02 Hrs
6.	Shear Test on Mild Steel.	02 Hrs
7.	Impact test on Mild steel (Charpy & Izod)	02 Hrs
8.	Hardness test on ferrous and non-ferrous metals-Brinell's Rockwell and Vickers's methods.	02Hrs
9.	Test on Bricks: Compressive strength, Water absorption and Efflorescence.	02 Hrs
10.	Test on Tiles: Flexural strength, abrasion resistance.	02 Hrs
11.	Demonstration of Strain gauges and Strain indicators.	06 Hrs

Question paper pattern:

Student have to conduct two tests one on major experiments (1 to 4 in syllabus) and one test on remaining experiments (5 to 11 experiments). Picked by the student and he has to prepare writeup and conduct experiment.

Reference Books:

1. Davis, Troxell and Hawk, Testing of Engineering Materials, International Student edition-Mcgraw Hill Book Co. New Delhi.
2. Fenner, George Newness, Mechanical Testing of Materials Ltd., London.
3. Holes K. A, Experimental Strength of Materials, English Universities Press Ltd. London.

E books and online course materials: www.civilenggebooks.com			
Course outcomes: **On completion of the course, the student will have the ability to:**			
Course Code	**CO #**	**Course Outcome (CO)**	**Blooms Level**
	CO1	Demonstrate the concepts of SOM theory course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the experiments and determination of Tension test, Compression test, Torsion test, Bending test, Shear Test, Impact test on Mild steel (charpy& Izod)**,** Hardness test, Test on Bricks: Compressive strength, Water absorption and Effloroscence, Test on Tiles: Flexural strength, abrasion resistance, Demonstration of Strain gauges and Strain indicators parameters.	C3
	CO4	Analyze the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

ADVANCE SURVEYING LAB-1		
Course Code	19CVL49	CREDIT 01
Number of Lecture Hours/Week	2 hrs (Practical)	CIE: 50 Marks
Total Number of Lecture Hours: 28	CIE: 50 Marks	SEE: 03 Hours

Prerequisite: none

Course objectives:
To enable the student to acquire the knowledge in the following topics

EXPERIMENTS	Teaching Hours
1.a) Measurements of horizontal angles by Reiteration method using transit theodolite.	02 Hours
2. Measurement of vertical angle using transit theodolite.	02 Hours
3.To Determine of Distance and elevation of an inaccessible object using single plane method.	02 Hours
4. To Determine the Distance and Elevation of an object using double plane method when the base of an object is inaccessible.	02 Hours
5.To Determine the Distance and Elevation of an object, when line of sight is inclined by fixed stadia hair system of tachometry.	02 Hours
6. To determine the tachometer constant using horizontal and inclined line of sight.	02 Hours
7 To Setout simple circular curve by Rankine's deflection angle method	02 Hours
8. Introduction to Total Station, Parts of total station and their functions, setting up, levelling up and centering of TS.	02 Hours
9. Determination of distance between two inaccessible points using RDM and determination 0f height of any object using REM.	02 Hours
10 Exposer of total station for orientation by back sighting	02 Hours
11. Determine the area of field by using total station.	02 hours
12. Exposure of use the total station for traversing & using relevant software for preparation of the contour drawing.	02hours

13 Exposure of use the total station for stake out. 14 Exposure of total station for free stationing 15 Demonstration of digital planimeter for Finding area of contour	02hours 02hours 02 Hours

Question paper pattern:
Conduct any one experiment by picking up student and he has to prepare writeup and conduct experiment.

Text books:

1 Bhavikatti S S, surveying & levelling, 3 edition, hubli-2008
2 K R Arora, plane and advanced surveying, standard book house, New Delhi
3 B C Punmia, surveying volume-ii, jain publication, New Delhi

Reference Books:

E books and online course materials:
www.civilenggebooks.com

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)	Blooms Level
	CO1	Demonstrate the concepts of Survey theory course through series of experiments.	C2
	CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C3
	CO3	Perform the experiments of Advance survey	C4
	CO4	Analyse the data and interpret the results.	C4
	CO5	Prepare a well-organized laboratory report.	C3

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

SCHEME AND SYLLABUS

FOR B.E. V SEMESTER AND VI SEMESTER

FOR THE ACADEMIC YEAR 2021-22

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr. Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.
- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAMEDUCATIONALOBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

V SEMESTER

Code No.	Course	Hours/Week					Maximum Marks		
		Lecture	Tutorial	Practical	Self-study	Credits	CIE	SEE	Total
THEORY									
19CV51	STRUCTURAL ANALYSIS -II	3	2	0	-	4	50	50	100
19CV52	GEOTECHNICAL ENGG - I	3	--	0	-1	3	50	50	100
19CV53	ENVIRONMENTAL ENGG-I	3	--	0	1	3	50	50	100
19CV54	DESIGN OF R.C.C STRUCTURES	3	2	0	-	4	50	50	100
19CV55x	INDUSTRIAL ELECTIVE	3	--	0	-	3	50	50	100
19HU01	RECRUITMENT PROCESS TRAINING-I	1	--	0	-	1	50	50	100
	PRACTICAL								
19CVL57	GEOTECHNICAL ENGINEERING LAB	0	0	2	-	1	50	50	100
19CVL58	CONCRETE LAB	0	0	2		1	50	50	100
19CVL59	ENVIRONMENTAL ENGG LAB	0	0	2	-	1	50	50	100
TOTAL		18	04	06	2	21	500	500	1000

INDUSTRIAL ELECTIVE:

19CV551	MECHANISATION IN CONSTRUCTION
19CV552	INDUSTRIAL SAFETY AND HEALTH
19CV553	ALTERNATE BUILDING MATERIALS

VI SEMESTER

Code No.	Course	Hours/Week					Maximum Marks		
		Lecture	Tutorial	Practical	Self-study	Credits	CIE	SEE	Total
	THEORY								
19CV61	WATER RESOURCES ENGG	2	2	0		3	50	50	100
19CV62	GEOTECHNICAL ENGG - II	3	--	0	1	3	50	50	100
19CV63	TRANSPORTATION ENGG	3	---	0	-	3	50	50	100
19CV64x	ELECTIVE – I	3	--	0	-	3	50	50	100
19CV65x	ELECTIVE - II	3	--	0	-	3	50	50	100
19CV6OEx	OPEN ELECTIVE-I	3	--	0	-	3	50	50	100
19HU02	RECRUITMENT PROCESS TRAINING-II	1	--	0	-	1	50	50	100
	PRACTICAL								
19CV67	EXTENSIVE SURVEY PROJECT*(MINI PROJECT)	1	0	2	-	2	50	50	100
19CVL68	HIGHWAY MATERIAL TESTING LAB	0	0	2	-	1	50	50	100
19CVL69	SOFTWARE BASED LAB	1	0	2		2	50.	50	100
	INTERNSHIP	To be carried out during the intervening vacations of VI and VII semesters			-	--	--	--	--
TOTAL		20	02	06	01	24	500	500	1000

THIS HAS TO BE CONDUCTED DURING VACATION BETWEEN 5TH& 6TH SEMESTER

ELECTIVE I	ELECTIVE - II	OPEN ELECTIVE-I
19CV641- STRUTURAL DYNAMICS	19CV651- THEORY OF ELASTICITY	19CV6OE11 - ECOLOGY AND ENVIRONMENT
19CV642- DESIGN OF MASONRY STRUCTURES	19CV652-BUILDING SCIENCE AND ENGG.	19CV6OE12 - REMOTE SENSING & GIS
19CV643 - GEOMATICS	19CV653- MAT LAB AND APPLICATION	19CV6OE13 - NUMERICAL METHODS IN CIVIL ENGINEERING

STRUCTURAL ANALYSIS -II		
Subject code	19CV51	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Elements of civil engineering, Strength of materials & Structural analysis- I

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Analysis of continuous beams and portal frames by slope deflection, moment distribution, Kani's and Matrix methods of Analysis.
2. Analysis of pin jointed redundant frames.
3. Basics of structural dynamics and SDOF vibration.

Modules	Teaching Hours
Module I **Slope Deflection method:** Introduction, Sign convention, Development of slope deflection equations, Analysis of continuous beams (with and without translatory motion of joints), Analysis of portal frames (Only orthogonal frames with and without translatory motion of column heads	8 hours
Module-II **Moment Distribution Method:** Introduction, Definition of terms, Development of the method, Analysis of continuous beams (with & without translatory motion of joints), Analysis of non-sway type of frames Analysis of sway type of orthogonal portal frames	8 hours
Module-III **Kani's Method of analysis:** Introduction, Development of the method, Analysis of continuous beams (with & without translatory motion of joints), Analysis of non-sway portal frames, Simplified analysis of symmetrical portal & multistoried frames (only up to two stories) without lateral sway Analysis of portal frames with lateral sway (due to unsymmetrical vertical loading only)	8 hours
Module -IV **Introduction To Matrix Methods:** Structure Stiffness Method, Fundamentals of the Stiffness Method Equivalent joint loads Displacement, Transformation matrix, Member Stiffness matrix, Total stiffness or System stiffness matrix. Concept of Direct stiffness method and application to continuous beam (D.O.F. 3) Structure Flexibility Method Fundamentals of Flexibility Method Element Flexibility Matrix Principle of contra gradience, and force Transformation Matrix, Member flexibility Matrix. Application to continuous beam (Static Indeterminacy with D.O.F 3)	8 hours
Module-V **Structural Dynamics:** Introduction, Brief History of structural Dynamics Some Basic Definitions Vibration of Single degree of Freedom system, Undamped, Damped, Free Vibrations Logarithmic Decrement. Redundant Frames: Introduction Analysis of Trusses (Redundant up to second degree) Stresses due to error in length (Up to two members)	8 hours 2 hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Analyze indeterminate beams and portal frames slope deflection, moment distribution for gravity and lateral loading	C3
CO2:	Analyze indeterminate beams and portal frames by moment distribution method for gravity and lateral loading	C3
CO3:	Analyze indeterminate beams and non-sway& sway (due to unsymmetrical vertical loading only) type portal frames by kani's method.	C3
CO4	Analyze indeterminate beams and portal frames by Matrix methods of Analysis	C3
CO5	Analyze redundant pin jointed frames and explain the basics of structural dynamics and SDOF vibration.	C3

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.
2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.
3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.
2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.
3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

Nptel Link: https://youtu.be/oa5ojjGEUSw

E-Books: www.civilenggebooks.com

GEOTECHNICAL ENGG - I		
Subject code	19CV52	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering geology

Course objectives:

To enable the student to acquire the knowledge in the following topics.

1. Understand basic properties of soil
2. Use standard methods to classify soils
3. Determine compaction, permeability of soil.
4. Understand the structure and minerals of the soil.
5. Develop an understanding of Shear strength of soil.

Modules	Teaching Hours
Module I	
Introduction: Definition, origin and formation of soil, Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships and Density index. Field identification of soils.	4 hours
Index properties of soils and their determination: Index properties of soils- Water content, Specific Gravity, Particle size distribution, Consistency limits and indices, insitu density, Activity of Clay, Sensitivity of clay, Thixotropy of clay and collapsible soils. Laboratory determination of index properties of soils: Specific gravity by Pycnometer /density bottle method, particle size distribution (Sieve analysis and Hydrometer analysis only) , Liquid Limit Casagrande and cone penetration methods, Plastic limit and shrinkage limit determination.	6 hours
Module-II	
Classification of soils: Particle size classification – MIT classification and IS classification, Textural classification. Unified soil classification and IS classification - plasticity chart and its importance.	3 hours
Flow of water through soils: Darcy's law- assumptions and validity, coefficient of permeability and its determination (laboratory), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena.	5 hours
Module-III	
Clay mineralogy and soil structure: Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.	04 Hours
Compaction of soils definition: Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control-proctor needle.	04 Hours.

Module -IV **Consolidation of soils**: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory, assumption and limitations. Normally consolidated, under consolidated and over consolidated soils. Reconsolidation pressure and its determination by Casagrande's method. Laboratory one dimensional consolidation test. Determination of consolidation characteristics of soils-compression index. and coefficient of consolidation, Determination of coefficient of consolidation by square root of time fitting method and logarithmic time fitting method.	08 Hours
Module-V **Shear strength of soil**: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, measurement of shear parameters. Direct shear test, unconfined compression test, Triaxial compression test and vane shear test. Test under different drainage conditions. Conventional and modified failure envelops. Total and effective shear strength parameters, factors affecting shear strength of soils.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Determine the index properties of soil	C2
CO2:	Apply the principal of flow of water through the soil and also classify the soil	C3
CO3:	Explain the importance of clay mineralogy in soil structure and determine the density of soil by compaction	C3
CO4	Determine the consolidation parameters and settlement of soil due to consolidation	C3
CO5	Analyze the shear strength of soil for various site conditions	C3

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India.

Reference books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons.
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi.
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-Tata McGraw Hill Publications.
4. Debashis Moitra, "Geotechnical Engineering", Universities Press.,
5. Malcolm D Bolton, "A Guide to soil mechanics", Universities Press.,

Nptel Link: https://youtu.be/afirGWlleSM

E-Books: www.civilenggebooks.com

ENVIRONMENTAL ENGG-I		
Subject code	19CV53	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **None**

Course objectives: To enable the student to acquire the knowledge in the following topics:

1. Fundamentals of water supply engineering.
2. Various components of water supply.
3. Quantitative and qualitative assessment of water requirement.
4. Solve water unit design problems using hydraulic principles and methods.
5. Operation of water treatment units, advance treatment methods.

Modules	Teaching Hours
MODULE-I	
Introduction: Human activities and environmental pollution. Requirement of Water for various beneficial uses. Need for protected water supply.	02 Hours.
Demand of water: Types of water demands- domestic demand in detail, institutional and commercial, public uses, fire demand. Per capita consumption –factors affecting per capita demand, population forecasting, different methods with merits and demerits- variations in demand of water. Fire demand – estimation by Kuching's formula, Freeman formula and national board of fire underwriters' formula, peak factors, design periods and factors governing the design periods.	05 Hours
MODULE-II	
Quality of water: Objectives of water quality management. Concept of safe water wholesomeness, palatability and potable. water borne diseases.	05 Hours
Examination of water: objectives – Physical chemical and Microbiological Examinations, (IS: 3025 and IS: 1622) using analytical and instrumental techniques. Drinking water standards BIS and WHO standards. Health significance of Fluoride, Nitrates and heavy metals like Mercury and Cadmium. Sampling of water for examination.	05 Hours.
Sources: Surface and subsurface sources – suitability with regard to quality and quantity.	
MODULE-III	
Collection and conveyance of water: Intake structures – different types of intakes; factor of selection and location of intakes. Pumps- Necessity, types – power of pumps; factors for the selection of a pump. Pipes – Design of the economical diameter for the rising main; Nomograms – use; Pipe appurtenances.	05 Hours.
Water treatment: Objectives – Treatment of flow-chart. Aeration- Principles, types of aerators.	02 Hours
Sedimentation: Theory of settling tanks, types, design. Aided sedimentation – with coagulants, dosages, chemical feeding, flash mixing, and flocculator-design of all units.	03 Hours.

MODULE-IV **Filtration**: Mechanism – theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing filters. **Disinfections**: Theory of disinfections, methods of disinfections, Chlorination, chlorine demand, residual chlorine, use of bleaching powder.	03Hours. 03 Hours.
MODULE-V **Softening: D**efinition, methods of removal of hardness lime soda process and zeolite process. **Methods of distribution systems:** System of supply, service reservoirs and their capacity determination, methods of layout of distribution. Design of pipe networks **Miscellaneous:** Pipe appurtenances, various valves, type of fire hydrants, pipefitting, Location of water supply pipes in buildings **Concepts of rain water harvesting:** Importance of rain water harvesting and methods of rain water harvesting.	03 Hours. 04 Hours 02 Hours

Course outcomes: On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Estimate the water demand for a known population considering different influencing Parameters	C3
CO2	Evaluate the quality of water with reference to physical, chemical and biological parameters from different sources.	C4
CO3	Describe different types of intake structures, pumps and design the rising main	C4
CO4	Explain the steps involved in the water treatment and design sedimentation, filtration and disinfection units	C4
CO5	Describe the water softening techniques rain water harvesting methods and the concepts. Involved in the design of water distribution systems.	C2

Question paper pattern:
Two questions are to be set from each module.
Total five questions are to be answered by selecting minimum one question from each module

Text books:
1. Environmental Studies Benny Joseph Tata Mc Graw – Hill. 2ndEdition, 2012
2. Environmental Studies S M Prakash Pristine Publishing, Mangalore 3rdEdition, 2018
3. Environmental Studies – From Crisis to Cure R Rajagopalan Oxford Publisher 2005

Reference Books:
1. Principals of Environmental Science and Engineering Raman Sivakumar Cengage learning, Singapore. 2ndEdition, 2005
2. Environmental Science – working with the Earth G. Tyler Miller Jr. Thomson Brooks /Cole, 11thEdition, 2006
3. Text Book of Environmental and Ecology Pratibha Sing, Anoop Singh & Piyush Malviya Acme Learning Pvt. Ltd. New Delhi. 1stEdition

Nptel Link: https://youtu.be/zVZ9c6EXfTA

E books and online course materials:www.civilenggbooks.com

DESIGN OF R.C.C STRUCTURES		
Subject code	19CV54	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1.Basic concepts of RCC, Working Stress method, Limit state method.

2.Design of beams, slabs, staircases, columns and isolated column footing using LSM

3.Serviceability requirements.

Modules	Teaching Hours
Module I **Introduction:** Basic concepts of reinforced concrete, Methods and design philosophies in RCC design, Load and Load combinations, Stress- Strain behavior of concrete and steel, Working stress method (Elastic theory): Assumptions, concept of Transformed Area concept, Philosophy of limit state design, Characteristic loads and design loads, Characteristic. Strength and design strength, Limit State of Collapse- Flexure, Ultimate flexural strength of rectangular sections and flanged sections, Numerical examples for analysis of rectangular, flanged section in Flexure.	9 Hours
Module-II **Limit State of Collapse Shear:** Ultimate Shear strength of R.C. Sections, Limit State of Collapse - Torsion, Concepts of development length and anchorage in R.C. Sections, Numerical examples. Limit state of serviceability for deflection, Computation of short term and long-term deflection for Singly Reinforced Rectangular section as perI.S.456-2000. Limit state of serviceability for cracking, Control of cracking and computation of crack width as per IS 456-2000 for Singly Reinforced sections. Numerical examples on computation of deflection and crack width.	8 Hours
Module-III **Design of beams:** Codal requirements in the design of beams, cover to reinforcement, spacing of Reinforcement, curtailment and splicing of reinforcement, Design of reinforced rectangular beams (singly & doubly) with detailing. (Cantilever & simply supported). Design of flanged beams with detailing.	8 Hours
Module -IV **Design of slabs:** Introduction, General aspects in the design of slabs, Design & detailing of rectangular slabs spanning in one direction (Simply supported and Continuous) as per IS: 456-2000, Design & detailing of rectangular slabs spanning in two directions (Simply supported and Continuous) as per IS: 456-2000, Design & detailing of Cantilever slabs. **Design of staircase:** Introduction, Structural behavior of staircases, Loads and distribution of load on staircases as per IS: 456-2000, Design & detailing of	8 Hours

staircases (Dog legged, Open well type), Design concepts of Free-Standing Stair cases.	
Module-V **Design of columns:** Introduction, Limit state of compression, Minimum eccentricity, slenderness limits, Code provisions for reinforcement & detailing, Design & detailing of short axially loaded columns (Square &. Rectangular and circular), Design & detailing of short columns under axial load with uniaxial bending and axial load with biaxial bending using SP-16 (Square & Rectangular sections). **Design of footing**: Introduction, types of footing, Structural behavior of footing, selection of types of footing, footing shapes & size, Reinforcement requirement as per IS: 456: 2000, Design & detailing of Isolated footing of uniform depth & variable depth (Square & Rectangular footing).	9 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Analyze rectangular and flanged beams using working stress method	C3
CO2:	Analyze the beams using limit state approach for flexure, shear, torsion and also analyze the flexural members for limit state of serviceability	C3
CO3:	Design rectangular and flanged beams by limit state approach	C4
CO4	Design one way and two-way slabs and stair case using limit state approach	C4
CO5	Design columns and isolated column footing using limit state approach	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Unnikrishnan Pillai and Devdas Menon, “Reinforced Concrete Design”, McGraw Hill, New Delhi
2. Subramanian, “Design of Concrete Structures”, Oxford university Press
3. H J Shah, “Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)”, Charotar Publishing House Pvt. Ltd.

Reference books:

1. P C Varghese, “Limit State design of reinforced concrete”, PHI, New Delhi.
2. W H Mosley, R Husle, J H Bungey, “Reinforced Concrete Design”, MacMillan Education, Palgrave publishers.
3. Kong and Evans, “Reinforced and Pre-Stressed Concrete”, Springer Publications.
4. A W Beeby and Narayan R S, “Introduction to Design for Civil Engineers”, CRC Press.
5. Robert Park and Thomas Paulay, “Reinforced Concrete Structures”, John Wiley & Sons, Inc.

Nptel Link: https://youtu.be/pIdaC_I6H_M

E-Books: www.civilenggebooks.com

MECHANISATION IN CONSTRUCTION		
Subject code	19CV551	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: None

Course objectives:

This course enables students to understand

1. Various type of equipment's used in constructions advantage & limitations of these equipment's
2. Manufacturing of natural aggregate & recycled aggregate through mechanization.
3. Mechanization in rebar fabrication, concrete production, placement, types of form work & scaffolding and materials used.
4. Construction of bridge/flyover by segmented construction and box pushing technology for tunneling &pile driving equipment.
5. Construction methods of drilling blasting, tunneling &various equipment's used in this construction.

