Dr. M.G.R. EDUCATIONAL AND RESEARCH INSTITUTE UNIVERSITY
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Madanavoyal, Chennai 600 095.
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DEPARTMENT OF CIVIL ENGINEERING

B.Tech. Civil Engineering (Part Time)
Curriculum & Syllabus
2017 Regulation

I SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BMA17022	Mathematics - I for Civil Engineers	4	3	1/0	0/0	Ty
2.	BCE17001	Mechanics of solids	4	3	1/0	0/0	**Ty**
3.	BCE17005	Concrete and Construction Technology	3	2	1/0	0/0	**Ty**
4.	BAR17I01	Engineering Geology	3	3	0/0	0/0	**Ty**
5.	BAR17IL1	Geology and building materials lab	1	0	0/0	2/0	Lb

Credits Sub Total: 15

II SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BMA17025	Mathematics – II for Civil & Chemical Engineers	4	3	1/0	0/0	**Ty**
2.	BCE17ET1	Engineering Survey I	3	2	0/0	2/0	**ETL**
3.	BCE17002	Mechanics of Fluids	4	3	1/0	0/0	**Ty**
4.	BCE17003	Strength of Materials	4	3	1/0	0/0	**Ty**
5.	BCE17L04	Strength of Materials and Concrete Lab	1	0	0/0	2/0	**Lb**

Credits Sub Total: 16

III SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BMA17010	Numerical Methods for mechanical and civil engineers	4	3	1/0	0/0	**Ty**
2.	BCE17ET3	Engineering Survey II	3	1	0/1	1/1	**ETL**
3.	BCE17004	Applied Hydraulic Engineering	4	3	1/0	0/0	**Ty**
4.	BCE17EXX	ELECTIVE-1	3	2	1/0	0/0	**Ty**
5.	BCE17L03	Fluid Mechanics & Hydraulic Machinery Lab	1	0	0/0	2/0	**Lb**

Credits Sub Total: 15

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IV SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BCE17006	Structural Analysis I	4	3	1/0	0/0	**Ty**
2.	BCE17007	Design of Concrete Structures I	4	3	1/0	0/0	**Ty**
3.	BEE17I04	Energy conservation techniques	3	2	1/0	0/0	**Ty**
4.	BCE17008	Soil Mechanics	3	2	1/0	0/0	**Ty**
5.	BCE17L06	Geotechnical Engineering Lab	1	0	0/0	2/0	**Lb**

Credits Sub Total: 15

V SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BCE17010	Structural Analysis II	4	3	1/0	0/0	**Ty**
2.	BAR17I03	Design of Concrete Structures II	3	2	1/0	0/0	**Ty**
3.	BCE17011	Foundation Engineering	3	2	1/0	0/0	**Ty**
4.	BCE17009	Transportation Engineering	3	2	1/0	0/0	**Ty**
5.	BCE17ET4	Water resources and irrigation engineering	3	1	0/1	1/1	**ETL**

Credits Sub Total: 16

VI SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BCE17012	Design of Steel Structures	4	3	1/0	0/0	**Ty**
2.	BCE17EXX	Elective II *(Based on students interest)	3	2	1/0	0/0	**Ty**
3.	BCE17EXX	Elective III *(Based on students interest)	3	3	0/0	0/1	**Ty**
4.	BCE17013	Construction Management	4	3	1/0	0/0	**Ty**

Credits Sub Total: 14

DEPARTMENT OF CIVIL ENGINEERING

VII SEMESTER							
S.No	**Sub. Code**	**Subject Name**	**C**	**L**	**T/SLr**	**P/R**	**Ty / Lb/ ETL**
1.	BCE17EXX	Elective IV *(Based on students interest)	3	2	0/1	0/0	**Ty**
2.	BCE17SEX	Elective (Special based on current technology)*	3	1	0/1	1/1	**ETL**
3.	BCE17L15	Project	8	0	0/4	0/8	**Lb**

Credits Sub Total: 14

C : Credits L : Lecture T : Tutorial S.Lr : Supervised Learning P : Problem / Practical R : Research Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab.* Internal evaluation (Departmental level Refer Annexure for evaluation methodology) 4 Credit papers should compulsorily have either P/R component.