Modules	Teaching Hours
Module I **Introduction to mechanization:** Definition, advantages and limitations of mechanization, Indian scenario and Global scenario. **Mechanization through construction equipment:** Equipment cost, Machine power, production cycle-Dozers, scrapers, Excavators, finishing equipment, Trucks and Hauling equipment, Hoisting equipment, Draglines and Clamshells	10 hours
Module-II **Mechanization in aggregate manufacturing:** Natural aggregates and recycled aggregates	8 hours
Module-III **Mechanization in rebar fabrication** Mechanization in concrete production and placement **Mechanization through construction:** Formwork and scaffolding types, materials and design principles	8 hours
Module -IV **Mechanization through construction methods/technologies:** Segmental construction of bridges/flyovers, box pushing technology for tunneling, trench-less technology Pile driving equipment: Pile hammers, selecting a pile hammer, loss of energy due to impact, energy losses due to causes other than impact.	8 hours
Module-V **Mechanization through construction methods of drilling, Blasting and Tunneling Equipment:** Definition of terms, bits, Jackhammers, Drifters, wagon drills, chisel drills, piston drills, blast hole drills, shot drills, diamond drills, tunneling equipment, selecting the drilling method equipment, selecting drilling pattern. Selecting and Environmental issues in mechanization.	8 hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Definition and explaining of various construction equipment's.	C2
CO2:	Explain the manufacturing process of natural & recycled Aggregate	C3
CO3:	Explain the production and placement of concrete through Mechanization materials of formwork& design of formwork.	C3
CO4	Explanation on construction of bridge/flyover by segmental Construction&boxpushingtechnologyfortunnelingandpiledrivingequipment.	C3
CO5	Choose the sites for tunneling& drilling method equipment.	C3
Question paper pattern: i) Two questions are to be set from each module. ii) Total five questions are to be answered by selecting minimum one question from each module		
Text book: 1) Construction equipment by, S. C. Shrama		
Nptel Link: https://youtu.be/2B7DhQvL8kw		
E-Books: www.civilenggebooks.com		

INDUSTRIAL SAFETY AND HEALTH		
Subject code	19CV552	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

1.Understand the basics of risk assessment methodologies
2 Select appropriate risk assessment techniques
3 Analyze public and individual perception of risk
4 Relate safety, ergonomics and human factors
5 Carry out risk assessment in process industries

Modules	Teaching Hours
Module I **General Risk Identification Methods – I:** Hazard identification methodologies, risk assessment methods-PHA, HAZOP, MCA, consequence analysis, hazards in workplaces-nature and type of work places, types of hazards, hazards due to improper housekeeping, hazards due to fire in multi floor industries and buildings.	8 Hours
Module-II **Risk Assessment Methods – II:** Risk adjusted discounted rate method, certainty equivalent coefficient method, quantitative analysis, probability distribution, coefficient of variation method, Simulation method, Shackle approach, Hiller's model, Hertz Model.	7 Hours
Module-III **Risk Management – III:** Emergency relief Systems, Diers program, bench scale experiments, design of emergency relief systems, risk management plan, mandatory technology option analysis, risk management alternatives, risk management tools, risk management plans, risk index method, Dowfire and explosion method, Mond index Method.	7 Hours
Module -IV Property insurance, transport insurance, liability insurance, risk Assessment, low Probability high consequence events. Fault tree analysis, Event tree analysis.	7 Hours
Module-V Handling and storage of chemicals, process plants, personnel protection equipment's. International environmental management system.	7 Hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Recall risk assessment techniques used in process industry	C2
CO2:	Interpret the various risk assessment tools	C43
CO3:	Use hazard identification tools for safety management	C3
CO4	Analyze tools and safety procedures for protection in process industries	C3
CO5	Analyze tools and safety Chemicals and Environmental Management	C3

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Goetsch D. L (1999), "Occupational Safety and Health for Technologists, Engineers and Managers", Prentice Hall.
2. Heinrich H.W. (2007), "Industrial Accident Prevention- A Scientific Approach", McGraw-Hill Book Company National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991),
3. "Industrial Safety and Pollution Control Handbook.
4. Risks in Chemical units, Pandya C G, Oxford and IBH publications, New Delhi, 1992

Reference books:

1. Functional Safety in the Process Industry: A Handbook of practical Guidance in the application of IEC61511 and ANSI/ISA-84, Kirkcaldy K.J.D Chauhan, North Carolina, Lulu publication, 2012
2. Safety Instrumented Systems Verification Practical probabilistic calculations, Goble and William M. Pensulvania ISA publication,2005
3. Industrial safety and risk Management, Laird Wilson and Doug Mc Cutcheon. The University of Alberta press, Canada, 1st Edition,2003

Nptel Link: https://youtu.be/v-eltsixu4I

E-Books: www.civilenggebooks.com

ALTERNATE BUILDING MATERIALS		
Subject code	19CV553	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Building Material and Constructions.

Course objectives:

to enable the student to acquire the knowledge in the following topics:

1.Energy in building materials and environmentally friendly and cost-effective building technologies.

2.Properties and applications of alternate building materials.

3.Properties and applications of alternative building technologies.

4.Design of masonry compression elements.

5.Cost effective buildings design and equipment for production of alternative materials

Modules	Teaching Hours
Module I **Introduction:** Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry, and environmentally friendly and cost-effective building technologies. Requirements for building of different climatic regions. Traditional building methods and vernacular architecture **Alternate Building Materials:** Characteristics of building blocks for walls, stones and laterite blocks, Bricks and hollow clay blocks.	8 hours
Module-II **Alternate Building Materials: concrete blocks, stabilized blocks:** mud blocks, steam cured blocks, Fal-G Blocks stone masonry block. Lime Pozzolana cement: Raw materials, manufacturing process, properties and uses. **Fiber reinforced concrete-Matrix materials, Fibers:** metal and synthetic, properties and applications Fiber reinforced plastics, matrix materials, Fibers: organic and synthetic, properties and applications. Building materials from agro and industrial wastes. Types of agro wastes, Types of industrial and mine wastes, properties and applications. Field quality control test methods.	8 hours
Module-III **Alternative Building Technologies:** Alternative for wall construction, Types construction methods, Masonry mortars types, preparation and properties. Ferrocement and ferroconcrete Building components, materials and specifications. Properties, construction methods, applications, alternative roofing systems-concepts, filler slabs, composite beam panel roofs, masonry vaults and domes. **Structural Masonry:** Compressive strength of masonry elements, factors affecting compressive strength, of units, prisms, /wallets and walls, effect of brick work bond on strength.	8 hours
Module -IV **Structural Masonry:** Bond strength of masonry: Flexure and shear. Elastic properties of masonry materials and masonry. Equipment for Production of Alternative Materials: IS Code provisions, Design of	8 hours

masonry compression elements, concepts in lateral load resistance. **Repair materials:** Polymer based repair materials, cement-based repair materials**.**	
Module-V **Cost Effective Buildings Design:** Cost concepts in buildings, cost saving techniques in planning, design and construction. Cost Analysis: Case studies using alternatives **Equipment for Production of Alternative Materials:** Machines for manufacture of concrete, Equipment's for production of stabilized blocks. Moulds and methods of production of precast elements. **Concrete repair:** Repair Methodology-Determine cause, extent, severity and urgency of damage repaired damage concrete surface- ceiling of large and small cracks.	8 hours 2 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Understand environmentally friendly and cost effective Building technologies	C2
CO2:	Explain raw materials, manufacturing process, properties and uses of alternate building Materials.	C2
CO3:	Select alternative building technologies for wall construction. Factors affecting compressive masonry unit	C3
CO4	Design of masonry compression elements materials	C4
CO5	Choose cost saving techniques in buildings, equipment for Production of alternate materials repair methodology.	C3

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:
1. Alternative Building methodologies for engineers and Architects
2. K.S. Jagadish and B.V. Venkatraman Reddy. IISC Bangalore. Structural Masonry by Arnold W. Henry.

Reference books:
1.Relevant IS codes.
2.Alternative building materials and technologies.
3.Proceedings of workshop on Alternative building material and technology. 19thto 20th December 2003 at B.V.B College of Engineering and Technology Hubli

Nptel Link: https://youtu.be/05lQlQSBXm4

E-Books: www.civilenggebooks.com

GEOTECHNICAL ENGINEERING LAB		
Subject code	19CVL57	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engineering geology

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. Determination of Specific gravity, moisture content, Grain size analysis, density by core cutter
2. Determination of Consistency limits- Liquid limit, plastic limit and shrinkage limit.
3. Determination of Standard Proctor compaction test and Modified Proctor Compaction test,
4. Determination of Coefficient of permeability, Strength tests, Unconfined compression test, Direct shear test (for small and big particle size), Triaxial compression test

Modules	Teaching Hours
1. Test for determination of specific gravity and moisture content	2 hours
2. Grain size analysis of soil sample (sieve analysis) 3. Insitu density by core cutter and sand replacement methods.	2 hours
4. Consistency limits- Liquid limit (Casagrande and cone penetration methods), plastic limit and shrinkage limit.	2 hours
5. Standard Proctor compaction test and Modified Proctor Compaction test.	2 hours
6. Coefficient of permeability by constant head and variable head methods	2 hours
7. Strength tests	
a) Unconfined compression test	2 hours
b) Direct shear test (for small and big particle size)	2 hours
c) Triaxial compression test	2 hours
8. Consolidation test–determination of compression index and co -efficient of consolidation.	2 hours
9. Laboratory vane shear test	2 hours
a) Demonstration of miscellaneous equipment's such as Augers, Samplers, Rapid moisture meter, Proctor's needle.	2 hours
b) Demonstration of Hydrometer test.	2 hours
c) Demonstration of free Swell Index test	2 hours
d) Demonstration of determination of relative density	2 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1	Demonstrate the concepts of GT theory course through series of experiments**.**	C2
CO2	Sharetheresponsibilitiesinsmallteamsof4-5membersforconductingtheexperiments	C3
CO3	Perform the experiments and determination of specific gravity, moisture content, Grain size analysis of soil sample, core cutter and sand replacement methods, Liquid limit, plastic limit and shrinkage limit, Standard Proctor compaction test, Modified Proctor Compaction test, compression index, co-efficient of consolidation, Laboratory vane shear test, Hydrometer test, Swell index test, relative density.	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:
Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1. Soil testing –lab manual & question bank by KVS Appa Rao, VCS Rao, university science press
2. Punmia B C, Soil Mechanics and Foundation Engineering-(2017),16th Edition, Laxmi Publications co., New Delhi.
3. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.
4. Head K.H., "Manual of Soil Laboratory Testing" Vol. I, II, III, Princeton Press
5. Bowles J. E "Engineering Properties of Soil and Their Measurements", -Mc Graw Hill Book Co. New York.
6. Relevant BIS Codes of Practice: IS-2720 series

Nptel Link: https://youtu.be/55RwyS0-ySo

E-Books: www.civilenggebooks.com

CONCRETE LAB		
Subject code	19CVL58	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Concrete Technology

Course objectives:

To enable students to acquire the knowledge in the following topics:

Modules	Teaching Hours
Cement:	
Normal Consistency,	2 Hours
Setting time	2 Hours
Soundness by autoclave method,	2 Hours
Compression strength test and	2 Hours
Air permeability test for fitness,	2 Hours
Specific gravity of cement	2 Hours
Fresh Concrete Workability:	
Slump	2 Hours
Compression factor	2 Hours
Vee Bee Tests	2 Hours
Hardened Concrete:	
Compression Strength	2 Hours
Split tensile tests	2 Hours
Test on flexural strength of RCC beams,	2+2 Hours
Permeability of concrete	2 Hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1 :	Demonstrate the concepts of CT theory course through series of experiments.	C2
CO2 :	Sharetheresponsibilitiesinsmallteamsof4-5membersforconductingtheexperiments	C3
CO3 :	Perform the experiments and determination of specific gravity, Setting time of cement, soundness and Tests on Hardened concrete.	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:

Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1. M. L. Gambir, “Concrete Manual”, Danpat Rai and sons, New Delhi
2. Shetty M.S, “Concrete Technology”, S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, “Properties of Concrete”, Tata McGraw Hill Publications, New Delhi
4. Relevant codes.

Nptel Link: https://youtu.be/cx5gPKp9QEc

E-Books: www.civilenggebooks.com

ENVIRONMENTAL ENGG LAB		
Subject code	19CVL59	Credit: 01
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: None

Course objectives:

1. To enable the student to acquire the knowledge in the following topics
2. Determination of Solids in Water / Sewage, turbidity, electrical conductivity, optimum alum dosage, Sieve Analysis of Filter Sand.
3. Determination of Chlorides. Alkalinity, Acidity, Total Hardness, COD, BOD, percentage of chlorine,
4. Determination of pH. Sulphate, Fluoride. Iron. Nitrate.
5. Determination of Total Count Test, Most Probable Number (MPN).

Modules	Teaching Hours
I Analysis of Physical Parameters:	
1. Determination of Solids in Water / Sewage – Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.	2 Hours
2. Determination of Turbidity present in water.	2 Hours
3. Determination of Electrical Conductivity of water.	2 Hours
4. Determination of Optimum Alum Dosage.	2 Hours
5. Sieve Analysis of Filter Sand.	2 Hours
II Analysis of Chemical Parameters:	
1. Determination of Chlorides.	2 Hours
2. Determination of Alkalinity, Acidity.	2 Hours
3. Determination of Total Hardness, Calcium Hardness, Magnesium Hardness	2 Hours
4. Determination of Dissolved Oxygen, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD).	2 Hours
5. Determination of Percentage of Chlorine in Bleaching Powder, Residual Chlorine, Chlorine Demand	2 Hours
III Analysis of Chemical Parameters by Instrumental Methods:	
1. Determination of pH.	2 Hours
2. Determination of Sulphate.	2 Hours
3. Determination of Flouride	2 Hours
4. Determination of Iron.	
IV. Analysis of Biological Parameters:	
1.Determination of Total Count Test, Most Probable Number (MPN).	2 Hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Demonstrate the concepts of Environmental Engg theory course through series of experiments.	C2
CO2:	Sharetheresponsibilitiesinsmallteamsof4-5membersfor Conducting the experiments.	C3
CO3:	Perform the experiments and determination of Solids in Water, Sewage – Total Solids Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settle able Solids, Turbidity present in water, Electrical Conductivity of water, Optimum Alum Dosage, Filter Sand , Chlorides Alkalinity, Acidity, Total Hardness, Calcium Hardness, Magnesium Hardness, Dissolved Oxygen (DO), Biochemical Oxygen Demand(BOD),ChemicalOxygenDemand(COD),BleachingPowder,ResidualChlorine,ChlorineDemand,p^H,Sulphate,Fluoride, Iron, Nitrate, Total Count Test, Most Probable Number (MPN).	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:
Any one of the above experiments is to be conducted in the examination by the student.

Reference books:

1.Standard Methods for Examination of Water & Wastewater American Publication-Association of Water Pollution Control Federation, American Water Works Association, Washington DC (New Edition).
2.Manual of Water Wastewater Analysis – NEERI Publication.
3. IS Standards: 2490-1974, 3360-1974, 3307-1974.
4.Chemistry for Environmental Engineering By Sawyer & Macarty.

Nptel Link: **https://youtu.be/LeKqhMqEoKQ**

E-Books: www.civilenggebooks.com

VI SEMESTER

WATER RESOURSE ENGG		
Subject code	19CV61	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

to enable the student to acquire the knowledge in the following topics

1. Introduce importance of water resource engineering
2. Making students to understand basics of hydrology
3. Introduce problems involved in canal irrigation system.
4. Design of earthen Demand spillway

Modules	Teaching Hours
Module I **Introduction:** water resources engineering disciplines, water management sectors Water wealth of India. Hydrological cycle, water shed hydrology, measurement of precipitation by rain gauges Computation of precipitation, missing rainfall data, rainfall density, rainfall mass curve & hyetograph Problems on above.	8 Hours
Module-II **Runoff:** Runoff cycle, factors affecting runoff, computation of average annual runoff maximum runoff & problems. **Reservoirs:** Types, site selection, Investigation for reservoirs. Determination of storage capacity of reservoirs using mass curve, analytical method, storage zones of reservoir, economical height of dam.	8 Hours
Module-III **Canal irrigation:** Types of canals, alignment of canals, definition of gross command area, culturable command area, intensity of irrigation, time factor, capacity factor, kharif season, rabi season, types of crops & their duty, delta, base periods determination of canal capacity frequency of irrigation, field capacity. Crop factor. Consumptive use of waterborne criddle equation problems irrigation efficiency, L-section of canal, balancing depth of canal	10 Hours
Module -IV **Types of Dams & Spillways:** Rigid dans& non-rigid dams Gravity dams, Forces acting on gravity dams, design of elementary profile of gravity dam, Types of Spillways, Necessity location, ogee spillway. Design of ogee spillway, Energy dissipation below spillway. Use of hydraulic jump &design of stilling basin	8 Hours
Module-V **Earthen dams:** Types, Necessity, mode of failures of earth dams, Preliminary section, design sf earth dam, determination of Phreatic line in earth dams, seepage discharge, problems Control of seepage in earth dams & beat sketches. Design criteria of earth dans, stability of slopes, Fellenious method of locating critical slip	8 Hours

circle, swedesh Alip circle method Hours		
Course Outcomes: On completion of this course, students are able to:		
CO		**Blooms Level**
CO1:	Explain water management sectors and importance of water resource projects	C2
CO2:	Describe hydrological cycles and various components	C2
CO3:	Assess requirements of canal irrigation and gain knowledge about spillways and energy dissipating systems	C2
CO4	Design od Spillways and Dams	C5
CO5	Design earthen dam	C5

Question paper pattern:
Scheme of SEE: i) Two questions are to be set from each module. i) Total five questions are to be answered by selecting minimum one question from each module.

Text book:
1. S. K. Garg, “Irrigation Engineering and Hydraulic Structures”, Khanna Publishers, New Delhi.
2. Punmia and Pandey Lal, “Irrigation and Water Power Engineering” Lakshmi Publications, New Delhi.
3. K. R. Arora. “Irrigation, Water Power and Water Resources Engineering” Standard Publications, New Delhi.

Reference books:
1. Garg, S.K. "Hydrology & Water Resource Engineering" Khanna publications
2. Modi, P.N. "Irrigation, Water Resources and Water Power Engineering Standard Book
3. R.K. Sharma, "Hydrology & Water resources Engineering
House, New Delhi.
4. Punmia and Pandey Lal, Irrigation and Water Power Engineering Lakshmi Publications, New Delhi.

Nptel Link: https://youtu.be/fx1uUek3Iqg

E-Books: www.civilenggebooks.com

GEOTECHNICAL ENGG – II		
Subject code	19CV62	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Geotechnical Engineering – i

Course objectives:

to enable the student to acquire the knowledge in the following topics.

1. Understanding of the essential steps involved in a geotechnical site investigation.
2. Stresses induced under the different types of soils foundations due to the loads.
3. Determining the lateral earth pressures due different soil conditions.
4. Stability of earth slopes and estimating the seepage & exit gradient for various hydraulic structures.
5. Familiarize the students with the procedures used for: estimation of Bearing capacity and settlement sunder the foundation

Modules	Teaching Hours
MODULE-I	
Subsurface exploration: Importance, Exploration program, Methods of exploration: Boring, sounding tests, geophysical methods-Electrical resistivity and Seismic refraction methods. Types of samples- undisturbed, disturbed and representative samples. Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilization of boreholes. Typical boring log. Number and depth of borings for building and dams. Determination of ground water level by Hvorselev method	04 Hours
Drainage and Dewatering: Introduction, ditches and sumps, well point system, shallow well system, deep well drainage, vacuum method forced flow, electro-osmosis method.	04 Hours
MODULE-II	
Stress in soil: Bossinesg's and Westergaard's theories for concentrated, circular, rectangular, line and strip loads. Newmark's chart, Pressure bulb, contact pressure.	07Hours
MODULE-III	
Lateral earth pressure: Types of Earth pressure, Active and Passive earth pressures, Earth pressure coefficient and their range. Earth pressure theories-Rankine's and Coulomb's – assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) –Cullman's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.	8 Hours
MODULE-IV	
Flownets: Laplace equation, characteristics and uses of flow nets, Methods of drawing flow nets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter.	04 Hours.
Stability of earth slopes: Types of slopes, causes and type of failure of Slopes.	05 Hours

Definition of factor of safety, Stability of finite and infinite slopes- Method of slices, Friction Circle method, Fellineous method, Taylor's stability number.	
MODULE-V **Bearing capacity:** Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations. Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Plate load test, Standard penetration test, cone penetration test. **Foundation settlement:** Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance BIS specifications for total and differential settlements of footings and rafts.	08 Hours. 02 Hours.

Course outcomes:
On completion of the course, the student will have the ability to:

CO	Course Outcome (CO)	Blooms Level
CO1	Explain the methods of subsurface exploration and methods of dewatering.	C2
CO2	Analyze the stresses in soil for different theories.	C4
CO3	Determine the lateral earth pressure for different cases. (C4)	C4
CO4	Explain the importance of flow nets and stability of earth slopes.	C3
CO5	Determine the bearing capacity of foundation and settlement of soil.	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:
1. V.N.S. Murthy, "Soil Mechanics and Foundation Engineering" Sai Tech Publishers, Chennai.
2. Bowles, J.E., "Foundation Analysis and Design" 5th Ed, McGraw Hill Pub.Co., New York (1996).

Reference Books:
1. Dr. C. Venkataramaiah, "Geotechnical Engineering" New age Publications.
2. Dr. Alam Singh, Modern Geotechnical engineering
3. Gopal Ranjan and A.S.R. Rao, "Basic & Applied Soil Mechanics" New age international (P) Ltd., New Delhi (2000).

Nptel link: **https://youtu.be/UyWy38Cbvj0**

E books and online course materials: **www.civilenggbooks.com**

TRANSPORTATION ENGG		
Subject code	19CV63	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **None**

Course objectives: To enable students to acquire the knowledge in the fallowing topics

1. Understand different modes of transportation systems, highway planning and highway alignment and survey.
2. Design the horizontal and vertical alignments of roads.
3. Understand the different pavement materials and design the thickness of different types of pavements.
4. Understand about pavement construction and highway drainage system.
5. Gain the skills of evaluating the highway economics by different methods and also introduce the students to highway financing and pavement maintenance.

Modules	Teaching Hours
MODULE-I	
Introduction: Importance of Transportation. Different modes of transportation, characteristics and comparison of different modes. Road development in India, Jayakar committee recommendations and implementation. Salient features of 1st, 2nd and 3rd 20-year road development plan and problems on 3rd20 year road development plan only. Salient features of road development plan vision 2021. Present scenario of road development in India. NHDP, PMGSY, KSHIP and KRDCL projects	03 Hours.
Highway Planning: Road Types and classification, road patterns. Planning surveys or fact-finding surveys, Master plan - saturation system of road planning, phasing road development programmed – problems on best alignment among alternate proposals and phasing.	03 Hours.
Highway Alignment and Surveys: Ideal alignment, factors affecting alignment, engineering surveys for new and realignment projects.	03 Hours
MODULE-II	
Highway Geometric Design: Importance, factors controlling the design of geometric elements. Highway cross section elements – pavement surface characteristics, camber, width of carriageway, shoulder width, formation width, right of way, typical cross section of roads. Design speed – sight distances - Design of horizontal alignment: radius of curve, superelevation, extra widening on curves, transition curves and vertical alignment –Summit and valley curves. Numerical problems on above (No derivation of formulae only brief description)	08 Hours.

MODULE-III **Pavement Materials:** Properties and requirements of subgrade soils, HRB and IS soil classification. Determination of CBR and Modulus of subgrade reaction of soil. Properties and requirements of road aggregates, Bitumen – Tar – Emulsion – Cutback (Tests on aggregates and bitumen not included). Numerical problems on above. **Pavement Design:** Types of pavements – Design factors, Determination of ESWL by equal stress criteria using graphical method only, EWL factors and numerical problems. IRC method of flexible pavement design based on CSA method using IRC: 37 – 2001. Stresses in rigid pavement and design of rigid pavement as per IRC: 58 – 2002 excluding design of joints.	03 Hours. 06 Hours
MODULE-IV **Pavement Construction:** Specifications, construction steps and quality control tests for Granular sub base course, WBM base course. Brief description on bituminous constructions such as prime coat, tack coat, bituminous binder course (BM and DBM), common types of bituminous surfacing courses such as surface dressing, premixed carpet (PMC) and bituminous concrete. Construction steps for cement concrete pavements. **Surface and Subsurface drainage system** for road pavements, types, functions and basic design principles	04 Hours. 04 Hours.
MODULE-V **Highway Economics and Financing:** Highway user benefits –VOC using charts only – Highway costs – Economic analysis by annual cost method and benefit cost ratio methods. Numerical problems on above. Highway financing – BOT and BOOT concepts. **Pavement Maintenance:** Pavement failures, cases. Maintenance of highways. Principles of pavement evaluation – functional and structural evaluation.	04 Hours. 04 Hours.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Understand about the road development in India, Highway planning &highway alignment	C2
CO2	Design highway geometries	C5
CO3	Explain the different pavement materials and design the thicknesses of different types of pavements	C2
CO4	Understand about pavement construction and highway drainage system	C2
CO5	Determine the highway economic cost by different methods and understand about highway financing and pavement maintenance	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:

1. Khanna, S.K. and Justo, C.E.G., "Highway Engineering" Nem Chand and Bros, Roorkee 8th Edition (2003).
2. Kadiyali, L.R., "Highway Engineering" Khanna Publishers, New Delhi.
3. Subramanyam, K.P., "Transportations Engineering –I" Scitech Publications, Chennai.
4. Rao, G.V., "Principles of Transportation and Highway Engineering," McGraw – Hill Publishing Company Limited, New Delhi.

Reference Books:

1. IRC: 37-2001, IRC: 58-2002 and other relevant IRC codes
2. MoRT&H-2001, "Specifications for Roads and Bridges" New Delhi (2001)
3. Partha ChakraoBorthy and Animesh Das, "Principles of Transportation Engineering", Prentice-Hall of India Private Limited, New Delhi (2003)

E books and online course materials: www.civilenggbooks.com

Nptel Link: https://youtu.be/5zKC_aq4ypM

STRUCTURAL DYNAMICS		
Subject code	19CV641	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Knowledge of basic structural engineering subjects, such as SOM, SA-I,SA-II& Matrix methods of structural analysis.

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. To attain the knowledge of effect of vibrations & earthquake force on the structures.
2. To attain the knowledge of rotating unbalance, Duhamel's integral, DLF, SDOF.
3. To attain the knowledge of free vibration of MDOF, natural frequencies, shear buildings modeled as MDOF.
4. To attain the knowledge of forced vibration of MDOF, response of shear building to base motion, base isolation.
5. To attain the knowledge of continuous systems, dynamic analysis of beams, lumped mass and consistent mass formulation

Modules	Teaching Hours
Module I Introduction to structural dynamics, Brief history of vibration and Earthquakes, Major earthquakes, Earthquakes zones, some basic definitions, Vibration of single degree of freedom system, undamped, damped, free vibrations, logarithmic decrement. Forced vibrations of single degree freedom systems, response of undamped and damped systems subjected to harmonic loading.	8 hours
Module-II Rotation unbalance, reciprocating unbalance. Duhamel’s integral, response due to general system of loading, dynamic load factor, response spectrum, response of SDOF subjected to harmonic base excitation, vibration isolation.	7 hours
Module-III Free vibration of multi degree of freedom systems, natural frequencies, normal modes, orthogonality property of normal modes, eigen values. Shear buildings modeled as multi degree of freedom systems, free vibrations, natural frequencies.	11 hours
Module -IV Forced vibration motion of shear buildings, modal superposition method, and response of shear buildings to base motion, harmonic forced excitation. Damped motion of shear buildings, equations for damped shear buildings, uncoupled damped equations, conditions for damping uncoupling	11 hours
Module-V Dynamic analysis of beams stiffness matrices lumped mass and consistent mass formulation equations of motion.	5 hours

Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Explain the terminology associated with earthquake And the basic concepts of SDOF System and its response to harmonic loads.	C2
CO2:	Explain Duhamel's integral vibration isolation and analyze SDOF subjected to general system of load, harmonic base excitation	C2
CO3:	Analyze MDOF system subjected to free vibration,	C3
CO4	Determine the response of shear building to forced vibration, base motion and Harmonic forced excitation.	C4
CO5	Analyze beams by dynamic approach using technique of lumped mass and consistent mass formulation.	C4

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi.

2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., NewDelhi,2015.

3. Bhavikatti, Structural Analysis, Vikas Publishing House Pvt. Ltd, New Delhi,2002.

Reference Books:

1. Hibbeler R C, Structural Analysis, Prentice Hall, 9th edition,2014.

2. Devadoss Menon, Structural Analysis, Narosa Publishing House, New Delhi,2008.

3. Prakash Rao D S, Structural Analysis, University Press Pvt. Ltd,2007.

Nptel Link: https://youtu.be/0KiYC8QQOiM

E-Books: www.civilenggebooks.com

DESIGN OF MASONRY STRUCTURES		
Subject code	19CV642	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: **Elements of civil engineering and Strength of material**

Course objectives:

This course will enable the students to

1. Understand properties of masonry units, strength and factors affecting strength.
2. Understand design criteria of various types of walls subjected to different load system.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of masonry elements

Modules	Teaching Hours
MODULE-I **Masonry units, materials, types & masonry construction:** Brick, stone and block masonry units –strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars, selection of mortars. Defects and errors in masonry construction, cracks in masonry, types, reasons for cracking, methods of avoiding cracks. **Strength and stability:** Strength and Stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship, Compressive strength formulae based on elastic theory and empirical formulae. .	10 Hours
MODULE-II **Permissible stresses**: Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile stress and shear stresses. **Design Considerations:** Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.	7 Hours
MODULE-III **Load considerations and design of Masonry subjected to axial loads:** Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.	9 Hours
MODULE-IV **Design of walls subjected to concentrated axial loads:** Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers, design of wall with openings. **Design of walls subjected to eccentric loads:** Design criteria – stress distribution under eccentric loads – problems on eccentrically loaded solid walls, cavity walls, walls with piers.	8 Hours
MODULE-V	

Design of Laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of shear wall – design of compound walls. Introduction to reinforced brick masonry, lintels and slabs. In-filled frames: Types – modes of failures – design criteria of masonry retaining walls.	8 Hours

CO	**Course Outcome (CO)**	**BL**
CO1	Explain different types of masonry construction such as brick, stone, reinforced walls in composite action and identify the loads on masonry walls. Summarize various formulae's for finding compressive strength of masonry units.	C2
CO2	Explain permissible stresses and design criteria as per IS: 1905 and SP-20.	C3
CO3	Consider the loads. and design of walls under udl, solid walls, cavity walls	C4
CO4	Design of Masonry walls subjected to axial loads and eccentric loads	C5
CO5	Design of Laterally and transversely loaded walls	C5

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module.

Text books:

1.Dayaratnam P, "Brick and Reinforced Brick Structures", Scientific International Pvt. Ltd.
2. M. L. Gambhir, "Building and Construction Materials", McGraw Hill education Pvt. Ltd.
3.Structural Masonry- Henry, A.W. Macmillan Education Ltd., 1990.

Reference Books:

1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd.,1990.
2. IS 1905–1987 "Code of practice for structural use o f un-reinforced masonry- (3rd revision) BIS, New Delhi.
3. SP20(S&T)–1991, "Hand book on masonry design and construction(1strevision) BIS, New Delhi.

Nptel Link: https://youtu.be/E-rfU6n2rCw

E books and online course materials: www.civilenggbooks.com

GEOMATICS		
Subject code	19CV643	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Survey –I and Survey-II

Course objectives:
to enable the student to acquire the knowledge in the following topics.
1.Field astronomy and determination of meridians, solar time and day
2.Classification of errors and determining precision of surveying applications
3.Basics of modern surveying instrument total station
4.Hydro graphic surveying application and setting out of major projects in civil engineering fields.

Modules	Teaching Hours
Module I **Field astronomy:** Definitions, Co-ordinate's system, the terrestrial latitude and longitude, spherical triangle and spherical trigonometry. Astronomical triangle Napier's rule, relationship between co-ordinates.	8 hours
Module-II **Time:** Side real time, day and year–solar time and day–Greenwich meantime–standard time. Meridian and azimuth–their determination -latitude and its determination	8 hours
Module-III **Theory of errors and triangulation adjustment:** Errors and classification of errors, Precision and accuracy, Laws of weight and accidental errors **Probability:** Probability distribution function and density function –normal distribution. RMS error-measure of precision. Rejection of observations-principles of least squares-Normal equations	5 hours 4 hours
Module -IV **Electronic distance measurement (EDM):** **I**ntroduction, Measurement principal EDM, Different wave length bands used by EDM, Electro Magnetic (EM) Waves, Phase comparison and modulation. Instruments –Geodimeter – Tellurimeter – Distomat. Introduction to GPS Total Station.	8 hours
Module-V **Hydrographic surveying:** Methods of sounding. Instruments. Three-point problem. Tidal and Stream discharge measurement. **Setting out works:** Introduction. Setting out of buildings, culverts, bridges, pipeline and sewers, tunnels.	4 hours 5 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Understand basic concept so fastronomical field survey	C2
CO2:	Interpret and solve C 2 problems indetermining meridians,	C2

	Solar time and day	
CO3:	Understand and interpret classification of error and determine precision in surveying application	C2
CO4	Demonstrate understanding of modern surveying Instruments like total station	C3
CO5	Understand and solve problems in hydrographic surveying And in setting out various engineering infrastructures works on ground	C3

Question paper pattern:

i) Two questions are to be set from each module.

ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi –2009.
2. Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I, Pune VidyarthiGrihaPrakashan,1988

Reference books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2009.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2010
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, NewDelhi
4. A. Bannister, S. Raymond , R. Baker, "Surveying", Pearson, 7th ed., NewDelhi

Nptel Link: https://youtu.be/TqbYlHIzYJs

E-Books: www.civilenggebooks.com

THEORY OF ELASTICITY		
Subject code	19CV651	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Strength of materials, Structural analysis –I, and Structural analysis–II

Course objectives:

1.Generalized Hooke's law and strain-displacement relations, Equations of equilibrium and compatibility for two dimensional problems in rectangular & polar co ordinates

2.Plane stress and plane strain problems, measurement of surface strains and strain rosettes, stalk polynomial.

3.Analysis of two-dimensional problems in rectangular and polar coordinates

Modules	Teaching Hours
Module I Introduction to Mathematical theory of elasticity, definition of continuum, stress and strain at a. point, constitutive laws, Generalized Hook's Law, Strain displacement relations.	7 hours
Module-II Differential equations of equilibrium, boundary conditions, compatibility equations, Airy's stress function, problems, Stress polynomials, St. Venant's principle.	8 hours
Module-III Plane stress and plane strain, Principal stresses and strains, measurement of surface strains, strain rosettes, analytical method. Two-dimensional problems in rectangular coordinates, bending of a cantilever beam subjected to end load, effect of shear deformation in beams, simply supported beam subjected to UDL.	10 hours
Module -IV Two-dimensional problems in polar coordinates, strain- displacement relations, equations of equilibrium, compatibility equation, stress function.	9 hours
Module-V Stress distribution symmetrical about an axis, Rotating discs, Lame's problem. Effect of circular hole in an infinite plate, stress concentration factors.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Describe stress and strain at a point, Generalized Hooke's law and strain displacement relations	C2
CO2:	Explain equilibrium and compatibility equation for the two-dimensional rectangular coordinate system &solve problems on stress polynomials	C2
CO3:	Explain surface strain measurement technique using strain rosettes and solve problems on cantilever and section beams.	C3
CO4	Solve two dimensional problems in polar coordinate system using the	C3

	Concepts of equilibrium and compatibility equation	
CO5	Develop the for- s t r e s s distribution for the call of rotator discs and Effect of circular hole in an infinite rate	C4

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:
1. S P Timoshenko and J N Goodier, "Theory of Elasticity", McGraw-Hill International Edition, 1970.
2. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 2012.
3. S Valliappan, "Continuum Mechanics - Fundamentals", Oxford &IBH Pub. Co. Ltd., 1981.
4. L S Srinath, "Advanced Mechanics of Solids", Tata - McGraw-Hill Pub., New Delhi, 2003.

Reference books:
Reference Books:
1. C. T. Wang, "Applied Elasticity", Mc-Graw Hill Book Company, New York,1953.
2. G. W. Housner and T. Vreeland, Jr., "The Analysis of Stress and Deformation", California Institute of Tech.,
CA, 2012. [Downloadasperuserpolicyfromhttp://resolver.caltech.edu/CaltechBOOK:1965.001].
3. A. C. Ugural and Saul K. Fenster, "Advanced Strength and Applied Elasticity", PrenticeHall,2003.
4. Abdel-Rahman Ragab and Salah Eldinin Bayoumi, "Engineering Solid Mechanics: Fundamentals and Applications", CRC Press,1998

Nptel Link: https://youtu.be/eICv1p8WjgI

E-Books: www.civilenggebooks.com

BUILDING SCIENCE AND ENGG		
Subject code	19CV652	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: None

Course objectives:

1.Learn the importance of sanitation, domestic water supply, and plumbing and fire services.
2. Understand the concepts of heat, ventilation and air conditioning.
3. Develop technical and practical knowledge in Building Services.

Modules	Teaching Hours
Module I **Introduction, Climate:** Climatic factors, Classification of tropical climates, Site climate, Microclimate of human settlements. Comfort Thermal comfort factors, Comfort indices	9 hours
Module-II **Principles of Thermal Design**: Thermal quantities, Heat exchange in buildings, Periodic heat flow. Mechanical means of thermal control.	8 hours
Module-III **Means of Thermal Control:** Mechanical and structural means of thermal control, Moisture control in buildings, Ventilation requirements for health. **Means of Thermal Control:** Mechanism and estimation of natural ventilation, Airflow patterns in buildings.	9 hours
Module -IV **Noise & Noise Control:** Propagation of sound, Sound insulation, absorption & transmission, reverberation, Design of floor, Roofing & walling system for sound absorption and insulation, Design of auditorium, Noise control in buildings.	8 hours
Module-V **Light & Lighting:** Day lighting, Design of fenestration in buildings for day light of various types, Illumination design, Luminaries and their characteristics, Code requirements.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Describe the basics of house plumbing and waste water collection and disposal.	C2
CO2:	Discuss the safety and guidelines with respect to fire safety.	C3
CO3:	Describe the issues with respect to quantity of water, rain water harvesting and roof top harvesting.	C3
CO4	Understand and implement the requirements of thermal comfort in buildings.	C4
CO5	Design of Lighting arrangements of the building	C5

Question paper pattern:

i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from

each module
Reference books: 1. National Building Code. 2. Charangith shah, Water supply and sanitary engineering, Galgotia publishers. 3. Kamala & D L Kanth Rao, Environmental Engineering, Tata McGraw Hill publishing co. Ltd. 4. Technical teachers Training Institute (Madras), Environmental Engineering, Tata McGraw Hill publishing Co. Ltd. 5. M. David Egan, Concepts in Building Fire Safety. 6. O. H. Koenigsberger, "Manual of Tropical Housing and Building", Longman Group United Kingdom. 7. V. K. Jain, Fire Safety in Building 2edition, New Age International Publishers. 8. E. G. Butcher, Smoke control in Fire-safety Design. 9. E. R. Ambrose, Heat pumps and Electric Heating, John and Wiley and Sons Inc, New York. 10. Handbook for Building Engineers in Metric systems, NBC, New Delhi
Nptel Link: https://youtu.be/nRanL9sXHhc
E-Books: www.civilenggebooks.com

MAT LAB AND APPLICATION		
Subject code	19CV653	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: None

Course objectives:

1. To Understand basic MATLAB functions
2. To be able to differentiation and integration and solve differential equations using MATLAB
3. To be able to carry out numerical computations on transformations.
4. To be able to understand Geospatial tool box and its applications

Modules	Teaching Hours
Module I **Introduction to MATLAB programming, approximations and errors;** Basics of MATLAB programming - Array operations in MATLAB - Loops and execution control - vector operation: Creation, dot product, work with vectors: create, topology, union and intersection, reselection, buffering, generate suitability map - Working with files: Scripts and Functions - Plotting and program output - Defining errors and precision in numerical methods - Truncation and round-off errors-Error propagation, Global and local truncation errors	8 hours
Module-II **Differentiation and integration:** Numerical Differentiation in single variable - Numerical differentiation: Higher derivatives- Differentiation in multiple variables - Newton-Cotes integration formulae - multi-step application of Trapezoidal rule - MATLAB functions for integration - Introduction to ODEs; Implicit and explicit Euler's methods - Second-Order Runge-Kutta Methods - MATLAB ode45 algorithm in single variable - Higher order Runge-Kutta methods - Error analysis of Runge-Kutta method	7 hours
Module-III **Linear and non-linear equations;** Linear algebra in MATLAB - Gauss Elimination - LU decomposition and partial pivoting - Iterative methods: Gauss Siedel - Special Matrices: Tri-diagonal matrix algorithm - Nonlinear equations in single variable - MATLAB function zero in single variable - Fixed-point iteration in single variable - Newton- Raphson in single variable - MATLAB function solve in single and multiple variables - Newton-Raphson in multiple variables.	8 hours
Module -IV **Algebra and transforms:** Solving quadratic equation, factorization, calculus: exploring limits, use of octaves, Differential: solving DE, maxima and minima, exponential, logarithmic and trigonometric derivatives, Integral: finding indefinite and definite integral, transform: Laplace and inverse Laplace transform, Fourier and inverse Fourier transform, working with lessons: derive slope map, create watershed, find landslide vulnerability	9 hours
Module-V	

Data visualization and modelling: Graph elements; color, theme, type, title and labels, drawing multiple functions, generating sub plots, drawing bar chart, contour, 3D plots, move elements, trace movement, work with plotting: regression analysis and presentation, contour map from DEM- Geospatial tool box implementation		9 hours
Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Perform basic MATLAB functions	C2
CO2:	solve mathematical problems related to differentiation and integration	C3
CO3:	solve problems related to Linear and Non-Linear equations to correct the same to geospatial algorithms	C4
CO4	solve transformations of geospatial problems	C4
CO5	Develop skills in geospatial tool box and mapmaking	C5

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Holly Moore, "MATLAB for Engineers" Third Edition–Pearson Publications
2. Stephen J. Chapman, "MATLAB Programming for Engineers" Fourth Edition –Thomson learning**.**
3. Holly Moore, "MATLAB for Engineers" Third Edition–Pearson Publications
4. Stephen J. Chapman, "MATLAB Programming for Engineers" Fourth Edition –Thomson learning**.**

Reference books:

1. FausettL.V.(2007) Applied Numerical Analysis Using MATLAB,2ndEd., Pearson Education.
2. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley,2004
3. Hahn B., and D. Valentine, 2013. Essential Matlab for Engineers and Scientists:
4. Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers, by Rudra Pratap, OUPUSA,2005.
5. Programming and Engineering Computing with MATLAB 2018 by Huei-Huang Lee SDC Publications, 2018.
6. Fausett L.V. (2007) Applied Numerical Analysis Using MATLAB, 2nd Ed Pearson Education.
7. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley,2004
8. Hahn B., and D. Valentine, 2013. Essential Matlab for Engineers and Scientists: 5th Edition, Academic Press.
9. Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers, by Rudra Pratap, OUPUSA,2005
10. Programming and Engineering Computing with MATLAB 2018 by Huei-Huang Lee, SDC Publications, 2018.

Nptel Link: https://youtu.be/IuEOMyGuuIg

E-Books: www.civilenggebooks.com

ECOLOGY AND ENVIRONMENT		
Subject code	19CV6OE11	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Environmental studies

Course objectives:

To enable the student to acquire knowledge in the following topics:

1. Componentsofenvironmentandtheirinteractionsandsubdivisionsofecology.
2. Structural and functional characteristics of an ecosystem, principles related to energy and concepts of productivity.
3. Bio-geochemical cycles and pathways of matter in the biosphere.
4. Fresh water and marine water eco system.
5. Effects of pollution on human health, aquatic and terrestrial ecosystems and global environmental problems.

Modules	Teaching Hours
Module I	
Introduction: Environment, definition, components of environment and its interaction. Ecology – Definition, Sub divisions of Ecology.	4 hours
Concepts of ecosystem: Structural and functional characteristics of an ecosystem. Balanced ecosystem, biological control, production and decomposition in nature.	6 hours
Module-II	
Principles and concepts pertaining energy in ecological system: Fundamental principles related to energy, energy environment, laws of thermodynamics, energy system. Pathways of energy in the biosphere; Concept of productivity – its measurement; Food chains/ Food webs – trophic levels, trophic structure	7 hours
Bio geo chemical cycles: Concept of bio-geochemical cycles –significance, pathways of matter in the biosphere, C, N, S & P cycles	7 hours
Module-III	
Fresh water ecology: Fresh water environment types and limiting factors, classification of fresh water organisms, fresh water biota (flora & fauna), zonation in streams, Eutrophication of lakes.	7 hours
Marine ecology: Marine environment, marine biota, zonation in the area (case study), estuarine ecology.	5 hours
Module -IV	
Pollution and environmental health: Types of pollution (Air, Water and Land) effects on human health, effects on aquatic and terrestrial system.	3 hours
Module-V	
Global environment problems: Acid rain, ozone layer depletion, greenhouse effect, Global warming.	3 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Identify the components of environment and the sub-divisions of ecology	C1

CO2:	Describe the characteristics of an ecosystem, energy system and the concepts of bio-geochemical cycles	C1
CO3:	Understand the fresh and marine water ecology,	C2
CO4	Understand effects of pollution on human health, and on ecosystems.	C2
CO5	Understand the global environment problems. And its causes and effect so faci drain, ozone layer depletion, greenhouse effect, global warming.	C1, C2

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:

1. Modi, P.N., "Irrigation Water Resources and Water Power Engineering". Standard Book House, New Delhi. 10th Edition, 2019.
2. Raghunath, H.M., "Groundwater",3rd Edition, New Age International Publishers, New Delhi, 2007.
3. Krishnan, M.S., "Geology of India & Burma". CBS publishers, New Delhi, 2017.
4. P. Jaya Rami Reddy, "A Textbook of Hydrology", University Science Press, New Delhi, 2011.
5. M N Rao and H V N Rao, "Air pollution", McGraw Hill Publications, 2017.
6. Krishnamurthy K.V., "An advanced textbook of Biodiversity- Principle &Practices." Oxford and IBH publications, New Delhi. 2004.

Reference books:

1. Odum, E.P., "Fundamentals of Ecology", W.B sounders, Philadelphia, USA, 1971
2. Singh J.S, Singh S.P & Gupta, S.R. "Ecology, environment and resource conservation", Anamaya publications, 2006.
3. Edmond A. Mathez & Jason E. Smerdon, "Climate Change: The science of Global warming and our energy feature", Columbia University Press, 2009.
4. National Council of Applied Economic Research, "Economic Impact of Interlinking of Rivers Program", Revised Final Report, April 2008.
5. http://nwda.gov.in/content.
6. Madhav Gadagil, "Biodiversity and India's degraded lands", Indian Academy of Sciences, Volume 22- No 2/3, http://www.jstor.org/pss/4314063

Nptel Link: https://youtu.be/ZngDF4jfRdw

E-Books: www.civilenggebooks.com

REMOTE SENSING AND GIS		
Subject code	19CV6OE12	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Survey-II

Course objectives:

To enable the students to acquire the knowledge in following topics

1.Basic Remote Sensing.
2.Concept of geographical Information.
3.GIS data models.
4.Digitizing, Editing & Structuring map data.
5.GPS (Basic knowledge of Global Positioning system).