Credit Summary

Semester : 1 : 15
Semester : 2 : 16
Semester : 3 : 15
Semester : 4 : 15
Semester : 5 : 16
Semester : 6 : 14
Semester : 7 : 14

Total Credits : 105

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DEPARTMENT OF CIVIL ENGINEERING
FACULTY OF ENGINEERING & TECHNOLOGY
B.TECH REGULATION – 2017 (PART TIME)
(For students admitted from the Academic Year 2017-18)

ELECTIVE-I

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E01	ENVIRONMENTAL ENGINEERING	3	2	1/0	0/0	Ty
BCE17E02	DESIGN OF COMPOSITE STRUCTURES	3	2	1/0	0/0	Ty
BCE17E03	INDUSTRIAL STRUCTURES	3	2	1/0	0/0	Ty
BCE17E04	SMART STRUCTURES AND SMART MATERIALS	3	2	1/0	0/0	Ty

ELECTIVE-II

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E05	ESTIMATION AND QUANTITY SURVEYING	3	2	1/0	0/0	Ty
BCE17E06	HOUSING PLANNING AND DESIGN	3	2	1/0	0/0	Ty
BCE17E07	BUILDING TECHNOLOGY AND HABITAT ENGINEERING	3	2	1/0	0/0	Ty
BCE17E08	COST EFFECTIVE BUILDINGS	3	2	1/0	0/0	Ty

ELECTIVE -III

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E09	INDUSTRIAL WASTE MANAGEMENT	3	2	1/0	0/0	Ty
BCE17E10	CLEANER PRODUCTION	3	2	1/0	0/0	Ty
BCE17E11	ARCHITECTURE AND TOWN PLANNING	3	2	1/0	0/0	Ty
BCE17E12	DAM ENGINEERING	3	2	1/0	0/0	Ty
BCE17E19	PRESTRESSED CONCRETE STRUCURES	3	2	0/1	0/0	Ty
BCE17E20	PRE FABRICATED STRUCTURES	3	2	0/1	0/0	Ty

DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE -IV

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ ETL
BCE17E13	STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING	3	2	0/1	0/0	Ty
BCE17E14	BRIDGE STRUCTURES	3	2	0/1	0/0	Ty
BCE17E15	STORAGE STRUCTURES	3	2	0/1	0/0	Ty
BCE17E16	TALL BUILDINGS	3	2	0/1	0/0	Ty
BCE17E17	HYDROLOGY	3	2	0/1	0/0	Ty
BCE17E18	MUNICIPAL SOLID WASTE MANAGEMENT	3	2	0/1	0/0	Ty

ELECTIVE (SPECIAL –BASED ON CURRENT TECHNOLOGY)

COURSE CODE	COURSE TITLE	C	L	T/SLR	P/R	Ty/Lb/ETL
BCE17SE1	REPAIR AND REHABILITATION OF STRUCTURES	3	1	0/1	1/1	Ty
BCE17SE2	INTELLIGENT BUILDINGS	3	1	0/1	1/1	Ty
BCE17SE3	FINITE ELEMENT ANALYSIS	3	1	0/1	1/1	Ty
BCE17SE4	ENVIRONMENTAL IMPACT ASSESSMENT	3	1	0/1	1/1	Ty

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BMA 17022	**Subject Name : MATHEMATICS – I (FOR CIVIL ENGINEERS)**	**Ty/Lb/ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: **None**	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart knowledge on matrices, trigonometry and fourier series

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the student shall be able

CO1	To understand the basic concepts in Algebra
CO2	To understand the basic concepts in Matrices
CO3	To understand the basic concepts in Trignometry
CO4	To understand the basic concepts in functions of several variables
CO5	To understand the basic concepts in Fourier series