Modules	Teaching Hours
Module I	
Remote sensing: Introduction–Historical sketch of Remote sensing, Idealized remote sensing-Basic principles of remote sensing-Electromagnetic energy Electromagnetic spectrum- Wave length regions and theirapplicationinremotesensing-characteristicsofsolarradiation-Basicradiation and atmosphere-interaction of Eradiation-with earth surface-remotesensingobservationplatform-sensors-ApplicationofRemotesensing.	8 hours
Module-II	
Geographic Information: system concepts and spatial models. Introduction, Spatial information, temporal information, conceptual models of spatial information, representation of geographic information.	2 hours
GIS Functionality –Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.	3 hours
Computer fundamentals of GIS and Data storage: Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees.	3 hours
Module-III	
Coordinate systems and map projection: Rectangular polar and spherical coordinates, types of map projections, choosing a map projection.	3 hours
GIS Data models and structures –Cartographic map model, GEO-relation model, vector/raster methods, non-spatial data base structure viz., hierarchal network, relational structures.	3 hours
Digitizing Editing and structuring map data –Entering the spatial data (digitizing), the non-spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types.	3 hours
Module -IV	
Data quality and sources of error –Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy.	5 hours
Principles of Spatial data: access and search, regular and object orient edde	4 hours

composition, introduction to spatial data analysis, and overlay analysis, raster analysis, network analysis in GIS.	
Module-V **GIS and remote sensing data integration techniques:** in spatial decision support system land suitability and multi criteria evaluation, rule-based systems, network analysis, special interaction modeling, Virtual GIS. **Global positioning system:** Hyper spectral remote sensing, Dip techniques, hardware and software requirements for GIS, overview of GIS software.	4 hours 4 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Define the basics principles of Remote sensing, sensors etc.	C2
CO2:	Classify RS and GIS software, and also about GPS device.	C2
CO3:	Contrast different areas with the help of RS and GIS	C2
CO4	Apply RS and GIS for urban application and water resources etc	C2, C3
CO5	Survey the area with respect to altitude, with the help of GPS	C3

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text book:
1. Narayan Panigrahi, "Geographical Information Science", and ISBN 10: 8173716285 / ISBN 13: 9788173716287, University Press2008.
2. Basudeb Bhatta, "Remote sensing and GIS" , ISBN:9780198072393, Oxford University Press2011
3. Kang – T surg Chang, "Introduction to Geographic Information System". Tata McGraw Hill Education Private Limited2015.
4. Lilles and, Kiefer, Chipman, "Remote Sensing and Image Interpretation", Wiley2011.

Reference books:
1. Chor Pang Lo and Albert K.W Yeung, "Concepts &Techniques of GIS", PHI,2006
2. John R. Jensen, "Remote sensing of the environment", an earth resources perspective– 2nd edition–by Pearson Education2007.
3. Anji Reddy M., "Remote sensing and Geographical information system", B. S. Publications2008.
4. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Information system", Oxford Publications2004.
5. S Kumar, "Basics of remote sensing & GIS", Laxmi publications 2005.

Nptel Link: https://youtu.be/-4D1-eSEWXw

E-Books: www.civilenggebooks.com

NUMERICAL METHODS IN CIVIL ENGG		
Subject code	19CV6OE13	Credit: 03
Hours/week	3 hours. (theory)	See: 50 marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: mathematics-III, mathematics- IV

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. To understand and apply a suitable technique for solution simultaneous equations.
2. To understand and apply a suitable non-linear differentiation equation method among the given, for the solution of beam problems.
3. Application of different methods for non-linear algebraic and transcendental equations.
4. To understand numerical integration method to be applied for beam problems.
5. To understand and apply finite difference techniques for beams and columns to and slopes, deflections, torsion.

Modules	Teaching Hours
Module I **Introduction:** Historical development of Numerical techniques, role n research and design in the field of civil engineering. Numerical solutions of simultaneous equations for Engg Problems. Development of Algorithms for (i) Cramer'srule (ii) Gaussian elimination method (iii) Gauss-Siedel iteration method (iv) Choleskyde composition method (v) Matrix inversion method Eigen value problems in civil engineering	1 Hours 9 Hours
Module-II **Solution of non-linear first order differential equation- applicable to beam problems.** (i) Euler's method (ii) Taylor's series (iii) Runge-Kutta 2nd and 4th order methods Gaussian quadrature method	9 Hours
Module-III **Solution for non-linear and algebraic and transcendental equation** (i) Newton-Raphson method (ii) Bisection method (iii) Gershoff's theory **Numerical integration** Numerical method for solving simple beam problems	6 Hours 3 Hours
Module -IV **Finite difference techniques:** (i)Slope and deflection of cantilever beam, simply supported beam, fixed beam, propped beam (ii)Beams of elastic foundation	8 Hours

Module-V **Finite Element Techniques:** 1. Buckling load from column 2. Torsion problem of non-regular section 3. Membrane problem		6 Hours
Course Outcomes: On completion of this course, students are able to:		
Co		**Bl**
CO1	Determine the solutions simultaneous for equations and develop algorithm for numerical technique such as Cramer's rule, gaussian elimination method, gauss seidel, Iteration method, cholesky decomposition method and eigen value problems in civil engineering	C2
CO2	Solve nonlinear first order differential equations especially applicable to beam problem using technique such as Euler's method, Taylor's series, runge-kutta and gaussian quadrature method.	C3
CO3	Solve nonlinear first order equation. About the most widely used (newton-ripsaw method) to find the roots also the simplest method (bisectional method) for the solution of nonlinear equation.	C3
CO4	Students will understand about the application of finite difference techniques to solve for soles & deflections for beams with different boundary conditions.	C4
CO5	Application off fdt's for column buckling, torsion and membrane Problems.	C4
Question paper pattern: I) Two questions are to be set from each module. Ii) Total five questions are to be answered by selecting minimum one question from Each module		
Text book: 1. Grewal. B.S. and Grewal. J.S., "Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi 2. Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi.		
Reference books: 1. Chapra. S.C. and Canale. R. P., "Numerical Methods for Engineers, Tata McGraw Hill, New Delhi. 2. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi. 3. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, New Delhi		
Nptel Link: https://youtu.be/qqhsmdkqgjq		
E-Books: www.civilenggebooks.com		

EXTENSIVE SURVEY PROJECT *(MINI PROJECT)		
Subject code	19CV67	Credit: 02
Hours/week	1 hours. (Theory)+ 2 hours Practical	See: 50 marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

To be conducted between 5th& 6th Semester for a period of 2 weeks, Viva voce conducted along with 6th semester exams)

An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The student shall submit a project report consisting of designs and drawings. Preferably the Total Station must be used for the survey work of the projects

General instructions, Reconnaissance of the sites and fly levelling to establish bench marks.

1.new tank projects: The work shall consist of

Alignment of center line of the proposed bund, Longitudinal and cross sections of the center line. Capacity surveys.

2. Details at Waste weir and sluice points. Canal alignment:

3. Restoration of an existing tank: The work shall consist of: Alignment of center line of the existing bund, Longitudinal and cross- sections. along the center line.

Capacity surveys, details at sluice and waste weir.

4. Water supply and sanitary project:

Examination of sources of water supply, Calculation of quantity required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling), location of sites for ground level and overhead tanks, underground drainage system surveys for laying the sewers

5. Highway project: Preliminary and detailed investigations to align a new road between two terminal stations. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1	Demonstrate the concepts of survey, water resource engineering, environmentalengineeringandtransportationengineeringtheorycoursethroughseriesof experiments	C2
CO2	Share the responsibilities in small teams of 4-5 members for conducting the experiments.	C2
CO3	Perform the experiments and determination of General instructions,	C4

	Reconnaissance new tank projects Alignment of center line of the proposed bund, Longitudinal and cross sections of the centerline. restoration of an existing tank, water supply and sanitary project, Examination of sources of water supply, highway project Preliminary and detailed investigations to align a new road between two terminal stations.	
CO4	Analyze the data and design the projects such highway, water supply and sanitation, overhead tank and restoration of existing tank project	C3
CO5	Prepare a well-organized drawings and report containing detail design.	C3
Question paper pattern:		
Reference books: Training manuals and User manuals Relevant course reference books		
Nptel Link: https://youtu.be/HgKYf6TVrNE		
E-Books: www.civilenggebooks.com		

HIGHWAY MATERIAL TESTING LAB		
Subject code	19CVL68	Credit: 01
Hours/week	2 hours Practical	See: 50 marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:
To learn the principles and procedures of testing of highway materials

List of Exercises:	Teaching Hours
1. Tests on Aggregates	
a. Aggregate Crushing value	2 Hours
b. Los Angeles abrasion test	2 Hours
c. Aggregate impact test	2 Hours
d. Aggregate shape tests (combined index and angularity number)	2 Hours
2. Tests on Bituminous Materials	
a. Penetration test	2 Hours
b. Ductility test	2 Hours
c. Softening point test	2 Hours
d. Specific gravity test	2 Hours
e. Viscosity test by tar viscometer	2 Hours
f. Bituminous Mix Design by Marshal Method (Demonstration only)	2 Hours
3. Tests on Soil	
a. Wet sieve analysis	2 Hours
b. CBR test	2+2 Hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Demonstrate the concepts of Highway Engg theory course through series of experiments.	C2
CO2:	Sharetheresponsibilitiesinsmallteamsof4-5membersfor Conducting the experiments.	C3
CO3:	Perform the experiments and determination of strength of aggregates, Bitumen and Tar Properties like Softening point, ductility, and Flash and fire	C4
CO4	Analyze the data and interpret the results.	C3
CO5	Prepare a well-organized laboratory report.	C3

Question paper pattern:
All are individual experiments
1.Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
2.All exercises are to be included for practical examination.

Reference books:
1. M. L. Gambir, “Concrete Manual”, Danpat Rai and sons, New Delhi

2. Shetty M.S, “Concrete Technology”, S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, “Properties of Concrete”, Tata McGraw Hill Publications, New Delhi.
4. Neville AM, “Properties of Concrete”, ELBS Publications, London.
5. Relevant BIS codes.
6. S K Khanna, C E G Justo and A Veeraragavan, “Highway Materials Testing Laboratory Manual”, Nem Chand Bros, Roorkee.
7. L R Kadiyali, “Highway Engineering”, Khanna Publishers, New Delhi.

Nptel Link: https://youtu.be/3oNa9Z94Hiw

E-Books: www.civilenggebooks.com

SOFTWARE BASED LAB		
Subject code	19CVL69	Credit: 01
Hours/week	1 hours. (Theory) + 2 practical	See: 50 marks
Total hours:	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Basic Knowledge of computers

Course objectives:

This course will enable students to

1.Use industry standard software in a professional set up.

2.Understand the elements of finite element modeling, specification of loads and boundary condition, performing analysis and interpretation of results for final design.

3.Develop customized excel spread sheets.

Modules	Teaching Hours
Module I Use of civil engineering software for: 1. Analysis and design of plane trusses, continuous beams. 2. 3D analysis of multistoried frame structures(G+2).	14 hours
Module-II Use of EXCEL spread sheets: Design of singly reinforced and doubly reinforced rectangular beams, design of one way and two-way slabs and Axially loaded Column.	8 hours
Module-III GIS applications using open-source software: 1.To create shape files for point, line and polygon features with a map as reference. 2. To create decision maps for specific purpose.	6 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Analyze and Design beams and trusses using software	C2
CO2:	3DanalysisofmultistoriedframestructuresusingSoftware.	C3
CO3:	ApplyGISsoftwaretocreateshapefileswithamapasreferenceandtocreate Decision maps for specific purpose	C4
CO4	Design beams and slabs using excel spread sheets	C5
CO5	Design Columns using excel spread sheets	C5

Question paper pattern:

Reference books:

Training manual sand User manual sand Relevant course reference books

E-Books: www.civilenggebooks.com

INTERNSHIP		
Subject code	19CVIN86	Credit:
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 Hours

Prerequisite:

Course objectives:

This course will enable students to get the field exposure and experience

Note: Internship /Professional Practice:

1. This shall be carried out by students in industry set-up related to the construction/ materials testing laboratories/research organizations/project management consulting firms/QS and QA organizations/ planning and design offices/Professional organizations like ACCE/ICI/INSTRUCT/RMCMA/QCI, PMI, CIDC etc. and other avenues related to the civil engineering domain in consultation and approval of internship guide/HOD /internship committees of the institutions.

2. The professional certification programs like ACCE(I)- SMP, ICI-BMTPC certifications, NSTRUCT certifications, CIDC certifications, RMC-QCI's RMCPCS Certification Programs, RMCMA-NRMCA'S Concrete Technologist India (CTI) programs and such similar programs by professional bodies with adequate industry exposures at sites/RMC plants can be considered as Internship /Professional Practice with due approvals from the guide/HOD /internship committees of the institutions

3. The industry/organization should issue certificates of internship offer and its completion. The offer letter should clearly have the nature of work to be done by the student and the supervisor's name and duration of internship.

4. The Duration of Internship shall be 8 Weeks. Student shall make a midterm and final presentation of the activities undertaken during the first 4 weeks (In last week of VII sem or at the beginning of VIII sem) and at the end of 8th week of internship (preferably latest by last week of VIII sem) respectively, to a panel comprising internship guide, a senior faculty from the department and head of the department. Each student should submit the internship report at the end of semester with internship certificate.

5. Viva-Voce examination shall be conducted by a panel of examiners consisting of internship supervisor from industry or industry professional approved by Institute or in the case of non-availability of industry person a internal expert and internship guide from the institute.

6. The College shall facilitate and monitor the student internship program.

7. The internship should be completed during vacation after VI and VII and
(If not completed during the vacation of VI and VII semesters, it shall be carried out during the vacation of VII and VIII semesters.

ESTD : 1958

Hyderabad Karnataka Education Society's

Poojya Doddappa Appa College of Engineering

(An Autonomous Institution &Affiliated to

Visvesvaraya Technological University, Belagavi)

Aiwan E-Shahi Area KALABURAGI 585 102 Karnataka India

CURRICULUM

FOR B.E.VII SEMESTER AND VIII SEMESTER

FOR THE ACADEMIC YEAR 2022-23

DEPARTMENT OF CIVIL ENGINEERING

About College:

Poojya Doddappa Appa College of Engineering (PDACE) is the first institution of Hyderabad Karnataka Education (HKE) Society, Kalaburagi, which was established in the year 1958. The foundation stone of this college was laid by the then Vice President of India Dr. Sarvapalli Radhakrishnan in 1958.

At present, PDA College of Engineering is offering 11 UG programs, 10 PG Programs and 12 Research centers, spreading and imparting technical education in North Karnataka Region. The college has state of the art laboratories, digitalized smart class rooms having highly qualified and experienced faculty with highest no. of Ph.D. and M. Tech degrees.

PDACE is the only Autonomous Institution in the region, which was sponsored under TEQIP I , TEQIP-II and TEQIP-III from World Bank and received grants of Rs.10.43 crores, Rs. 17.5 crores and 7 crores respectively. This is one among 12 institutions having TEQIP-I and TEQIP -II sponsorship. At present, college is selected in TEQIP-III as Mentor Institution for Bundelkhand Institute of Engineering & Technology, Jhansi.

The Vision and Mission of PDA College of Engineering are as mentioned below.

VISION

- To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

MISSION

- To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.

- To provide beneficial service to the national and multinational industries and communities through educational, technical and professional activities.

About Department of Civil Engineering

The Civil Engineering Department was established in the year 1958with an intake of 60 students. In 1994 the intake was increased to 90 and further increased to 180 in the year 2014.Presentlythe department runs both UG and PG (Environmental Engineering and Structural Engineering) programs with intake of 180 in UG program and 18 in each PG program. Department is recognized as Research Centre by Visvesvaraya Technological University Belagavi in the year 2002 and at present 35research scholars are pursuing their Ph.D. and seven research scholars have been awarded with Ph D degree.

The Department has signed MoU with various industries like Medini, Sharan Technical consultancy, Canter Technologies Pvt. Ltd, Sharan Chandra Consultant, JGD Consultants, Jalavahini Management Services Pvt. Ltd. Dharwad, Shah Technical Consultants Pvt. Ltd., PP Raju & Co., Design Consortium, KRIDL, Bharath Dal and Oil Industries, Ultratech, ACC, Alstom, Karnataka State Pollution Control Board & HCC. These MoUs have helped the students in getting exposure to industrial environment and also for conducting Industry Institute Interaction events.

The Vision, Mission and Program educational objectives of Civil Engineering Department are as follows:

VISION

- To be the preeminent department for imparting technical knowledge and skills in the Civil Engineering field to meet the social, industrial, environmental and research needs at local and global levels.

MISSION

- To provide technical education to meet the challenges in the profession through a well-structured curriculum.
- To inculcate innovation and research ideas for sustainable development with ethical background.
- To impart entrepreneurial skills for serving the needs of the society through technical and professional activities.

- To create Civil Engineering professionals to serve the needs of the industry at local and global levels.

PROGRAMEDUCATIONALOBJECTIVES(PEO'S)

Program educational objectives are broad statements that describe the Career and Professional accomplishments that the program is preparing graduates to achieve. The program educational objectives of the B.E. in Civil Engineering Program at PDA College of Engineering, Kalaburagi are:

PEO1: To provide the knowledge of mathematics, science and engineering fundamentals for solving civil engineering problems.

PEO2: To enable the graduates to exhibit their technical knowledge and skills of recent practices to identify and solve civil engineering problems.

PEO3: To enable the graduates to conduct and interpret the results of laboratory/ field experiments in basic sciences, engineering sciences and civil engineering.

PEO4: To enable the graduate for pursuing higher education and lifelong learning.

PEO5: To enable the graduates to acquire communication, team work and entrepreneurial skills along with the values of professional ethics.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

The Civil Engineering graduates are able to:

PSO1: Plan, Analyze and Design buildings, Water supply and Sewerage systems, Hydraulic structures and Transportation infrastructure using sustainable materials and conceptual knowledge of Geotechnical engineering.

PSO2: Conduct survey and Laboratory experiments/ field investigations and interpret the data for application to real life problems.

PSO3: Prepare detailed estimate of civil Engineering works and Execute the civil Engineering Projects with optimum resources using effective communication skills and Professional ethics

SEMESTER VII

Code No.	Course	Hours/Week					Maximum Marks		
		Lecture	Tutorial	Practical	Self-study	Credits	CIE	SEE	Total
THEORY									
19HU71	ENTREPRENEURSHIP MANAGEMENT AND FINANCE	3	0	0	-	3	50	50	100
19CV72	ESTIMATING, COSTING & SPECIFICATIONS	3	2	0	-	4	50	50	100
19CV73	ENVIRONMENTAL ENGG - II	3	--	0	1	3	50	50	100
19CV74x	ELECTIVE – III	3	--	0	-	3	50	50	100
19CV75x	ELECTIVE –IV	3	--	0	-	3	50	50	100
19CVOEx	OPEN ELECTIVE-II	3	--	0	-	3	50	50	100
PRACTICAL									
19CVL77	CAD LAB	1	0	2	-	2	50	50	100
19CV78	SEMINAR/CASE STUDY/GROUP WORK	0	0	2	-	1	50	--	50
19CV79	PROJECT PHASE – I	0	0	2	-	2	50	50	100
	INTERNSHIP	To be carried out during the intervening vacations of VI and VII semesters (If not completed during the vacation of VI and VII semesters, it shall be carried out during the vacation of VII and VIII semesters							
Total		18	04	06	-	24	450	450	900

ELECTIVE - III	ELECTIVE - IV	OPEN ELECTIVE-II
19CV741- SOLID WASTE MANAGEMENT	19CV751-ADVANCED FOUNDATION DESIGN	19CVOE761- RURAL DEVELOPMENTTECHNOLOGY
19CV742- ENGINEERING HYDROLOGY	19CV752- INDUSTRIAL WASTE WATER TREATMENT	19CVOE762 – OPTIMIZATION AND RELIABILTIY ANALYSIS
19CV743- DESIGN OF BRIDGES	19CV753- RAILWAY, AIRPORT & HARBOUR ENGG	19CVOE763-FINITE ELEMENT METHOD
19CV744 REINFORCED EARTH	19CV754- PAVEMENT DESIGN	19CVOE764 -GLOBAL ENVIRONMENTAL ISSUES

SEMESTER VIII

Code No.	Course	Hours/Week					Maximum Marks		
		Lecture	Tutorial	Practical	Self-Study	Credits	CIE	SEE	Total
THEORY									
19CV81	DESIGN OF STEEL STRUCTURES	3	2	0	--	4	50	50	100
19CV82x	ELECTIVE-V	3	--	0	-	3	50	50	100
19CV8OEx	OPEN ELECTIVE -III	3	--	0	-	3	50	50	100
19CVMC84	CERTIFICATION COURSE (NPTEL/MOOCS)	--	--		-	1	-	--	--
PRACTICAL									
19CVP85	PROJECT WORK PHASE – II	0	0	16	-	8	50	50	100
19CVIN86	INTERNSHIP				-	2	50	50	100
Total		09	02	16	-	21	250	250	500

ELECTIVE -V	**OPEN ELECTIVE- III**
19CV821- ADVANCED RCC DESIGN	19CV8OE31- ENGINEERING ECONOMICS AND MANAGMENT
19CV822- DESIGN OF PRESTRESSED CONCRETE STRUCTURES	19CV8OE32: ENVIRONMENTAL IMPACT ASSESSMENT
19CV823- DESIGN OF HYDRAULIC STRUCTURES	19CV8OE33- AIR POLLUTION AND CONTROL
19CV824- DESIGN OF EARTHQUAKE RESISTANT STRUCTURES	19CV8OE4 ENVIRONMENTAL PLANNING AND MANAGEMENT
19CV825- ADVANCED STEEL STRUCTURE DESIGN	18CV8OE-35-DISASTER MANAGEMENT

VII SEMESTER

ENTREPRENEURSHIP, MANAGEMENT AND FINANCE

Subject code	19HU71	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 3 hours
Total hours: 42	CIE Marks: 50 Marks	SEE: 50 Marks

Prerequisite: None

Course objectives:

To enable the students to obtain the basic knowledge about Entrepreneurship and Management and finance in the following topics: -

1. The Meaning, Functions, Characteristics, Types, Role and Barriers of
2. Entrepreneurship, Government Support for Entrepreneurship
3. Management – Meaning, nature, characteristics, scope, functions, role etc. and Engineers' social responsibility and ethics
4. Preparation of Project and Source of Finance
5. Fundamentals of Financial Accounting
6. Personnel and Material Management, Inventory Control

Module - I	**Teaching Hours**
ENTREPRENEUR: Meaning of Entrepreneur; Functions of an Entrepreneur; Characteristics of an entrepreneur, Types of Entrepreneurs; Intrapreneurs – an emerging class; Role of Entrepreneurs in economic development; Barriers to entrepreneurship, Government Support for Innovation and Entrepreneurship in India - Startup-India, Make-in-India, PMMY, AIM, STEP, BIRAC, Stand-up India, TREAD	8 Hours
Module-II	
MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management, Roles of Management, Levels of Management, Henry Fayol - 14 Principles to Management, Engineers Social responsibility and Ethics	08 Hours
Module-III	
PREPARATION OF PROJECT AND SOURCE OF FINANCE: PREPARATION OF PROJECT: Meaning of project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents;	08 Hours

SOURCE OF FINANCE: Long Term Sources (Equity, Preference, Debt Capital, Debentures, loan from Financial Institutions etc.) and Short-Term Source (Loan from commercial banks, Trade Credit, Customer Advances etc.)	
Module -IV	
FUNDAMENTALS OF FINANCIAL ACCOUNTING: Definition, Scope and Functions of Accounting, Accounting Concepts and Conventions: Golden rules of Accounting, Final Accounts - Trading and Profit and Loss Account, Balance sheet	09 Hours
Module-V	
PERSONNEL MANAGEMENT, MATERIAL MANAGEMENT AND INVENTORY CONTROL: PERSONNEL MANAGEMENT: Functions of Personnel Management, Recruitment, Selection and Training, Wages, Salary and Incentives MATERIAL MANAGEMENT AND INVENTORY CONTROL: Meaning, Scope and Objects of Material Management. Inventory Control- Meaning and Functions of Inventory control; Economic Order Quantity (EOQ) and various stock level (Re-order level, Minimum level, Maximum level, Average level and Danger level)	09 Hours

Course Outcomes: On completion of this course, students are able to:		
CO 1	Develop Entrepreneurship skills	
CO 2	Apply the concepts of management and Engineers Social responsibility & Ethics practice	
CO 3	Prepare project report & choose different Source of Finance.	
CO 4	Apply Fundamentals of Financial Accounting and interpret the final accounts	
CO 5	Apply personnel management skills, Material and inventory control techniques	

Text book:

1. Financial Accounting -B S RAMAN- United Publishers Manglore, Maheswar S N & Maheswari S K-Vikas Publishing House. January 2018
2. Management & Entrepreneurship- K R Phaneesh- Sudha Publications January 2018 ,Prof Manjunatha & Amit kumar G – laxmi Publication , January 2011. Veerbhadrappa Havina -Published by New Age International (P) Ltd., 2009.
3. Principles of Management First Edition (English, G. Murugesan), Laxmi Publications – New Delhi

Reference Books :

1) Industrial Organization & Engineering Economics-T R Banga & S C Sharma- Khanna Publishers, Delhi.