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H					M			
CO2	H	H		H					M			
C03	H	H		H					M			
C04	H	H		H					M			
C05	H	H		H					M			

COs / PSOs	PSO1	PSO2
CO1	H	M
CO2	H	M
C03	H	M
C04	H	M
C05	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
	✓											
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BMA 17022 MATHEMATICS – I FOR CIVIL ENGINEERS

UNIT I ALGEBRA **12 Hrs**

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

UNIT II MATRICES **12 Hrs**

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem (without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

UNIT III TRIGONOMETRY **12 Hrs**

Expansions of Sin $n\theta$, Cos $n\theta$ in powers of Sinθ and Cosθ – Expansion of Tan $n\theta$ – Expansions of $\text{Sin}^n\theta$ and $\text{Cos}^n\theta$ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES **12 Hrs**

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

UNIT V FOURIER SERIES **12 Hrs**

Dirichlet's conditions – General Fourier series – Half range Sine & Cosine series – Parseval's identity – Harmonic Analysis.

Total No. of Hrs: 60

TEXT BOOKS:

1. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw Hill Publishing Co., (2005).
3. Singaravelu, Transforms and Partial Differential Equations, Meenakshi Agency, (P) Ltd., (2017).

REFERENCES

1. Kreyszig E., Advanced Engineering Mathematics (10 th ed.), John Wiley & Sons, (2011).
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17001	**Subject Name : MECHANICS OF SOLIDS**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn fundamental concepts of Stress, Strain and deformation of soild applications of bars and thin cylinders
  To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
  To understand the effect of torsion on shafts and springs.
  To analyze a complex two dimensional state of stress and plane trusses

COURSE OUTCOMES (COs) : (3- 5)

CO1	To apply the fundamental concepts of stress and strain in the design of various structural components and machines
CO2	To analyze and design shafts to transmit required power
C03	To analyze about the force in member Truss with different methods
C04	To determine the bending, shear stresses and deflection produced in a beam subjected to system of loads
C05	To determine stresses due to impact and suddenly applied loads

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M								
CO2	H		H									M
C03	H			M	L							
C04	H	H		H								
C05	H	H				H					H	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H
C04	H	H
C05	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17001 MECHANICS OF SOLIDS

UNIT I: INTRODUCTION TO FORCE CONCEPT 12 Hrs

Equivalent system of forces, rigid bodies, external & internal forces-Application of Statics of Particles-Free body Diagram Concurrent & Non Concurrent Forces - Principles of transmissibility- Equivalent forces & Varignon's theorem. Tension, Compression and Shear stress – Lateral Strain- Poisson's Ratio- Volumetric Strain – Deformation of Simple and Compound Bars - Elastic constants – Composite Sections .

UNIT II: CENTRE OF GRAVITY AND MOMENT OF INERTIA 12 Hrs

Areas and volumes - Centroid of simple areas and volumes by integration - Centroid of composite areas - Second moment of areas - Radius of Gyration - Parallel axis and Perpendicular axis theorems - Moment of Inertia of simple areas by Integration -Moment of Inertia of Composite Areas - Mass Moment of Inertia of thin plates and simple solids.

UNIT III: BENDING MOMENT & SHEAR FORCE 12 Hrs

Introduction to Bending and S.F- Beams and support conditions – types of supports – types of loads - shear forces and bending moment diagrams for simply supported beams, cantilevers and overhanging beams with all loads.

UNIT IV: ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSSES 12 Hrs

Stability and equilibrium of plane frames – Perfect frames - Types of Trusses – Analysis of forces in trusses member – Method of joints – Method of Sections – Tension co-efficient method – Graphical method

UNIT V: BENDING STRESS IN BEAMS & TORSION OF SHAFTS 12 Hrs

Theory of simple bending-expression for bending stress-Section modulus-bending stress in symmetrical sections-Theory of torsion-Torsion of circular, hollow circular shafts and power -close coiled helical springs and leaf springs

Total No of Hours: 60

TEXT BOOKS

* Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007. 2.
* Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010
* Dr.R.K.Bansal A text book of Strength of Materials, Laxmi Publications,New Delhi 1996.
* S. Ramamirutham and R.Narayanan, Strength of Materials, Dhanpat Rai Publications, New Delhi,1989.

REFERENCES

* Kazimi S.M.A. " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991.
* Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions
* William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions 1994

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17005	**Subject Name : CONCRETE AND CONSTRUCTION TECHNOLOGY**	**T y/ Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Building Science and materials	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To understand various construction procedures from sub structure to super structure and also the equipment needed for construction of various types of structures from foundation to super structure

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	understand about concrete making materials and supplementary cementations materials.
CO2	Design the concrete mix for the required strength
CO3	Will acquire knowledge on handling of different types of construction equipments

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M			M					M	
CO2	H		H			M					M	
CO3	H		M			M					M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

DEPARTMENT OF CIVIL ENGINEERING

BCE17005 CONCRETE AND CONSTRUCTION TECHNOLOGY

UNIT I : CONCRETE MAKING MATERIALS 8 Hrs

Manufacture and Components of Portland Cement- Hydration Process- Types of Cement, Aggregates - Classification and Properties Admixtures.

UNIT II: MIX DESIGN 10 Hrs

Properties of Fresh Concrete- Workability, Segregation and Bleeding of Concrete - Factors influencing Mix Proportions - I.S and ACI Methods of Mix Design.

UNIT III : PROPERTIES OF HARDENED CONCRETE 8 Hrs

Strength - Creep and Shrinkage - Durability of Concrete - Chemical Attack - Different Types of FRC - Properties and Applications.

UNIT IV: SUB STRUCTURE CONSTRUCTION 9 Hrs

Piling techniques – Sheet piles – Under water construction of Diaphragm wall and basement – Driving diaphragm walls – Driving well and caisson – Sinking coffer dam – Shoring for deep cutting – Well points – Dewatering and stand by plant equipment for underground open excavation.

UNIT V : SUPER STRUCTURE AND CONSTRUCTION EQUIPMENTS 10 Hrs

Construction sequences in cooling Towers, Bunkers, Silos and Chimney – Pre- stressed construction – In situ pre-stressing in high rise structures – Erecting light weight components on tall structures. Types of earth work equipment's - Tractors, Motor graders, Scrappers - Equipment for compaction – Batching and mixing and concreting.

Total No of Hours : 45

TEXT BOOKS

* Shetty. M.S., Concrete Technology, S.Chand and Co, Pune,1984
* Arora S.P. And Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Roy and Sons, New Delhi, 1997.
* Peurifoy, R.L., Ledbetter, W.D And Schexnayder, C., 'Consruction Plaaning, Equipment and Methods' V Edition McGraw Hill, Singapore, 1995

REFERENCES

* Krishnasamy. K.T., Concrete Technology, Dhanapt Rai - New Delhi – 1985
* Neville, properties of concrete elbs, 1977.
* Sharma S.C., Building Construction, Khanna Publishers, New Delhi.1998

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BAR17I01	Subject Name : **ENGINEERING GEOLOGY**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	Ty	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To understand the importance of geological knowledge such as earth, earthquake and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundation

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	identify and classify rock using basic geologic classification systems
CO2	Understand geologic concepts and approaches.
CO3	Identify the various lithological units and its applications in civil engineering

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H						M				M	
CO2	H						M				M	
C03	H						M				M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		√										
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BAR17I01 ENGINEERING GEOLOGY

UNIT I : GENERAL GEOLOGY 9Hrs

Geology in civil engineering - branches of geology - earth structure and composition - elementary knowledge on continental drift and plate tectonics. Seismo tectonics of the Indian plate, seismic zones of India, Weathering - work of rivers, wind, glaciers.

UNIT II: MINERALOGY 9Hrs

Physical properties of minerals - study of rock forming minerals - quartz family. Feldspar family, augite, hornblende, biotite, muscovite, calcite, garnet - properties, behavior and engineering significance of clay minerals – fundamentals of process of formation of ore minerals - coal and petroleum - their origin and occurrence in India.