Nptel Link: https://nptel.ac.in/courses/110/106/110106141/

E-Books:https://www.businessmanagementideas.com/notes/management-notes/notes-on-management-in-an-organisation/4669

ESTIMATING, COSTING & SPECIFICATIONS

Subject code	19CV72	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 3 hours
Total hours: 42	CIE Marks: 50 Marks	SEE: 50 Marks

Prerequisite: Building material and construction, building planning and drawing

Course objectives:

To enable the students to obtain the basic knowledge about in the following topics: -

1.Understand the methods of taking out the quantities of each item of building components earth work, Bed concrete, Size stone masonry, Brickwork, RCC work etc. and for sanitary works, culverts, and steel truss.

2. Understand the method of writing the detailed specifications for all items of building of other works

3. Capable of calculate the rate per unit quantity of all items of building and other works.

4. Able to evaluate the value of property for different purposes.

Modules	Teaching Hours
Module I **Estimate:** Different types of estimates, Study of various drawings, important terms, units of measurements, abstracts, approximate methods of estimating **1. Estimation:** Methods of taking out quantities & their cost – center line method, long wall & short wall method. Preparation of detailed abstract & estimates for the following civil engineering works – Buildings- masonry structures & framed structures with flat & sloped R.C.C roof. Building components such as beams, columns, footings & roof slab with T beams. Excel spread sheet for estimation of small buildings. **2. Estimates:** Steel trusses – fink & Howe trusses, R.C.C. slab culverts, manholes & septic tank with soak pits. Excel spread sheet for estimation of slab culvert bridges.	10 Hours 06 Hours
Module-II **1. Specifications:** Definition, objectives & essentials of specifications. General &	03 Hours

detailed specifications for items of works in buildings, specifications of aluminum & wood partitions, false ceiling, aluminum & fiber doors & windows, various types of claddings. **2. Contracts:** Types of contracts – essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – tender, earnest money deposits, security deposit, tender forms, documents & types. Comparative statements, acceptance of contract documents & issue of work order. Duties & liabilities, termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval, technical sanction, nominal muster roll, measurement books, procedure for reading & checking measurements – preparation of bills.	03 Hours
Module-III **Rate Analysis:** Definitions & purpose, working of quantities of and rates for the following standard items of works – earth work, cement concrete, brick work, stone masonry, flooring, plastering, R.C.C. works, centering & form work for different R.C.C. items, wood & steel works for doors, windows & ventilators.	07 Hours
Module -IV **Measurement of earthwork for roads:** methods for computation of earthwork by different methods.	07 Hours
Module-V **Valuation:** Definition of terms used, different methods of valuation for different purposes with numerical examples.	06 Hours

Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Prepare the estimate for building items such as foundation, wall, column, beam, roofs lab steel roof trusses and Sanitary works.	C2
CO2:	Prepare the tender document and tender notice with detailed specifications including the legal aspects of contract of civil engineering projects	C2
CO3:	Determine the rates of different items of civil engineering works such as Earth work excavation, stone and brick masonry, woodwork, concrete and Reinforced concrete works.	C3
CO4	Determine the quantity of earthwork by different methods for railways and highway	C3
CO5	Determine the fair price of the property by different methods of valuation for different	C3

Text book:

1. Datta B.N., “Estimating and costing”, UBSPD Publishing House, New Delhi.
2. B.S. Patil, “Civil Engineering Contracts and Estimates”, Universities Press.
3. M. Chakraborthi; “Estimation, Costing and Specifications”, Laxmi Publications.
4. MORTH Specification for Roads and Bridge Works – IRC New Delhi.

Reference books:

1. Kohli D. D and Kohli R.C, “Estimating and Costing", 12 th Edition, S.Chand Publishers, 2014.
2. Vazirani V.N and Chandola S.P, “Estimating and costing", Khanna Publishers, 2015.
3. Rangwala, C. "Estimating, Costing and Valuation", Charotar Publishing House Pvt. Ltd.,

2015.
4. Duncan Cartlidge, "Quantity Surveyor's Pocket Book", Routledge Publishers, 2012.
5. Martin Brook, "Estimating and Tendering for Construction Work", A Butterworth-Heinemann publishers, 2008.
6. Robert L Peurifoy, Garold D. Oberlender,"Estimating Construction Costs" – 5ed, Tata McGraw-Hill, New Delhi.

Nptel Link: **https://youtu.be/ofkpm4lhJcg**

E-Books: www.civilenggebooks.com

ENVIRONMENTAL ENGINEERING – II		
Subject code	19CV73	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Environmental engineering –I

Course objectives:
To enable the student to acquire the knowledge in the following topics.

1. Fundamentals of waste water engineering.
2. Various components of sewerage system.
3. Quantitative and qualitative assessment of waste generated.
4. Solve waste treatment unit design problems using hydraulic principles and methods.
5. Operation of waste water treatment units. Advance treatment methods

Modules	**Teaching Hours**
MODULE-I **INTRODUCTION**: Waste water disposal - Necessity for sanitation. methods of sewage disposal. types of sewerage systems and their suitability. **QUANTITY OF SEWAGE**: Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system; computation of design flow, estimation of storm flow, rational method and empirical formulae of design of storm water drain; Time of concentration. **DESIGN OF SEWERS**: Hydraulic formulae for velocity, effects of flow variations on velocity, self-cleansing and non-scouring velocities. Design of hydraulic elements for circular sewers flowing full and for partially full.	03 Hours 04 Hours 05 Hours
MODULE-II **MATERIALS OF SEWERS**: Sewer materials, Shapes or sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewers. **SEWER APPURTENANCES**: Catch basins, manholes, flushing tanks, oil and	03 Hours

grease traps, drainage traps, basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage. **ANALYSIS OF SEWAGE**: Physical. chemical and biological characteristics concepts of aerobic and anaerobic activity, CNS cycles, more emphasis on BOD and COD. Sampling, significance, techniques and frequency.	03 Hours 04 Hours
MODULE-III **Sewage pumping: Need**, types of pumps and pumping stations. **Disposal of effluents:** By dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, disposal standards on land and water, chlorination of sewage. **Treatment of sewage:** Flow diagram of municipal sewage treatment Plant.	02 Hours 03 Hours 01 Hours
MODULE-IV **Primary Treatment: screening**, grit chambers, skimming tanks, primary sedimentation tanks – Designs. **Secondary Treatment:** Trickling filter – types, theory and operation – Designs. Activated sludge process – principle and flow diagram, methods of aeration, modifications, F/M ratio – Design **Sludge: methods** of sludge disposal, sludge drying beds, sludge digestion tank.	02 Hours 03 Hours 04 Hours
MODULE-V **Miscellaneous treatment methods: Septic** tank and Oxidation Ponds – Designs. Introduction to Aerobic lagoon, Anaerobic lagoon, Oxidation ditch, Anaerobic filters, RBC, UASB and Hybrid reactors. Sequencing of reactors viz., serial and parallel.	05 Hours

Course Outcomes: On completion of this course, students are able to:

CO		
CO1:	Explain the suitability of different sewerage systems and estimate the quantity of sewage and storm water and design sewers (storm water drains)by different methods	
CO2:	Describe the different materials & shape of sewers and sewer appurtenances and evaluate the quality of sewage w.r.t physical, chemical and biological parameters	
CO3:	Describe the different types of pumps, methods of disposal of effluents and explain the steps involved in the sewage treatment	
CO4	Design the primary and secondary treatment units –grit chamber, sedimentation tanks, trickling filter and activated sludge process.	
CO5	Design the other treatment units septic tanks, oxidation ponds and ditches,	

	aerobic lagoons & anaerobic lagoons and describe RBC, UASB and hybrid reactors	

Question paper pattern:
i) Two questions are to be set from each module.
ii) Total five questions are to be answered by selecting minimum one question from each module

Text books:

1. Environmental Engineering (Vol II) – By S.K. Garg, Khanna Publishers
2. Environmental Engineering – II By B.C. Punmia and Ashok Jain
3. Manual on Waste Water Treatment – CPHEEO, Ministry of Urban Development, New Delhi
4. Water and Wastewater Engineering Vol – II By Fair, Geyer, Okun, Willey Eastern Publishers, New York

Waste Water Treatment, Disposal and Reuse - By Metcalf & Eddy Inc... Tata McGraw Hill Publications (2003 Edition)

1.

Reference Books:

1. Water Technology By Hammer & Hammer

Environmental Engineering By Howard.S. Peavy, Donald. Rowe, George Tchobanoglouse, McGraw Hill International Edition

E-Books: www.civilenggebooks.com

SOLID WASTE MANAGEMENT

Subject code	19CV741	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Environmental studies, Environmental engg- II

Course objectives:
To enable the students to acquire the knowledge in the following topics:

1. Need for solid waste management studies scope and importance of solid waste management.
2. To identify the sources of wastes collection and transportation of wastes.
3. Waste disposal methods
4. Knowledge of the hazardous solid waste and impacts on environment.
5. Concept of reduce recycle and reuse of wastes.

Modules	Teaching Hours

Module I **Introduction:** Solid waste – Definition, Land pollution – scope and importance of solid waste management, functional elements of solid waste management. **Sources:** Classification and characteristics – municipal, hospital / biomedical waste, Quality – generation rate, methods.	6 hours
Module-II **Collection and transportation:** Systems of collection, collection equipment, garbage, chutes, transfer stations – bailing and compacting, route optimization. **Treatment / processing techniques:** Component's separation, volume reduction, size reduction, chemical reduction and biological processing.	5 hours 5 hours
Module-III **Incineration:** Processes – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis. **Composting**: Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes, Vermicomposting	5 hours 4 hours
Module -IV **Sanitary land filling:** Definition, methods, trench area, ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate collection and control methods, gas collection systems. Open dumping – selection of site, ocean disposal, feeding to hogs	9 hours
Module-V **Disposal method**: Incineration, pyrolysis, composting, sanitary landfilling, merits and demerits**.** **Recycle and reuse:** Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse.	3 hours 5 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Identify the sources, types, composition and characteristics of solid wastes.	C1
CO2:	Identify the systems of collection, equipment's used for the collection of solid waste.	C3
CO3:	knowledge of the hazardous of solid waste and the necessity to treat solid waste.	C2
CO4	Identify the methods of disposal for different solid waste.	C1
CO5	know the importance of reduce, recycle and reuse of solid wastes.	C1

Text book:

1. George Tchobanoglous, Hilary Theisen, Samuel A Vigil, "Integrated Solid Waste Management Engineering principles and management issues", M/c Graw hill Education. Indian edition
2. Howard S Peavy, Donald R Rowe and George Tchobanoglous, "Environmental Engineering", Tata Mcgraw Hill Publishing Co ltd.,

Reference books:

1. Municipal Solid Wastes (Management and Handling) Rules, 2000.Ministry of Environment

and Forests
2. Notification, New Delhi, the 25th September, 2000. Amendment – 1357(E) – 08-04-2016
3. Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Central
4. Public Health and Environmental Engineering Organization (CPHEEO), 2016, Ministry of Urban Development, Government of India.
5. Handbook of Solid waste management, second edition, George Tchobanoglous, Frank Kreith, published by M/c Graw hill Education, 2002, ISBN-13 978-0071356237 ISBN -10 0071356231

Nptel Link:
https://youtu.be/cjIacnNRLHE

E-Books: www.civilenggebooks.com

ENGINEERING HYDROLOGY

Subject code	19CV742	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: The students should have knowledge of Engg. Mechanics & water resources engineering

Course objectives:
The students will be able to acquire knowledge in the following topics
1. Hydrological cycle & Measurement rainfall over a catchment.
2. Engineering Analysis of Rainfall data.
3. Rainfall-Runoff relationship & Analysis of stream flow data.
4. Hydrograph theory & Application to predict floods.

Ground water hydrology & Estimation of yield of well.

Modules	Teaching Hours
Module I **INTRODUCTION:** Introduction and practical application of Hydrology and water Resources. Hydrologic cycle (Horton's Qualitative Representation), Concept of Catchment and Its Characteristics and Water budget equation.	4 hours
PRECIPITATION: Definition and forms &Types of precipitation – Climate & Weather seasons in India Measurement of precipitation – Non recording and recording type rain gauges. Computation of average depth of precipitation over an area. Statistical methods. Estimation of missing precipitation data	4 hours
Module-II **ANALYSIS OF RAINFALL DATA**: Mass curve and consistency of rainfall data Rain gauge networks – optimum number of rain gauges, Hyetograph, Infiltration and Infiltration Indices. Average & Maximum intensity curves, Depth area duration curves. Problems on dependable rain, frequency analysis.	8 hours

Module-III **RUNOFF & STREAM FLOW MEASUREMENT:** Components. Factors affecting runoff. Basin yield. Rainfall – Runoff relationship using simple regression analysis. Computation of maximum flood discharge by rational formula, Empirical equations, frequency analysis. Stream flow measurement, Stage – Discharge Curve, area-velocity method. Slope area method, Dilution method, Units of stream flow, flow duration curve, flow mass curve.	9 hours
Module -IV **HYDROGRAPH THEORY:** Components of hydrograph. Separation of base flow. Unit hydrograph theory. Derivation and application of unit hydrograph. Computation of unit hydrographs ordinates of different durations. S-Curve and its use. Computation of Run off Hydrograph using unit hydrograph. Unit hydrograph for complex storms.	9 hours
Module-V **GROUND WATER HYDROLOGY AND WELL HYDRAULICS:** Scope and importance of ground water hydrology. Occurrence of ground water. Definitions: Aquifers, aquitard, aquifuge, aquiclude, perched aquifer. Aquifer parameters. Darcy's law and its validity. Steady radial flow into a well in confined and unconfined aquifers. Safe yield, yield of an open well Pumping test and recuperation test. problems	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Students will be in a position to analyze the rainfall data and apply the principles to the real problems.	C1
CO2:	Students in a position to understand runoff computations and apply the principles.	C2
CO3:	Students acquire the knowledge of hydrographs and its components also students can apply the principles of various hydrographs to solve field problems.	C2 C3
CO4	Students gain knowledge in ground water source and apply the principles to different problems.	C2 C3
CO5	Students will acquire the skills to interpret the hydrological data pertaining to surface and ground water.	C3 C4

Text book:

1. K. Subramanya, "Engineering Hydrology", Tata McGraw Hill Publishers, New Delhi.
2. Jayarami Reddy, "A Text Book of Hydrology", Lakshmi Publications, New Delhi.
3. Punmia and Lal Pandey, "Irrigation and Water Power Engineering" Lakshmi Publications, New Delhi.

Reference books:

1. H.M. Raghunath, "Hydrology", Wiley Eastern Publication, New Delhi.
2. Sharma R.K., "Irrigation Engineering and Hydraulics", Oxford & IBH Publishing Co., New Delhi.
3. Ven Te Chow, "Applied Hydrology", Tata McGraw Hill Publishers, New Delhi.
4. Modi P.N "Water Resources and Water Power Engineering"-. Standard book house, Delhi.
5. Garg S.K, "Irrigation Engineering and Hydraulic Structures" Khanna publications, New Delhi.

Nptel Link: https://youtu.be/XTDkU7kPfUQ
E-Books: www.civilenggebooks.com

DESIGN OF BRIDGES

Subject code	19CV743	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Elements of engg and engg mechanics, Strength of material, Structural analysis- I, Structural analysis- II

Course objectives:

1. Types and importance of bridges and basic investigations for proposing bridge at a site.
2. Details of different types of foundations for a proposed bridge its stability analysis for different components of substructures.
3. Loads as per IRC and stresses on different components of bridge and design of RCC slab culvert.
4. Design of pipe culvert and box culvert for a proposed highway road.
5. Design of RCC T-beam girder bridge by different methods and detailing.

Modules	Teaching Hours
Module I	
Introduction: Definition, components of bridges, Classification, types of bridges, importance of bridges.	2 hours
Bridge Site Investigation and Hydraulic Design: Selection of bridge site, determination of design discharge, natural, artificial and linear waterways, afflux, economical span, scour depth for alluvial and quasi alluvial waterways. Numerical problems on above.	6 hours
Module-II	
Substructure and Foundations: Types of abutments, piers, wing walls, forces to be considered for the design, Principles of stability analysis of abutment and pier & wing walls. Codal provisions for fixing of tentative sections of abutment, pier, wing walls. problems on stability analysis of abutments	4 hours
Foundation: Types of foundations. Shallow and deep foundations, spread and raft type foundation. Pile foundation: bearing, friction and combined bearing and friction piles. Caisson foundations and open and pneumatic caissons.	4 hours
Module-III	
Loads and stresses: various loads to be considered while designing bridges. IRC Loading standards. **Design**	2 hours
of RC slab culvert for IRC class AA tracked and class A two lane loading using effective width method. Neat dimensioned sketches of slab culvert showing half section plan at foundation, half front elevation, half plan at foundation level and half top view.	6 hours

Module -IV **Design of pipe culvert:** Hydraulic and structural design. pipe culvert for shallow and high embankments. Design of pipe culvert for high embankments. given site particulars. Neat dimensioned sketches of pipe culvert for given site particulars. **Design of Box Culvert:** Design of single box culvert by actual analysis using momemt distribution method for different combinations of loads such as dead load, live load, earth pressure from outside and water pressure from inside	5 hours 5 hours
Module-V **Design of T-Beam Bridge:** Design of all the components of T-Beam bridge for class AA tracked vehicle only. Design of interior deck slab panel by Pigeaud's theory. Design of interior longitudinal girder by Courbon's load distribution method. Approximate method of design of interior cross girder. Neat sketches showing reinforcement details in slab and beams.	8 hours

CO		**BL**
CO1:	Explain different types of bridges and determine hydraulic inputs required for design of bridges	C2
CO2:	Explain different types of foundation, principles of stability analysis of abutment, pier and wing walls and analyse abutment from stability criteria	C4
CO3:	Explain different types of loads for design of bridges and design a RCC slab culvert	C5
CO4	Design a Pipe and Box culvert	C5
CO5	Design a T-Beam Bridges	C5

Text book:
1. Johnson Victor. D, "Essentials of Bridge Engineering", Oxford Publishing Company.
2. N Krishna Raju, "Design of Bridges, Oxford and IBH publishing company
3. T R Jagadeesh and M A Jayaram, "Design of bridge structures", Prentice Hall of India

Reference books:
1. Jain and Jai krishna, "Plain and Reinforced Concrete", Vol.2 Nem Chand Brothers.
2. Standard specifications and code of practice for road bridges, IRC section I,II, III and IV. "Concrete Bridges", The Concrete Association of India

Nptel Link: https://youtu.be/5k8vdDSK6jU

E-Books: www.civilenggebooks.com

REINFORCED EARTH

Subject code	19CV744	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Geotechnical Engg-I and II

Course objectives:
1. identify, formulate reinforced earth techniques that are suitable for different soils and in different structures;

2. understand the laboratory testing concepts of Geosynthetics
3. design RE retaining structures and Soil Nailing concepts
4. Determine the load carrying capacity of Foundations resting on RE soil bed.
5. asses the use of Geosynthetics in drainage requirements and landfill designs

Modules	**Teaching Hours**
Module I **Basics of Reinforced Earth Construction**: Definition, Historical Background, Components, Mechanism and Concept, Advantages and Disadvantage of reinforced earth Construction, Sandwich technique for clayey soil. **Geosynthetics and Their Functions**: Historical developments, Recent developments, manufacturing process, Raw materials – Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics **Properties and Tests on Materials Properties** –Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties	9 Hours
Module-II **Design of Reinforced Earth Retaining Walls**: Concept of Reinforced earth retaining wall, Internal and external stability, Selection of materials, Typical design problems **Soil Nailing Techniques**: Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken	8 Hours
Module-III **Design of Reinforced Earth Foundations:** Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull-out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines.	9 Hours
Module -IV **Geosynthetics for Roads and Slopes:** Roads – Applications to Temporary and Permanent roads, Role of Geosynthetic in enhancing properties of road, control of mud pumping, enhancing properties of subgrade, Design requirements Slopes – Causes for slope failure, Improvement of slope stability with Geosynthetic, Drainage requirements, Construction technique. Simple Numerical Stability Checking Problems on Reinforced Slopes	8 Hours
Module-V **Geosynthetics - filter, drain and landfills:** Filter & Drain – Conventional granular filter design criteria, Geosynthetic filter design requirements, Drain and filter properties, Design criteria – soil retention, Geosynthetic permeability, anticlogging, survivability and durability (No Numerical Problems) Landfills – Typical design of Landfills – Landfill liner & cover, EPA Guidelines, Barrier walls for existing landfills and abandoned dumps (No Numerical Problems)	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**Blooms Level**
CO1:	Identify, formulate reinforced earth techniques that are suitable for different soils and in different structures;	C1

CO2:	Understand the laboratory testing concepts of Geosynthetics	C2
CO3:	Design RE retaining structures and Soil Nailing concepts	C2
CO4	Determine the load carrying capacity of Foundations resting on RE soil bed.	C3
CO5	Asses the use of Geosynthetics in drainage requirements and landfill designs	C3

Text book:

1. Koerner. R.M, "Design with Geosynthetics", Prince Hall Publications
2. Koerner. R.M. &Wesh J.P, "Construction and Geotechnical Engineering using synthetic fabrics", Wiley Inter Science, New York
3. SivakumarBabu G. L., "An introduction to Soil Reinforcement and Geosynthetics", Universities Press, Hyderabad
4. Swami Saran, "Reinforced Soil and its Engineering Applications", I. K. International Pvt. Ltd, New Delhi
5. Venkattappa Rao, G., & Suryanarayana Raju., G. V.S, "Engineering with Geosynthetics", Tata McGraw Hill publishing Company Limited., New Delhi.

Reference books:

1. Jones, "Earth reinforcement and Soil structure", CJEP Butterworths, London
2. Ingold, T.S. & Millar, K.S, "Geotextile Hand Book", Thomas, Telford, London.
3. Hidetoshi Octial, Shigenori Hayshi& Jen Otani, "Earth Reinforcement Practices"Vol. I, A.A. Balkema, Rotterdam
4. Bell F.G, "Ground Engineer's reference Book", Butterworths, London
5. Ingold, T.S, "Reinforced Earth", Thomas, Telford, London.
6. Sarsby R W- Editor, "Geosynthetics in Civil Engineering", Woodhead Publishing Ltd & CRC Press, 2007

Nptel Link: https://youtu.be/10TwMa2JiXY

E-Books: www.civilenggebooks.com

ADVANCED FOUNDATION DESIGN

Subject code	19CV751	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Geotechnical engg- I, Geotechnical engg- II

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Types of shallow foundations, Bearing capacity according to BIS.
2. Classification of pile foundation, Group efficiency of piles.
3. Construction of different types of drilled piers and caissons.
4. Components of well foundation and forces acting on it.
5. Classification of expansive soils, Design of foundations in swelling soils, Drilled piers, Under reamed piles.

Modules	Teaching

	Hours
Module I **Shallow foundations:** Presumptive Bearing Capacity according to BIS, Factors affecting bearing capacity and settlement. Factors influencing selection of depth of foundation, type of shallow foundations – isolated footing. Combined footing, strap footing, Strip footing and Raft (Proportioning only)	9 hours
Module-II **Pile foundations:** Necessity, Classification, Load bearing capacity by static formula, Dynamic formula, pile load test and Penetration tests, pipe groups, group capacity of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, under reamed piles.	8 hours
Module III **Drilled piers and casissons:** Introduction, construction, advantages and disadvantages of drilled piers. Design of open, pneumatic and floating caissons. Advantages and disadvantages of floating caissons.	8 hours
Module -IV **Well foundation:** Different shapes and characteristics of wells. Components of well foundation. Terzaghi's Analysis, IRC method, Forces acting on well foundation. Sinking of wells. Causes and remedies of this and shifts.	7 hours
Module-V **Foundation in expansive soils:** Expansive soils, Parameters of Expansive soils, Classification of Expansive soils, Causes of moisture changes in soils, Effects of swelling on buildings, Preventive measures for expansive soils, Modification of expansive soils, Design of foundations in swelling soils, Drilled piers, Belled drilled pier, Under-reamed piles, construction of Under-reamed piles, Identification of collapsible soils, Design of foundation on collapsible soils not subjected to wetting, design of foundations subjected to wetting, Illustrative examples, problems.	10 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Apply principles of soil design for shallow foundations.	C3
CO2:	Design pile and pile groups with reference to dimensions.	C5
CO3:	Explain the construction of drilled piers and principles of design for open, pneumatic and floating caissons.	C2
CO4	Explain the construction of drilled piers and principles of design for open, pneumatic and floating caissons.	C2
CO5	Determine the effects of expansive soil on foundations and apply soil design principle for foundation in swelling soil.	C4

Text book:

1. Punmia B.C., “Soil Mechanics and Foundation Engineering,Laxmi Publications Co., India.
2. Donald P. Coduto, “Geotechnical Engineering Principles & Practices”, Prentice-hall of India Ltd, India.
3. Murthy V.N.S., “Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering”, CRC Press, New York.

Reference books:

1. Bowles J.E., "Foundation Analysis and Design", McGraw Hill Pub. Co. New York.
2. Swami Saran, "Analysis and Design of Substructures", Oxford & IBH Pub. Co. Pvt. Ltd., India.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn, "Foundation Engineering", Wiley Eastern Ltd., India.
4. Braja, M. Das, "Principles of Geotechnical Engineering", Cengage Learning, India.
5. Bureau of Indian Standards: IS-1904, IS-6403, IS-8009, IS-2950, IS-2911 and all other relevant codes.

Nptel Link:https://youtu.be/lsYFtwwlHIw

E-Books: www.civilenggebooks.com

INDUSTRIAL WASTE WATER TREATMENT

Subject code	19CV752	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Engg Chemistry, Environmental engg-I , Environmental engg- II

Course objectives:

To enable the student to acquire the knowledge in the following topics

1. To enable the students to understand fundamentals of industrial wastewater treatment.
2. To make students to understand theoretical treatment of industrial wastewater in order to reduce the cost of treatment.
3. To make students to understand minimize the cost of treatment by joint treatment with municipal wastewater.
4. To enable students to understand the characterization, suitable treatment and disposal of industrial wastewater.

To enable students to understand reuse and recovery of by products from industrial wastewater.

Modules	Teaching Hours
Module I	
Introduction: Industrial wastewater, difference between Industrial and domestic wastewater, effects of industrial wastewater on municipal sewage treatment systems and on receiving streams.	4 hours
Dissolved oxygen sag curve in streams Streeter-Phelps formulation, stream sampling, effluent and stream standards.	4 hours
Module-II	
Treatment methods: Volume reduction, strength reduction, neutralization, equalization, proportioning.	4 hours
Removal of suspended and dissolved solids. Treatment and disposal of sludge solids.	3 hours

Module-III **Combined treatment:** Feasibility of combined treatment of industrial raw wastewater with domestic wastewater. Discharge of raw, partially treated and completely treated industrial wastes to streams.		6 hours
Module -IV **Treatment of industrial wastes:** Processes involved, flow chart showing origin of wastes, their characteristics, treatment methods, disposal, reuse and recovery of bi-products. Integrated cotton textile, sugar, dairy, canning, brewery, distillery and tanning industry.		11 hours
Module-V **Treatment of industrial wastes:** Flow chart of process involved, origin of wastes, characteristics, treatment, disposal, reuse and recovery of by-products of canning, paper and pulp, pharmaceutical industries, metal plating and radio-active wastes.		10 hours
Course Outcomes: On completion of this course, students are able to:		
CO		**BL**
CO1:	Differentiate between domestic waste water and industrial waste water.	C1
CO2:	Understand the effects of industrial waste water on domestic treatment plants and on streams.	C2
CO3:	Understand the different methods of treatment of industrial wastes.	C2
CO4	The feasibility of combined treatment of industrial waste water with domestic waste water.	C3
CO5	Understand the origin of wastes in different industries, their characteristics and treatment.	C2 C3
Text book: 1. Howard S. Peavy, Donald R. Rowe, George T, Environmental Engineering - McGraw Hill International Edition. New York,2000 2. S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi2010 3. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P)Ltd., New Delhi2010.		
Reference books: 1. CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi. 2. Mark. J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., New York,2008. 3. Industrial wastewater treatment – Nelson Nemerow 4. Industrial waste treatment – M N Rao and A K Dutta 5. Industrial waste disposal – Ross R D 6. Pollution control in process industries – Mahajan.		
Nptel Link: https://youtu.be/in3GSRuooRs		
E-Books: www.civilenggebooks.com		

RAILWAY, AIRPORT & HARBOUR ENGG

Subject code	19CV753	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Transportation Engg-I

Course objectives:

To enable the students to acquire the knowledge in the following topics

1. Understand role of railway and different route selection for the construction railway track
2. Learn different types of structural components, engg properties of material to construct the material to calculate the material quantities required for construction
3. Understand the various aspects of geometric element, points and crossings, significance of maintenance of track
4. Design and plan Airport layout, design facilities required for runway, taxiway and impart knowledge about visual aids.
5. Understand different types of harbour structure, dock and necessary navigational aids: also expose them to various methods of tunneling and tunnel necessaries.

Modules	Teaching Hours
Module I **Railways**: Role of railways in transportation- selection of routes. **Permanent way** – Gauges in railways – railway track, cross-sections, coning of wheels, rails, rail sections, Ballast and sleepers. Rail fixtures, calculation of quantity of materials needed for laying of tracks. Wear on rails, rail joints, welding of rails, creep of rails, traction and tractive resistances, tractive power, Hauling capacity. Problems on above	8 Hours
Module-II **Geometric design of track –** Necessity, grade, ruling gradient, pusher grade, minimum Gradient, grade compensation on curves. Speed of train, super elevation, cant- deficiency, negative cant- speed calculation based on IR Formulae for High speed tracks only-problems on above. **Points and crossing:** Necessity, components, turnout, design of turnout (no derivations, only relevant problems).	9 Hours
Module-III **Points and crossing Continued:** stations and yards, Signaling and interlocking, track defects, track maintenance, level crossing, Indian Railway standards. **Airport Planning:** Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications, - Site selection- regional Planning.	8 Hours
Module -IV **Runway Design-** Analysis of Wind data-determination of the best orientation of the runway configurations by using two types of wind rose diagrams- basic length of the runway –corrections to runway length by ICAO and FAA specification- runway	9 Hours

cross Sections- problems on above. **Taxiway Design:** Factors affecting the layout of the taxiway-geometrics oftaxiway-design of exit taxiways, - ICAO Specifications. Problems on above. **Visual Aids:** Airport marking – lightings- ILS.	
Module-V **Harbors:** Types, components, typical layout, objects and functions of docks. different harbour structures.	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Identify various components of permanent way and determine hauling capacity of railway	C3
CO2:	Determine the permanent parameters required for geometric design of track.	C4
CO3:	Explain the components of points, crossings, signaling and interlocking systems and design the turnouts.	C2
CO4	Explain the component parts and functions of an airport and design the runway length and exit taxiway.	C2
CO5	Compare different techniques of tunnelling in hard and soft rock and explain different dock and harbour structures.	C5

Text book:

1. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi.
2. Satish Chandra and Agarwal M. M, "Railway Engineering", 2nd Edition, Oxford University Press, New Delhi.
3. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemch and and Brothers, Roorkee.
4.CVenkatramaiah, "Transportation Engineering", Volume II :Railways, Airports, Docks and Harbours, Bridges and Tunnels, Universities Press.
5. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi.

Reference books:

1. Oza.H.P.andOza.G.H.,"AcourseinDocks&HarbourEngineering".Charotar Publishing Co.,
2. Mundrey J. S. "A course in Railway Track Engineering". Tata Mc Graw Hill.
3. Srinivasan R. Harbour," Dock and TunnelEngineering",26thEdition2013.

Nptel Link: https://youtu.be/37WMS483T7Y

E-Books: www.civilenggebooks.com

PAVEMENT DESIGN

Subject code	19CV754	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Transportation Engg-I and Transportation Engg-II

Course objectives:

To enable students to acquire the knowledge in the fallowing topics:

1. Gain knowledge about the types of pavements, factors affecting pavement design and Excel in the path of analysis of stress, strain and deflection in pavement.
2. Design Pavement using Burmeister Theory
3. Understand design concepts of flexible pavement by various methods
4. Determine the stresses in Rigid pavements
5. Design the Rigid Pavement using IRC:58 metho

Modules	Teaching Hours
Module I	
Introduction: Types and component parts of pavements, functions of various components of flexible and rigid pavements, factors affecting design and performance of pavements. Comparison of highway and airport pavements. Advantages and disadvantages of rigid or CC pavement	4 hours
Stresses and Deflections in Flexible Pavements: Stresses and deflections in homogenous masses using Bossiness's theory, Principle, assumptions and limitations. Design of flexible pavement using single layer elastic theory. numerical problems on above	4 hours
Module II	
Wheel load stresses various factors in traffic wheel loads, ESWL of dual and multiple wheel loads using equal stress and equal deflection criteria. Repeated loads and EWL factors using Macleod and IRC methods, numerical problems on above.	4 hours
Burmeister two-layer theories Principle, assumptions and limitations. Vertical stress distribution in two-layer system. Design of pavement using vertical surface deflections, numerical problems on Above.	4 hours
Module-III	
Burmeister three-layer theories, Principle, assumptions and limitations. stresses and strain using Peattie's charts and forces tables. Numerical problems on above.	4 hours
Flexible Pavement Design Methods for Highways and Airports: Empirical, semi empirical and theoretical approaches. Perpetual pavement. IRC: 37-2012 method of pavement design. Principles of pavement design. Design of flexible pavement with following two pavement compositions. i] granular base and granular sub base. ii] cementitious base and granular sub base with rack relief layer of aggregate	5 hours

above cementitious base.	
Module -IV **Stresses in Rigid Pavements:** Types of stresses and causes, factors influencing stresses, general considerations in rigid pavement analysis, wheel load stresses, warping stresses, frictional stresses, combined stresses. Numerical problems on above. Types of joints in cement concrete pavements and their functions, contraction, warping ad construction joints**.** Joint spacings and layout. numerical problems	5 hours 3 hours
Module-V **Rigid Pavement Design:** Design of plain jointed rigid pavements for highways using IRC-58:2011. Procedure for slab design. Design of, dowel bars and tie bars by IRC-58:2011. Numerical problems on above.	9 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Explain types of pavements, factors effecting design of pavement and determine stresses and deflection in flexible pavement	**C4**
CO2:	Design Pavement using Burmeister Theory	**C5**
CO3:	Design flexible pavement using empirical, semi-empirical, theoretical and IRC:37 approach	**C5**
CO4	Explain different types of joints in concrete pavement and determine stresses in rigid pavement	**C4**
CO5	Design a Rigid Pavement using IRC:58 method	**C5**

Text book:

1.Highway Engineering- Khanna, S.K., and Justo, C.E.G.: Nem Chand and Bros. Roorkee.
2. Construction Equipment and its Management- Sharma, S.C. Khanna Publishers.
3. Hot Mix Asphalt Materials, Mixture Design and Construction- Freddy L. Roberts, Kandhal, P.S: University of Texas Austin, Texas. NAPA Education Foundation Lanham, Maryland.

Reference books: .

Reference Books

1. RRL, DSIR, 'Bituminous Materials in Road Construction', HMSO Publication.
2. RRL, DSIR, 'Soil Mechanics for Road Engineers', HMSO Publication.
3. Relevant IRC codes and MoRT& H specifications

Nptel Link: https://youtu.be/uJntLOgEHD4

Web links and Video Lectures:

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

E-Books: www.civilenggebooks.com

RURAL DEVELOPMENT TECHNOLOGY		
Subject code	19CV7OE761	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned competency:

1.Undertake surveys to decide the status of socio-economic significance.
2.Identify the need of watershed management in rural areas.
3.Suggest relevant government schemes for construction of roads, housing and energy conservation. .
4.Suggest the relevant cottage and agro based industries for the rural areas.
5.Select the relevant schemes of Central/State Government for the rural areas.
6.Apply the principles of rural development in rural areas.

Modules	Teaching Hours
Module I 1. Rural Development: Need, definition, objectives, Rural development as a phenomenon, Rural development as a strategy 2. Significance Of Rural Development Social significance – Rural problems, social change, resource utilization, infrastructure etc.Economic significance – National income, employment, food and fodder, industrial development, internal trade and transport, capital formation, etc.political significance- Political stability, 3. Rural Development Environment, Panchayat raj institution, CAP ART (Council for advancement of people's action and rural technology)-Organizational set up, purposes, objectives, activities. 4. Socio-Economic survey 5. Role of Civil Engineer in Rural Development.	8 Hours
Module-II 1. Indira Awas Yojana – Salient features, beneficiary people, Conversion of Unserviceable blouses into Pucca/Semi-Pucca houses. 2. Credit-cum- Subsidy scheme of rural housing- Salient features, share of Central and state Government, 3. Rural Building Centres-Purpose, technology transfer, skill development, training, eco-friendly materials 4. Pradhan Mantri Gram Sadak Yojna (PMGSY) and Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) Schemes- Key elements, concept of rural road connectivity.	9 Hours
Module-III 1. Low-Cost Housing- Principles, purposes, use of Local Material for construction 2. Rural Roads- Type, Specifications, Construction Techniques and Road Drainage	

3. Bio mass – Types of fuel such as Firewood, agricultural residues, dung cakes 4. Renewable energy and Integrated Rural Energy Programme -Objectives, key elements, implementation, financial provisions, sources of renewable energy Working of Gobar gas and Biogas plant, National project on biogas development-technology, performance and implementation, financial assistance, involvement of Panchayat and local bodies		8 Hours
Module -IV 1. Cottage Industry- Brick Manufacturing, Concrete hollow Block, Artificial Sandstone crushing plant. 2. Agro based Industry- Dairy, Animal Husbandry, Horticulture, Sericulture, and Fishery 3. sources of funds for rural development Domestic (institutional and non - institutional) foreign institutional and non -institutional)		8 Hours
Module-V 1. Plan and planning for rural development. 2. Levels and Functions of Planning. 1. Micro-level Planning 2. meso-level Planning 3. macro-level Planning 3. Decentralization policy of Planning. 4. Block and District Level Planning.		8 Hours
Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Justify the necessity of planning for the development of the given rural area.	C2
CO2:	Execute the relevant plan at the specified level of the given rural area.	C2
CO3:	Describe the functions of planning at micro, meso and macro levels for the given rural area.	C3
CO4	Describe the process of micro level planning w.r.t. agriculture.	C3
CO5	Describe the methodology used for executing the block and district level planning for the given rural area.	C2
Text book: 1. V. M. Euler's and E. W. Steel, Municipal and Rural Sanitation, 6th Ed., McGraw Hill Book Company, 2009. 2. H. S. Peavy, D. R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw-Hill International Ed., 2013. 3. S. Gupta, Rural Water Supply and Sanitation, Vayu Education of India, New Delhi, 2013.		
Reference books: 1. F. B. Wright, Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York, 1977 2. K. Verma, Decentralized Governance in Water and Sanitation in Rural India, Academic Foundation, NEW DELHI, 2014. 3. Central Public Health and Environmental Engineering Organization, Manual on Water Supply and Treatment, 2nd Ed, Ministry of Urban Development, New Delhi December 1991.		
Nptel Link: https://youtu.be/pv0PhvQ3G4k		
E-Books: www.civilenggebooks.com		

OPTIMIZATION AND RELIABILTIY ANALYSIS

Subject code	19CV7OE762	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course objectives:
The objective of this course is to make students to learn principles of optimization,
To implement the optimization Concepts for the structural engineering problems. To evaluate different methods of optimization.

Modules	Teaching Hours
Module I **Introduction:** Introduction to optimization, engineering applications of optimization, Formulation of structural optimization problems as programming problems. Optimization Techniques: Classical optimization techniques, single variable optimization, multivariable optimization with no constraints, unconstrained minimization techniques and algorithms constrained optimization solutions by penalty function techniques, Lagrange multipliers techniques and feasibility techniques.	8 Hours
Module-II **Linear Programming:** Linear programming, standard form of linear programming, geometry of linear programming problems, solution of a system of linear simultaneous equations, pivotal production of general systems of equations, simplex algorithms, revised simpler methods, duality in linear programming.	9 Hours
Module-III **Non-linear programming:** Non-linear programming, one dimensional minimization methods, elimination methods, Fibonacci method, golden section method, interpolation methods, quadratic and cubic methods, Unconstrained optimization methods, direct search methods, random search methods, descent methods	8 Hours
Module -IV **Constrained optimization**: Techniques such as direct methods, the complex methods, cutting plane method, exterior penalty function methods for structural engineering problems. Formulation and solution of structural optimization problems by different technique	9 Hours
Module-V **Geometric programming:** Geometric programming, conversion of NLP as a sequence of LP/ geometric programming. Dynamic programming: Dynamic programming conversion of NLP as a sequence of LP/ Dynamic programming	8 Hours

Course Outcomes: On completion of this course, students are able to:		**BL**
CO1	Achieve Knowledge of design and development of problem-solving skills.	C2
CO2	Understand the principles of optimization.	C2
CO3	Design and develop analytical skills.	C2

CO4	Summarize the Linear, Non-linear and Geometric Programming	C3
CO5	Understands the concept of Dynamic programming	C3

Reference books:

1. Spunt, "Optimum Structural Design"- Prentice Hall
2. S.S. Rao, "Optimization – Theory and Practice"- Wiley Eastern Ltd.
3. Uri Krisch, "Optimum Structural Design"- McGraw Hill
4. Richard Bronson, "Operation Research"- Schaum's Outline Series
5. Bhavikatti S.S.- "Structural optimization using sequential linear programming"- Vikas publishing house

Nptel Link: https://youtu.be/3Bh_viwz6_0

E-Books: www.civilenggebooks.com

FINITE ELEMENT METHOD

Subject code	19CV7OE763	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite: Strength of material, structural analysis-1, Structural analysis 2, and Numerical methods

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1.To provide the fundamental concepts of the theory of the finite element method

2.To develop the ability to generate the governing finite element equations for systems governed by partial differential equations

3. To learn basic principles of finite element analysis procedure for structural applications using truss, beams, frame and plane elements.

4. To learn and apply finite element solutions to linear and non-linear Structural analysis problem and to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

5. Learn to model complex geometry problems and solution techniques.

Modules	Teaching Hours
Module I **Introduction: -** Basic concept, Background review of Theory of Elasticity, Matrix displacement formulation, Energy concept, Equilibrium and energy methods for analyzing structures, Rayleigh-Ritz method, Galerkin's method, Simple application in structural analysis.	8 hours
Module-II **Fundamentals:** - Displacement function and natural co-ordinates, construction of displacement functions for 2 D truss and beam elements, applications of FEM for the analysis of truss, continuous beam and simple frame problems.	8 hours
Module-III	

Analysis of 2 d continuum problems: - Elements and shape functions, Triangular, rectangular and quadrilateral elements, different types of elements, their characteristics and suitability for application, polynomial shape functions, Lagrange's and Hermitian polynomials, compatibility and convergence requirements of shape functions.	9 hours
Module -IV **Theory of iso parametric elements:** - Iso-parametric, Sub – Parametric and Super-parametric elements, Jacobian transformation matrix-numerical integration, plane stress and plane strain problems, characteristics of iso-parametric quadrilateral elements, structure of computer program for FEM analysis, description of different modules, pre and post processing.	9 hours
Module-V Development of stiffness matrix for plate bending element. Choice of displacement function (C0, C1 and C2), rectangular and triangular elements, mindlin elements.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1	Understand the concepts behind variational methods and weighted residual methods in FEM.	C4
CO2	Identify the application and characteristics of FEA elements such as bars, Truss, beams, plane and isoperimetric elements, and 3-D element.	C4
CO3	Develop element characteristic equation procedure and generation of global stiffness equation will be applied.	C4
CO4	Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.	C4
CO5	Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, Continuous beams, Trusses, portal frames, slabs, with different boundary conditions.	C4

Text book:

1.Krishnamoorthy C.S., "Finite Element analysis" -Tata McGraw Hill
2. Desai C &Abel J F.," Introduction to Finite element Method" , East West Press Pvt. Ltd.,
3. Cook R D et.al. "Concepts and applications of Finite Element analysis", John Wiley.

Reference books: .

1. C.S. Krishnamurthy – "Finite Element Analysis - Theory and programming" Tata – Mcgraw Hill Co. Ltd., New Delhi.
2. J.F. Abel and Desai C.S. – "Introduction to the Finite Element Method", Affiliated Eat West Press Pvt. Ltd., New Delhi.
3. Zeinkeiwicz O.C. – "Finite Element Method", Tata – Mcgraw Hill Co. Ltd., New Delhi.
4. Rajashekharan. S. – "Finite Element analysis in engineering design", Wheeler Publishers.
5. R D Cook and Passla. "Finite element analysis "

Nptel Link: https://youtu.be/KR74TQesUoQ

E-Books: www.civilenggebooks.com

GLOBAL ENVIRONMENTAL ISSUES

Subject code	19CV7OE764	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 hours

Prerequisite:

Course Objectives:

This course will cover a number of looming global environmental problems, what society can do about them, and the reasons why we aren't doing more. We will introduce a number of psychological and socio-economic factors that contribute to environmental issues, and use them to gain insight into and draw parallels between specific environmental problems

Modules	Teaching Hours
Module I **Introduction:** Goals, history global environmental problems, pathologies framework Population Growth, Fisheries Depletion, Eutrophication, Ocean Acidification, Biodiversity Loss	8 Hours
Module-II **Infectious Disease and Pandemic:** Food Security Deforestation, Nuclear War, Solid waste management Control measures of urban and industrial waste, special reference e-waste, Biomedical waste e Pollution Tragedies Love canal, Bhopal Gas Endosulfan, Minamata and Flint water	9Hours
Module-III **Effects:** Effects on organisms including humans, effects on ecosystems and productivity, species distribution ranges, spread of diseases, extinction risk for temperature-sensitive species and UV effects	8 Hours
Module -IV **Global warming and climate change**: Evolution and development of Earth's atmosphere, atmospheric structure and composition, significance of atmosphere in making the Earth, the only biosphere; Milankovitch cycles, atmospheric windows Trends of global warming and climate change, drivers of global warming and Global Warming Potential (GWP) climate change, impact of climate change on atmosphere, weather patterns, sea level rise, agricultural productivity and biological responses-range shift of species, CO2 fertilization and agriculture; impact on economy and spread of human diseases	9Hours
Module-V **Ozone layer depletion, environmental policy & agreements:**Ozone layer or ozone shield; importance of ozone layer, ozone layer depletion and causes; Chapman cycle, process of spring time ozone depletion over Antarctica, ozone depleting substances (ODS), effects of ozone depletion, mitigation measures and international protocols Environmental policy debate, International agreements, Montreal protocol 1987, Kyoto protocol 1997, Convention on Climate Change, carbon credit and carbon trading: clean development mechanism	8 Hours

Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Understand the Environmental Issues and problems	C2
CO2:	Understand Biomedical waste e Pollution Tragedies	C3
CO3:	Information about spread of diseases, extinction risk fortemperature-sensitive species and UV effects	C3
CO4	Analyse the impact of climate change on atmosphere, weather patterns, sea level rise, agricultural productivity and biological responses-range shift of species, CO2 fertilization and agriculture; impact on economy and spread of human diseases	C4
CO5	Understand about Environmental and Global Acts	C3

Text Book

1. Hardy, JT 2003 Climate Change Causes, Effects and Solutions. John Wiley & Sons Harvey, D. 2000. Climate and Global Climate Change Prentice Hall

Reference books

1. Barry, R. G. 2003. Atmosphere, Weather and Climate. Routledge Press, UK asu, M.and Xavier, S., Fundamentals of Environmental Studies, Cambridge University Press, 2016
2. Mitra, A. K and Chakraborty, R., Introduction to Environmental Studies, Book Syndicate, 2016

Nptel Link: **https://youtu.be/ID_gk0aSo0Y**

E-Books: www.civilenggebooks.com

COMPUTER AIDED DESIGN LABORATORY

Subject code	19CVL77	Credit: 02
Hours/Week	2 hours. (Practical)	SEE: 50 Marks
Total hours: 28	CIE: 50 Marks	SEE: 3 hours

Prerequisite: NONE

Course objectives:

To enable the students to obtain the basic knowledge about in the following topics: -

Modules	**Teaching Hours**
1. Project Planning & Management Concepts	2 Hours
2. Introduction to PRIMAVERA	2 Hours
3. Primavera P6 Architecture	2 Hours
4. Portfolio Program & Project structure Creation	2 Hours
5. Project Code & Calendars	2 Hours
	2 Hours

6. Project Time Management 7. WBS & Activities 8. Project Resource Management 9. Project Cost Management 10. Schedule Comparison 11. Reflections 12. Reporting 13. Importing & Exporting Data 14. Printing View & Reports	2 Hours 2 Hours 2 Hours 2 Hours 2 Hours 2 Hours 2 Hours 2 Hours
Question paper pattern: Perform one project and generate a report.	

SEMINAR		
Subject code	19CV78	Credit: 01
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE:
Prerequisite: none		
Course objectives: To enable the students to obtain the knowledge about latest development in civil engg field such as new materials, construction techniques, design tools for structures (software's), environmental and water resource engg.		
Seminar is intended to give an exposure to the students about recent trends and advances in various field of Civil Engineering. In view of this student shall select the topics from recently published literature in National and International Journal and also topics from conference proceedings of high standards approved by Guide. Seminar shall be presented in the department in presence of a committee consisting of Batch of minimum two teachers including Guide constituted by HOD. The seminar marks are to be		

awarded by the committee. Students shall submit the seminar report in the prescribed standard format.

Question paper pattern:

Evaluation of CIE marks: Seminar will be evaluated by expert committee constituted by HOD consisting of guide and one expert faculty of the department in the relevant field. Students have to deliver seminar before expert committee.

Course outcomes: On completion of the course, the student will have the ability to

CO #	Course Outcome (CO)	Blooms Level
CO1	Identify a technical seminar topic using the criteria of recent trends in civil engineering, industrial development and societal issues.	C5
CO2	Collect exhaustive literature relevant to the selected topic	C2
CO3	Summarize effectively the literature review and provide the critical analysis of the selected topic.	C4
CO4	Present the seminar topic using good oral and writing skill.	C4
CO5	Prepare a well-organized and compiled seminar report.	C4

PROJECT PHASE-I

Subject code	19CV79	Credit: 01
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE:

Prerequisite:

Course objectives:

To enable the students to conduct literature survey in the field of their interest in latest in civil engg field such as new materials, construction techniques, design tools for structures (software's), environmental and water resource engg.

Prepare a report containing literature review, objective, methodology.

Student shall select the topic of the project work and Guide in the beginning of the VII Sem only and shall complete the literature survey and finalize the objectives of the project work as part of Project phase-I by the end of the VII Sem. The project work will be carried out in batches containing maximum four students.

Project works can be taken up on different specializations of civil engineering preferably on emerging topics. Students have to present their project before expert committee constituted by HOD. Guide shall award the CIE marks based on performance of the students and after completion of literature survey. SEE will be conducted by one internal and external examiner

appointed by HOD

Question paper pattern:
Evaluation of CIE marks: 60% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 40% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee.
Evaluation of SEE marks: Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Propose an engineering-based project in a clear and concise manner	C5
CO2	Identify and summarize the literature review and relate them to current project.	C5
CO3	Formulate clearly a work plan and procedures consisting of fore casting of project costs, time lines, quality & ethical issues	C4
CO4	Present the project outlining the literature review, methodology and expected results using good oral and written presentation skills.	C5
CO5	Prepare a well-organized and compiled project report involving literature review, methodology and expected results.	C4

INTERNSHIP		
Subject code	19CVIN86	Credit: 02
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE:
Prerequisite:		

Course objectives:
This course will enable students to get the field exposure and experience

Note: Internship /Professional Practice:

1. This shall be carried out by students in industry set-up related to the construction/ materials testing laboratories/research organizations/project management consulting firms/QS and QA organizations/ planning and design offices/Professional organizations like ACCE/ICI/INSTRUCT/RMCMA/QCI, PMI, CIDC etc. and other avenues related to the civil engineering domain in consultation and approval of internship guide/HOD /internship committees of the institutions.

2. The professional certification programs like ACCE(I)- SMP, ICI-BMTPC certifications, NSTRUCT certifications, CIDC certifications, RMC-QCI's RMCPCS Certification Programs, RMCMA-NRMCA'S Concrete Technologist India (CTI) programs and such similar programs by professional bodies with adequate industry exposures at sites/RMC plants can be considered as Internship /Professional Practice with due approvals from the guide/HOD /internship committees of the institutions

3. The industry/organization should issue certificates of internship offer and its completion. The offer letter should clearly have the nature of work to be done by the student and the supervisor's name and duration of internship.

4. The duration of the internship shall be 8 weeks. The student shall make a midterm and final presentation of the activities undertaken during the first 6 weeks and at the end of 12th week of internship respectively, to a panel comprising internship guide, a senior faculty from the department and head of the department. Each student should submit the internship report at the end of semester with internship certificate.

5. Viva-Voce examination shall be conducted by a panel of examiners consisting of internship supervisor from industry or industry professional approved by university and internship guide from the institute.

6. The College shall facilitate and monitor the student internship program.

7. The internship should be completed during vacation after VI and VII semesters.

SEMESTER VIII

DESIGN OF STEEL STRUCTURES		
Subject code	19CV81	Credit: 04
Hours/Week	3 hours. (Theory)	SEE: 50 Marks

Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Civil Engineering Materials, Strength of Materials, Structural Analysis

Course objectives:

The objectives of this course are to learn:

1. Design philosophies, loads and load combinations
2. Behavior and design of fasteners typically bolted and welded and simple beam-column connections
3. Behavior and design of axially loaded members and column bases

Behavior and design of simple beams

Modules	Teaching Hours
Module I	
Introduction: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications and section classification.	3hours
Plastic Behavior of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams	5 hours
Module-II	
Bolted connections: Introduction, Behavior of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Design of axially loaded and eccentrically loaded connections.	4 hours
Welded connections: Introduction, Welding process, advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of axially loaded and eccentrically loaded joints using fillet and butt welds.	4 hours
Module III	
Design of Tension Members: Introduction, Types of tension members, Design of strands, Slenderness ratio, Behavior of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles.	4hours
Design of Compression Members: Introduction, Failure modes, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members: angle struts, laced and battened built up compression members.	5hours
Module -IV	
Design of Beams: Introduction, Beam types, , Lateral stability of beams, factors affecting lateral stability, Behavior of simple and built-up beams in bending(I-sections with flange plates only without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams.	8 hours
Module-V	

Design of column bases: Design of simple slab base and gusseted base subjected to axial loading. Design of concrete pedestal along with anchor bolt design for given uplift load. **Design of beam to beam and beam to column connections:** Design of simple framed and seated (un stiffened and stiffened) connections using bolting and welding.	4 hours 5 hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	Explain different design philosophies and analyze continuous beams using plastic analysis technique	C4
CO2:	Design axially loaded and eccentrically loaded bolted and welded connections	C4
CO3:	Design axially loaded tension and compression members	C4
CO4	Design simply supported beams using single I section and simple built-up sections	C4
CO5	Design simple beam to column connections using bolting and welding	C4

Text book:

1. N Subramanian., "Design of Steel Structures" (2016), Oxford University Press, New Delhi.
2. Duggal S K., "Limit State Method of Design of Steel Structures", Tata McGraw Hill, New Delhi.

Reference books:

1. Dayarathnam P, "Design of Steel Structures", Scientific International Pvt. Ltd.
2. Kazim S M A and Jindal R S, "Design of Steel Structures", Prentice Hall of India, New Delhi.
3. IS 800-2007: General Construction in Steel Code Practice (Third revision), Bureau of Indian Standards, New Delhi.

Nptel Link: **https://youtu.be/CNE4hk_SGTo**

E-Books: www.civilenggebooks.com

ADVANCED RCC DESIGN		
Subject code	19CV821	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite:
Elements of civil engineering and strength of material, structural analysis 1, structural analysis 2

Course objectives:
To enable the students to acquire the knowledge in the following topics
1.Understand the design procedure of cantilever & counterfort retaining walls
2.Understand the design procedure o circular & rectangular water tanks resting on ground.
3.Understand the design procedure of slab type & beam type combined footings.
4.Understand the base concept of yield line theory for the design of different shapes of RCC slabs. Understand the design concept of grid floors & flat slabs.
5.Understand the design procedure for continuous beams & single bay & single storey RC frames

Modules	Teaching Hours
Module I **Design and Detailing of RCC Retaining Walls:** Different types of Retaining walls, types of backfill. Design & detailing of cantilever type retaining walls. Design & detailing of counterfort retaining walls.	8hours
Module-II **Design and Detailing of Water Tanks:** Different types of water tanks, Design & detailing of circular water tanks resting on ground with flexible base & rigid base. Design & detailing of rectangular water tanks resting on ground with flexible base & rigid base.	7hours
Module-III **Design and Detailing of Combined Footing:** Different types of combined footings. Design & detailing of slab type combined footing. Design & detailing of slab & beam type combined footing (Only Rectangular Footing)	7hours
Module -IV Yield line theory**:** Introduction, basic ideas of yield line theory, location of yield lines for standard cases, yield line analysis of one way & two-way rectangular slab, circular slab, hexagonal slab, triangular slab & design of different shapes of slabs. Design of grid floor and flat slabs**:** Introduction, analysis & design of grid floors by approximate & plate theory, design of flat slabs	10 hours
Module-V Design of continuous beams and portal frames**:** Introduction, effective span, and calculation of BM & SF, design of continuous beams by limit state method, design and detailing of single bay, single story portal frame (hinged & fixed) for with analyzed data, reinforcement detailing	10 hours

Course Outcomes: On completion of this course, students are able to:

CO		Blooms Level
CO1:	Design of cantilever and counterfort retaining walls.	C4
CO2:	Design of circular and rectangular water tanks resting on ground.	C4
CO3:	Design of slab type and slab & beam type combined footings	C4
CO4	Design of circular slab, grid floors and flat slabs	C4
CO5	Design of continuous beams and portal frames	C4

Text book:		
1. Dr. S. S. Bhavikatti "Advanced RCC Design" Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", McGraw Hill, New Delhi		
2. Subramanian, "Design of Concrete Structures" , Oxford university Press		
3. H J Shah, "Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)" , Charotar Publishing House Pvt. Ltd.		
Reference books: .		
1. N. Krishna Raju, - **"Design of Advanced Reinforced concrete structures"** CBS publishers, New Delhi.		
2. A.K. Jain — **"Limit State method of design"** Nemichand and Bros., Roorkee		
3. Park & Paulay — **"Reinforced Concrete"**, John Wiley & Bros.		
4. B.C. Punmia, Ashok kumar Jain & Arun kumar Jain — **"Limit State design of Reinforced concrete"**, Laxmi Publication, New Delhi.		
5. V. Ramakrishnan & P. D. Arthur, **"Ultimate strength design of structural concrete"**, Wheeler Books, Allahabad		
6. IS 456-2000, SP 16		
Nptel Link: https://youtu.be/undsd92MM8w		
E-Books: www.civilenggebooks.com		

DESIGN OF PRESTRESSED CONCRETE STRUCTURES		
Subject code	19CV822	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours
Prerequisite:		
Course objectives: 1.Explain the fundamental concepts of stress analysis 2 Apply systems of pre-stressing for various sections of structural elements 3 Evaluate and analyze the stresses under various conditions 4 Design and detail the prestressed concrete members for various loading conditions		
Modules		**Teaching Hours**
Module I **Introduction to Pre stressed concrete and codal provisions:** **Introduction:** Historic development- general principles of Prestressing, Types of prestressing, pre-tensioning and post tensioning, advantages and limitation of prestressed concrete, Materials for pre stressed concrete- high strength steel and concrete, properties, Stress-strain characteristics of high strength steel and concrete **Codal Provisions:** Basic principles of pre stressing, fundamentals of prestressing, load balancing concept, Stress concept, center of thrust, Pre-Tensioning and post		9 Hours

tensioning methods-Analysis of pre and post tensioning, Systems of pre stressing, End anchorages	
Module-II **Analysis of sections for Flexure:** Elastic analysis of pre stressed concrete beams with straight, parabolic, triangular, trapezoidal cable profiles, Eccentric and concentric pre stressing, Numerical problems	8 Hours
Module-III **Losses of Pre stress**: Loss of prestress in pretensioned and post tensioned members due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, relaxation of steel, slip in anchorage and frictional losses, Numerical problems	8 Hours
Module -IV **Deflection of pre stressed concrete beams:** short term and long-term deflections, Elastic deflections under transferred loads and due to different cable profiles, Deflection limits as per IS 1343, Effect of creep on deflection, Load versus deflection curve, methods of reducing deflection, Numerical problems. **Limit state of Collapse:** Flexure- IS code recommendations, Ultimate flexural strength of sections, IS code recommendations on shear strength, Shear resistance of sections, shear reinforcement, Limit state of serviceability- Control of deflection and cracking, Numerical Problems	9 Hours
Module-V Design of Beams: Design of pre stressing force and eccentricity for post tensioned prismatic beams, permissible stresses, Limiting zone and cable profile	8 Hours

Course Outcomes: On completion of this course, students are able to:		BL
CO1:	Understand the fundamental concepts of stress analysis	C2
CO2:	Apply systems of pre-stressing for various sections of structural elements	C2
CO3:	Analyse and evaluate the stresses under various conditions	C3
CO4	Design the prestressed concrete members for various loading conditions	C4
CO5	Design of Prestressed Beams	C4

Text book:

Krishna Raju, N. “Pre stressed Concrete”, Tata McGraw Hill Publishing Company, New Delhi 2006

2. Krishna Raju. N., “Pre-stressed Concrete - Problems and Solutions”, CBS Publishers and Distributors, Pvt. Ltd., New Delhi.

3. Rajagopalan N, “Pre - stressed Concrete”, Narosa Publishing House, New Delhi

Reference books:

1.Prestressed concrete, N Krishna Raju, Tata McGraw Hill Publishers, 2009,

2 Prestressed Concrete, P Dayarathnam, Oxford and IBH Publishing Co., 2000,

3. Design of pre stressed concrete structures, T Y Lin and Ned H Burns, John Wiley & Sons, New York, 2008

4.Fundamental of pre stressed concrete, N C Sinha and S K Roy, 3rd Edition, S Chand and Company Ltd, 2011

5. Code Books: IS 1343:2012; Pre stressed Concrete: Code of practice

Nptel Link: https://youtu.be/4KYPltsNAWs

E-Books: www.civilenggebooks.com

DESIGN OF HYDRAULIC STRUCTURES		
Subject code	19CV823	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: The students should have knowledge of Engg. Mechanics, Hydrology & water resources engineering

Course objectives:

The students will be able to acquire knowledge in the following topics

The students will be able to acquire knowledge in the following topics

1. Design of canals and silt theories
2. Design of cross drainage works
3. Canal regulators
4. Design of weirs and barrages
5. Design of spillways and outlets

Modules	**Teaching Hours**
Module I **Design of canals and silt theories:** Types of silt, Kennedy's theory and design of lined & Unlined canals by Kennedy's theory, Defects of Kennedys theory, Silt supporting capacity, lacey's regime theory, lacey's equation for velocity, discharge and silt factor, Design of canals by Lacey's theory. Transportation of sediments, Drawbacks of Lacey's theory, comparison between kennedy's and lacey's theory.	8 Hours
Module-II **Design of Cross Drainage work:** Introduction, classification, various types of aqueducts and siphon aqueducts, design consideration for cross drainage works, fluming of canal, Mitra's hyperbolic transition formula, Design of back connection canals, canal wings, and drainage wings (Hydraulic design only). Design of aqueduct and siphon aqueduct.	9 Hours
Module-III **Canal regulation works:** Purpose, canal falls, location, types of Regulators, ogee falls, rapid falls, stepped falls, vertical drop fall, Montague type fall, Inglis type fall, methods of energy dissipation, head regulators, cross regulators, pipe outlet, design of cistern, design of sarda type fall.	8 Hours
Module -IV **Design of weirs and theory of seepage:** Bligh's creep theory, safety against piping and uplift, Khosla's theory, flow nets, exit and critical gradient, Khosla's	8 Hours

method, design of vertical drop weir, Body wall, crest wall of a weir, design of impervious floor and Impervious aprons	
Module-V **Spillways and outlets:** Types, location of spillway, design consideration for spillway, ogee spillway, free overfall and siphon spill way, energy dissipation, scour protection, Design of spillway crest gates, outlet works, design of outlets and sluices of different type.	9 Hours

Course Outcomes: On completion of this course, students are able to:

CO		**BL**
CO1:	The students will be able to design canals	C1, C3,
CO2:	The students will understand necessity & Design of CD works	C2, C3, C4
CO3:	The students will be able to design Regulators	C2C3, C4
CO4	The students will be able to design weirs and analyse for controlling Seepage	C2, C3, C4
CO5	The students will be able to design spillways & Outlets	C2, C3, C4

Text book:

1. Dr. PN Modi & Seth, Hydrology & Water Resources Engg. Standard Publishers, New Delhi
2. R.K. Sharma and Sharma – Hydrology and Water Resource Engineering
3. Linsley, Kohler and Paulhus: Applied Hydrology, McGraw Hill, New Delhi
4. Garg. S.K: Hydrology and Water resources engineering, Khanna Publications

Reference books:

1. Linsley & Frazini, Water Resources Engineering, McGraw-Hill international Edition
2. Birdie G S & Das, Hydrology & Water Resources Engineering, Dhan path rai Publishers New Delhi
3. B.L. Gupta& Amit Gupta, Water resources systems and management, Standard Publishers distributers New Delhi

Nptel Link: https://youtu.be/FYYJgSMjYB4

E-Books: www.civilenggebooks.com

DESIGN OF EARTHQUAKE RESISTANT STRUCTURES		
Subject code	19CV824	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Engg Geology, Design of RCC structures, Structural dynamics.

Course objectives:

To enable the students to acquire the knowledge in the following topics:

1. Different types of earthquakes and different seismic instruments.
2. Analysis, Design of building according to earthquake design philosophy.
3. Structural configuration of earthquake resistance design.
4. Concept of ductility and design of column and beams with reference to ductility as per codal provisions.
5. Design of masonry building in shear flexure.

Modules	Teaching Hours
Module I Introduction to endogenic processes, Tectonic and volcanic earthquakes, General features of earth quakes with regard to Indian continent, magnitude and intensity scales, and seismic instruments	8 hours
Module-II Seismic design philosophy, determination of design lateral forces, dynamics of multi storey building- natural frequencies and mode shapes, analysis of multi storey building using is-1893.	10 hours
Module-III Structural configuration for earthquake resistant design, frames, shear walls and dual systems, effect of infill masonry walls on frames, capacity design procedures.	8 hours
Module -IV Ductility and energy absorption in buildings, confinement of concrete for ductility, ductility of columns and beams – code provisions, problem of soft storey	8 hours
Module-V Behavior of masonry building during earthquake failure pattern, strength of masonry in shear and flexure, codal provisions for earthquake resistant masonry buildings.	8 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Explain different types of earthquakes and their features &working of different seismic instruments.	C2
CO2:	Analyse multistory building for determining natural frequencies & mode shapes using static and dynamic techniques.	C4
CO3:	Compare performance of different structural configuration for earthquake resistance design.	C5
CO4	Design columns &beams with reference to ductility using codal provisions.	C4
CO5	Determine strength of masonry buildings in shear, flexure &failure pattern during earthquake.	C4

Question paper pattern:

Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.

Text book:

Pankaj Agarwal and Manish Shrikande, “Earthquake resistant design of structures”, PHI India.
2. S.K. Duggal, “Earthquake Resistant Design of Structures”, Oxford University Press
3. Anil K. Chopra, “Dynamics of Structures: Theory and Applications to Earthquake Engineering”, Pearson
Education, Inc.
4. T. K. Datta, “Seismic Analysis of Structures”, John Wiley & Sons (Asia) Ltd.

Reference books: .

1. David Dowrick, “Earthquake resistant design and risk reduction”, John Wiley and Sons Ltd.
2. C. V. R. Murty, Rupen Goswami, A. R. Vijayanarayanan& Vipul V. Mehta, “Some Concepts in Earthquake
Behaviour of Buildings”, Published by Gujarat State Disaster Management Authority, Government of Gujarat.
3. IS-13920 – 2016, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces, BIS, New Delhi.
4. IS-1893 – 2016, Indian Standard Criteria for Earthquake Resistant Design of Structures, Part-1, BIS, New Delhi.
5. IS- 4326 – 2013, Earthquake Resistant Design and Construction of Buildings, BIS, New Delhi.
6. IS-13828 – 1993, Indian Standard Guidelines for Improving Earthquake Resistance of Low Strength Masonry
Buildings, BIS, New Delhi.
7. IS-3935 – 1993, Repair and Seismic Strengthening of Buildings-Guidelines, BIS, New Delhi.

Nptel Link: **https://youtu.be/m00cSWtRK9w**

E-Books: www.civilenggebooks.com

ADVANCED STEEL STRUCTURE DESIGN		
Subject code	19CV825	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Civil Engineering Materials, Strength of Materials, Structural Analysis, Design of steel structures-I

Course objectives:

To enable the students to obtain the basic knowledge about in the following topics: -

1. Behaviour and design some specialized steel structures such as plate girder, gantry girder, and tubular structures.
2. Components and design of roof trusses for the given analysed forces.
3. Behaviour and design of rigid and semi rigid beam-column connections

Modules	Teaching Hours
Module I Design of welded plate girder: Design of welded plate girder along with stiffeners, connection design, curtailment of flange	9 Hours
Module-II Design of gantry girder: Design of gantry girder for electrically and manually operated travelling crane in single bay	8 Hours
Module-III Design of roof trusses: Types of roof trusses, design of a typical roof truss (Forces in the members to be given), design of joints and end bearing, design of purlins.	9 Hours
Module -IV Design of rigid and semirigid connections: Design of Small moment resistant connections, large moment resistant connections, semi-rigid and behavior of semi-rigid connections	8 Hours
Module-V Design of Tubular structures – Introduction, permissible stresses, tubular columns, tube tension members. Design of members of tubular roof truss for given member forces and the joints in tubular trusses, design of tubular beams and purlins.	8 Hours

Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Design the welded plate girder	**C5**
CO2:	Design the gantry girder	C5
CO3:	Design the roof trusses	C5
CO4	Design rigid beam- column connections and explain the behavior of semi rigid connections	C5
CO5	Design the axially loaded and flexural tubular structural members	C5

Text book:

1. N Subramanian., "Design of Steel Structures" (2016), Oxford University Press, New Delhi.
2. Duggal S K., "Limit State Method of Design of Steel Structures", Tata McGraw Hill, New Delhi.

Reference books:

1. Dayarathnam P, "Design of Steel Structures", Scientific International Pvt. Ltd.

2. Kazim S M A and Jindal R S, "Design of Steel Structures", Prentice Hall of India, New Delhi.
3. IS 800-2007: General Construction in Steel Code Practice (Third revision), Bureau of Indian Standards, New Delhi.

Nptel Link: https://youtu.be/CNE4hk_SGTo

E-Books: www.civilenggebooks.com

ENGINEERING ECONOMICS AND MANAGEMENT		
Subject code	19CV8OE831	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Building material and construction, Building planning and drawing, Estimation

Course objectives:

To enable the student to acquire the knowledge in the following topics: -

1. Planning scheduling controlling bar chart mild stone chart elements of a network and PERT network analysis for a project.
2. Probability of meeting the scheduled date for PERT network, CPM Network analysis and cost model.
3. Resource allocation (man power) and economics concepts.
4. To apply economy in design material selection, location and standardization. Interest and interest formulae.
5. Compare the alternatives in civil engg problem using PW, AE, FW and rate of return. Evaluate replacement alternatives breakeven and minimum cost analysis and benefit cost analysis for civil engg problems.

Modules	Teaching Hours
Module I	
Engineering Management:	
Project Management: Introduction, planning scheduling, controlling, bar charts and milestone charts. Elements of network- event, activity, dummy activity, network rules, numbering of events, problems.	5 hours
Network Analysis: PERT network, uncertainties in PERT network, time estimates, earliest expected time (T_E) latest allowable occurrence time (T_L), slack, critical path,	4 hours
Module II	
Probability of meeting the scheduled date for PERT network.	4 hours
CPM network analysis- Activity time estimates, start and finish times of activity, float, critical path.	
Cost Model: Costs involved in a project, total project cost, optimum duration	4 hours

and optimum cost, contracting network for optimization.	
Module III **Engineering Management:** **Resource Allocation:** Resource smoothing and resource levelling. Introduction to Management software package "Primavera" **Engineering Economics:** **Economic Concepts:** Economy deals with behavior of people, value and utility, consumer and producer goods, economy of exchange, classification of cost, price is determined by supply and demand, law of diminishing return.	4hours 3hours
Module IV **Elementary Selection in Economic Analysis**: Design and economy, economy of material selection, perfection and economy, size and economy, economy and location, economy of standardization and simplification. **Interest and Interest Formulas:** Interest rate and interest, earning power of money, time value of money, interest formulas, annual compounding interest-annual payments, nominal and effective interest rates, interest formula for continuous compounding.	3 hours 5 hours
Module V **Basis for Comparison of Alternatives:** Present worth amount, annual equivalent amount, future worth amount, rate of return. Evaluating replacement alternatives, breakeven and minimum cost analysis, benefit cost analysis.	5 hours 5 hours
Question paper pattern: Two questions is to be set from each module by intermixing the topic in the same module. Total five questions to be answered by selecting minimum one question from each module.	
Text books: Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide" Earthscan Publications Ltd, London, 1999. 2. ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organization for Standardization, 2004 3. ISO 19011: 2002, "Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002 4. Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000. 5. Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.	
Reference Books: 1) CPM and PERT by "Punmia" 2) CPM and PERT by "LS.Srinath" **3)** Engineering Economics by "Theusen"	
E books and online course materials: www.civilenggebooks.com	

Nptel Link: https://youtu.be/ycyMktNFZ88		
Course outcomes: **On completion of the course, the student will have the ability to:**		
CO #	**Course Outcome (CO)**	**Blooms Level**
CO1	Prepare the schedule for drawing milestone chart, CPM and PERT network for a project	C5
CO2	Analyze CPM and PERT network for determining optimum cost and duration for a project.	C4
CO3	Allocate and Level resource for a project.	C5
CO4	Apply the concepts and principles of economics for civil engineering problems	C4
CO5	Evaluate different alternatives for project using Present worth, Future worth and Annual equivalent	C5

ENVIRONMENTAL IMPACT ASSESSMENT		
Subject code	19CV8OE832	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours
Prerequisite:		
Course objectives: 1.To study factors to be considered for preparing an Environmental Impact Statement 2 To study the principles, methodologies and techniques of Environmental Impact Assessment (EIA) 3 To study mitigation techniques and study of alternatives. 4 To prepare EIA for specific case studies.		
Modules		**Teaching Hours**
Module I **Introduction:** Impact of developmental projects – sustainable development – Need for Environmental Impact Assessment (EIA), Rapid and Comprehensive EIA, Environmental Impact statement (EIS) – EIA capability and limitations – Legal provisions on EIA – stages ofEIA.		8 Hours
Module-II Role of NEPA in EIA, CEQ, Environmental documents. IA/ EIS& FONSI		9 Hours

relationship, processing of EIA/EIS, Environmental attributes. Methodologies: Criteria to be considered for the selection of EIA methodologies, Adhoc, overlays, Check lists – Matrices – Networks – Cost-benefit analysis with their advantages and limitations		
Module-III Guidelines for preparation of EIA Prediction and Assessment: Assessment of Impact on land, water, air and noise. Social and cultural activities and on flora and fauna – mathematical models – public participation.		9 Hours
Module -IV Environment management plan: Plan for mitigation of adverse impact on Environment– Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to project affected people. Post project monitoring. ISO 9000, 14000 &18000.		8 Hours
Module-V Case Studies: EIA for the infrastructure projects –Airport, Dam, Highway, Multi-storey buildings, water supply and drainage projects, Hazardous waste landfill site.		8 Hours
Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Carryout scoping and screening of developmental projects for environmental and social assessments.	C2
CO2:	Explain different methodologies for environmental impact prediction and assessment.	C3
CO3:	Prepare environmental management plans	C3
CO4	Evaluate environmental impact assessment reports and roles, actions that citizens and interest groups can take to influence the EIA process and outcome.	C4
CO5	Understand about the Case Studies	C3
Text book: 1.Environmental Impact Assessment, Larry W Canter, McGraw-Hill Inc. ISBN: 10-0071141030, 13- 9780071141031, 1996, 2. Environmental Impact Analysis Handbook, John G. Rau and David C Hooten (Ed), McGrawHill Book Company, 10- 0070512175, 13- 9780070512177, 1980 Reprint 2013. 3. Concepts in Environmental Impact Analysis, Shukla, S.K. and Srivastava, P.R., Common Wealth Publishers, New Delhi, 10- 8171692087, 13- 9788171692088, 1992 Reprint 2013		
Reference books: 1. Environmental Impact Analysis, 2nd Edition, R.K.Jain, Mc Graw- Hill , Newyork, 2002, ISBN - 9780071370080 2. Environmental Impact Assessment, Y.Anjaneyulu CRC press, ISBN 10- 0415665566, 13-9780415665568, 2011		
Nptel Link: https://youtu.be/xPO1qIZOtY0		
E-Books: www.civilenggebooks.com		

AIR POLLUTION AND CONTROL

Subject code	19CV8OE833	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite: Environmental engg-1, Environmental engg-2

Course objectives:

To enable students to acquire the knowledge in the following topics:

1. To enable the students to understand fundamentals of air pollution.
2. Enable the students to understand meteorology and air pollution.
3. Enable the students to understand measurement of pollutants.
4. Students to understand about control equipment's.
5. Students to understand about location of industries

Modules	**Teaching Hours**
Module I	
Introduction: Definition, classification, properties of air pollutants, primary and secondary pollutants, point source, mobile sources and sources of air pollution	4 hours
Effects of air pollution: On human health, animals, plants and properties. Major air pollution episodes	6 hours
Module-II	
Meteorology: Meteorological variables, lapse rate, inversion, stability conditions, wind rose, plume behaviors, Gaussian behavior or Gaussian dispersion model.	6 hours
Air quality standards – Clean dry air constituents.	3 hours
Module-III	
Sampling and analysis: sampling and measurement of gaseous and particulate pollutants.	5 hours
Emission standards	2 hours
Module -IV	
Control of air pollutants: control methods-particulate emission control, gravitational settling chambers, cyclones, fabric filters, electrostatic precipitators, wet scrubbers.	9 hours
Module-V	
Industrial plant locations and planning. Emission standards. Automobile exhaust gases	5 hours

Course Outcomes: On completion of this course, students are able to:

CO		BL
CO1:	Classify and explain various constituents of clean dry air and pollutants.	**C2**
CO2:	Explain the effects of air pollution on humans, animals and properties.	**C2**
CO3:	Sampling and analysis of gaseous and particulate pollutants, environmental impact assessment.	**C3**
CO4	Understand air pollution control equipment's to minimize pollution.	**C3**
CO5	Identify air quality and emission standards. Become professional	**C3**

	consultant to work for air pollution monitoring.	

Reference books:

1. Air Pollution: HVN Rao and M N Rao
2. Environmental Pollution Control: C S Rao

Air Pollution: Henry Perkins

Nptel Link: **https://youtu.be/4AuwG2G_ERU**

E-Books: www.civilenggebooks.com

ENVIRONMENTAL PLANNING AND MANAGEMENT

Subject code	19CV8OE834	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite:

Course objectives:

To enable students to acquire the knowledge in the following topics:

1. To enable the students to understand fundamentals of Environmental Management
2. Enable the students to understand meteorology and Management

Modules	Teaching Hours
Module I **Environment and sustainable development:** Importance of Planning – local, regional, state and national planning concepts, site and location with reference to environmental pollution. Zoning – physical planning.	8 Hours
Module-II **Economics of pollution control:** Cost benefit ratios, total cost of development and environmental protection cost. Reliability and risk anlaysis, case studies on regional carrying capacity, National capital region – Delhi area.	9 Hours
Module-III **Environmental education:** Introduction, objectives, formal and non-formal education. Organizational structure for Environmental Management at central and state levels **Cleaner technologies and their role in environmental management:** Total Quality Management (TQM) in environmental management and protection, ISO – 14000 Series of standards.	9 Hours
Module -IV **Legislation related to environmental management:** Water, Air, Environmental protection, Wild life protection, Forest conservation, Motor vehicle act, Hazardous waste, Biomedical waste and Noise pollution **International efforts for environmental protection:** Stockholm Conference –	8 Hours

1972, UNEP – 1982, control of transboundary movements and disposal of hazardous wastes, Earth Summit – 1992, Montreal Protocol, Kyoto and Copen Hagen Protocols, Manila declaration.		
Module-V **Environmental protection:** Economic development and social welfare consideration in socioeconomic development policies		8 Hours
Course Outcomes: On completion of this course, students are able to:		**BL**
CO1:	Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards.	C2
CO2:	Lead pollution prevention assessment team and implement waste minimization options.	C2
CO3:	Develop, Implement, maintain and Audit Environmental Management systems for Organizations.	C3
CO4	Understand International efforts for Environmental impact	C3
CO5	Analyse the environmental protection methods	C4

Text book:

1. Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide" Earthscan Publications Ltd, London, 1999.
2. ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organization for Standardization, 2004
3. ISO 19011: 2002, "Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002
4. Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.
5. Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001.

Reference books:

1. Danoy G.E., and Warner R.F. (1969), Planning and Design of Engineering Systems, Unwin Hyman Publications.
2. Chanlet Emil T, (1973), Environmental Protection, Mc Graw Hill Publication.
3. Lohani B.N, (1984), Environmental Quality Management, South Asian Publishers, New Delhi
4. Environmentally Sustainable Development – UNEP / UNDP.
5. J. Glynn Henry; Gary W. Heinke, (1997) , Environmental Science and Engineering, American Institute of Biological Sciences.
6. Journal of Indian Association for Environmental Management,1995-1997.
7. Carrying Capacity Based Developmental Planning Studies for the National Capital Region – MOEF, Government of India (1995- 1996). NEERI (1995 and 1996)., Nagpur, Annual Reports
8. Suresh K., and Dhameja, (2000), Environmental Engineering and Management, S.K. Kataria & Sons.

Nptel Link: **https://youtu.be/-j1rjB_-DhI**

E-Books: www.civilenggebooks.com

DISASTER MANAGEMENT		
Subject code	19CV8OE835	Credit: 03
Hours/Week	3 hours. (Theory)	SEE: 50 Marks
Total hours: 42	CIE: 50 Marks	SEE: 3 Hours

Prerequisite:

Course objectives:

1 Study the environmental impact of natural and manmade calamities
2 Learn to analyze and assess risk involved due to disasters.
3 Understand the role of public participation.
4 Learn the management tools and mitigation techniques.

Modules	Teaching Hours
Module I Natural disasters and Disaster management Introduction to natural and Industrial Hazards- floods, landslides, earthquakes, volcanoes, avalanche, cyclones, drought, fire, release of effluents, harmful gases, Blast etc. Prediction and perception. Environmental risk due to project activities. Preparation of on-site and off-site disaster management plans - Pre disaster, actual disaster, Post disaster plans. Relief camp organization. Role of voluntary organization and armed forces during disasters	8 Hours
Module-II Risk analysis and assessment Basic concept. Purpose of risk analysis. Analytical techniques and tools of risk assessment. Toxicology. Significance of risk. Risk characterization. Risk communication and Management, AI in emergency responses.	9 Hours
Module-III Environmental Impact Assessment (EIA) Definition, Basic concepts and principles of EIA. Regulatory framework in India. Environmental inventory. Base line studies. Over view of EIA studies	8 Hours
Module -IV Assessment and Methodologies Physical, Biological, Natural resources, Socio economic and cultural environmental assessment. EIA methodologies- Adhoc, Matrix, Checklist approaches. Economic evaluation of impacts- cost benefits of EIA. Public participation in environmental decision making. Procedures for reviewing EIA analysis and statement. Decision methods for evaluation of alternatives.	8 Hours
Module-V Disaster Mitigation and Management Introduction, types, modes of disaster	

management, tools and techniques, primary and secondary data. Natural disasters its causes and remedies-Earthquake Hazards-Causes and remedies, Flood and Drought assessment, causes and remedies, Landslides-causes and remedies. Fire hazards in buildings, Fire hazard management, Traffic management, Cyclones and hurricanes, inter department cooperation. Regional and global disaster mitigation. Disaster management Act, Disaster management authority at central, state and district levels.	8 Hours

Course Outcomes: On completion of this course, students are able to:

CO1:	Explain the different types of disasters and manage the pre and post disaster situation.
CO2:	Estimate and communicate the risk by conducting the risk assessment and Environmental Impact Assessment
CO3:	Identify the methods of disaster mitigation based on the basis of the risk assessment.
CO4	Analyze and evaluated the impact of measures adopted to mitigate the impacts.
CO5	

Text book:

1.David Dowrick, "Earthquake resistant design and risk reduction", John Wiley and Sons Ltd.
2. C. V. R. Murty, Rupen Goswami, A. R. Vijayanarayanan& Vipul V. Mehta, "Some Concepts in Earthquake Behaviour of Buildings", Published by Gujarat State Disaster Management Authority, Government of Gujarat.
3. IS-13920 – 2016, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces, BIS, New Delhi.
4. IS-1893 – 2016, Indian Standard Criteria for Earthquake Resistant Design of Structures, Part-1, BIS, New Delhi.
5. IS- 4326 – 2013, Earthquake Resistant Design and Construction of Buildings, BIS, New Delhi.
6. IS-13828 – 1993, Indian Standard Guidelines for Improving Earthquake Resistance of Low Strength Masonry Buildings, BIS, New Delhi.
7. IS-3935 – 1993, Repair and Seismic Strengthening of Buildings-Guidelines, BIS, New Delhi

Reference books:

Environmental Impact Analysis Hand Book, John G Rau and David C Wooten, Edition: 2013, ISBN: 978-0070512177.
2 Introduction to environmental Impact assessment, John Glasson, Riki Therivel, Andrew Chadwick, Edition: 2012, Research Press, ISBN:000-0415664705.2005, Reliance Publishing House, New Delhi.
3 Natural Disaster Reduction, Girish K Mishrta, G C Mathew (eds), Edition, 2005, Reliance Publishing House, New Delhi,
4 Remote Sensing and Image Interpretation, Thomas M. Lillisand and R.W. Keifer, 6th Edition, 2002, John Wiley, ISBN:9780470052457.

Nptel Link: https://youtu.be/DExlZTfKZAM

E-Books: www.civilenggebooks.com

CERTIFICATION COURSE(NPTEL/MOOCS)		
Subject code	19CVMC84	Credit: 01
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 Hours
Prerequisite: None		
Course objectives: To enable the students to get exposure to Recent trends in the field related to civil Engg.		
Every student should undergo National Programme on Technology Enhanced Learning (NPTEL) Online certification course for the duration of 4 Weeks to 8 Weeks**.** For more details on these online courses under NPTEL you may visit the link http://onlinecourses.nptel.ac.in which are similar to the MOOCS offered in platforms like edX, Coursera etc can be offered under this initiative.		

PROJECT WORK (PHASE II)		
Subject code	19CVP85	Credit: 08
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 Hours
Prerequisite: None		

Course objectives:
To enable the students to conduct the project in the field related to civil engg such as construction materials, drinking water, waste water or design of structures, pavement, irrigation structures, Analysis of structures using latest software's.

Project work Phase-II shall be carried out in par with literature survey and the objectives finalized in Project Phase-I.

The project report shall be presented in the following form:
1. Definition of the problem
2. Literature survey
3. Analysis of results and Discussion
4. Conclusions
5. References

The project report shall be submitted in the prescribed standard format (04 copies) to the HOD on or before the last working day of the semester after the certification of the concerned guide and HOD.

Question paper pattern:
Evaluation of CIE marks:60% marks will be evaluated by concerned guide on the basis of the performance of the student during project work remaining 40% marks will be evaluated by expert committee constituted by HOD containing minimum two experts of the department in the relevant field. Students have to deliver seminar before expert committee.
Evaluation of SEE marks: Viva-voce examination will be conducted in the presence of internal and external examiners appointed by HOD.

Course outcomes:
On completion of the course, the student will have the ability to:

CO #	Course Outcome (CO)	Blooms Level
CO1	Demonstrate the technical knowledge of the selected project topic.	C5
CO2	Execute the project work independently in small group of 4-5 members demonstrating strong working knowledge of ethics & professional responsibility.	C6
CO3	Compile and analyze the project data using modern tools and produce a good quality project work.	C5
CO4	Present the project outcomes effectively using good presentation skills.	C4
CO5	Prepare a well-organized and compiled project thesis.	C4

INTERNSHIP		
Subject code	19CVIN86	Credit: 02
Hours/Week		SEE: 50 Marks
Total hours:	CIE: 50 Marks	SEE: 3 Hours
Prerequisite:		

Course objectives:

This course will enable students to get the field exposure and experience

Note: Internship:

1. This shall be carried out by students in industry set-up related to the construction/ materials testing laboratories/research organizations/project management consulting firms/QS and QA organizations/ planning and design offices/Professional organizations like ACCE/ICI/INSTRUCT/RMCMA/QCI, PMI, CIDC etc. and other avenues related to the civil engineering domain in consultation and approval of internship guide/HOD /internship committees of the institutions.

2. The professional certification programs like ACCE(I)- SMP, ICI-BMTPC certifications, NSTRUCT certifications, CIDC certifications, RMC-QCI's RMCPCS Certification Programs, RMCMA-NRMCA'S Concrete Technologist India (CTI) programs and such similar programs by professional bodies with adequate industry exposures at sites/RMC plants can be considered as Internship /Professional Practice with due approvals from the guide/HOD /internship committees of the institutions

3. The industry/organization should issue certificates of internship offer and its completion. The offer letter should clearly have the nature of work to be done by the student and the supervisor's name and duration of internship.

4. The Duration of the Internship shall be 8 Weeks. Student shall make a midterm and final presentation of the activities undertaken during the first 4 weeks (In last week of VII Sem or at the beginning of VIII Sem) and at the end of 8th week of internship (preferably latest by last week of VIII Sem) respectively, to a panel comprising internship guide, a senior faculty from the department and head of the department. Each student should submit the internship report at the end of semester with internship certificate.

5. Viva-Voce examination shall be conducted by a panel of examiners consisting of internship supervisor from industry or industry professional approved by Institute or in the case of non-availability of industry person an internal expert and internship guide from the institute.

6. The College shall facilitate and monitor the student internship program.

7. The internship should be completed during vacation after VI and VII and
(If not completed during the vacation of VI and VII semesters, it shall be carried out during the vacation of VII and VIII semesters).