UNIT III: PETROLOGY 9Hrs

Classification of Soil and Rock, Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic rocks, description occurrence, engineering properties of following rocks. Igneous rocks - granite, diorite, gabbro, pegmatite, dolerite and basalt sedimentary rocks sandstone, limestone, shale, conglomerate and breccia. Metamorphic rocks, quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV : STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD 9Hrs

Strength Behavior of Soil and Rock , Stress and strain in rock, failure and shear failure of soil and rock, folds, faults and joints in rock, consequences of failure (earthquakes), Bearing on engineering construction. Seismic and electrical methods for civil engineering investigations.

UNIT V : GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING 9Hrs

Geologic Mapping and Remote Sensing, Topographic maps, geologic maps, aerial photographs, LIDAR, SAR, interpretation for civil engineering projects - geological conditions necessary for construction of dams, tunnels, buildings, road cuttings, landslides - causes and preventions. Sea erosion and coastal protection.

Total No of Hrs = 45 hrs

TEXT BOOKS

* Parbin singh, “Engineering and General geology ", S. K. Kataria & Sons, 2009
* D. Venkat Reddy “Engineering Geology”, Vikas publishing House New Delhi, 2010
* Krynine and Judd, “Engineering Geology and Geotechniques ", McGraw Hill Book Company, New Delhi 1990.

REFERENCE

* Legeet, “Geology and Engineering ", McGraw Hill Book Company, New Delhi
* Blyth, “Geology for Engineers ", elbs, Pune 1995

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BAR17IL1	**Subject Name : GEOLOGY AND BUILDING MATERIALS LAB**	**T y/ Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Engineering Geology Building Science and Materials	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Learn to appreciate field condition in relation to engineering projects/problems and understand the problems.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Determine engineering properties of soils
CO2	Measure strike and dip of the bedding planes
CO3	Interpret geological Maps
CO4	Test on Physical Properties of Soil

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					M	M					
CO2	H					M	M					
C03	H					M	M					
C04	H					M	M					

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H
C04	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					

Approval	

DEPARTMENT OF CIVIL ENGINEERING

BAR17IL1 GEOLOGY AND BUILDING MATERIALS LAB

ENGINEERING GEOLOGY

1. Study of Geological map and section of local area
2. Study the various properties of igneous rocks, sedimentary and metamorphic through rocks samples.
3. Study the various properties of different minerals and mineral ores through samples.
4. Study the various types of folds and faults.
5. Physical properties of minerals such as, hardness, colour, streak, etc.
6. Numerical Problems related to Dip and Strike
7. Study of different geological features through models
8. Field visit

BUILDING MATERIALS

1. Assessment of physical properties of bricks such as absorption, shape and size, structure, soundness, Hardness, presence of soluble salts.
2. Hardness, impact and water absorption test etc for stones
3. Study on different types of bonds for bricks and stones
4. Study on defects in timber

Total No. of Hours: 30

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BMA 17025	**Subject Name : MATHEMATICS – II (FOR CIVIL & CHEMICAL ENGINEERS)**	**Ty/Lb/ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: **MATHEMATICS I**	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on partial differential equation, Laplace and Fourier transforms

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the basic concepts in partial differential equations
CO2	To understand the basic concepts in one & two dimensional heat and wave equations
CO3	To understand the basic concepts in Laplace Transforms
CO4	To understand the applications of Laplace Transforms
CO5	To understand the basic concepts in Fourier transforms

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H					M			
CO2	H	H		H					M			
C03	H	H		H					M			
C04	H	H		H					M			
C05	H	H		H					M			
COs / PSOs	PSO1		PSO2									
CO1	H		M									
CO2	H		M									
C03	H		M									
C04	H		M									
C05	H		M									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
	√											
Approval												

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DEPARTMENT OF CIVIL ENGINEERING

BMA 17025 **MATHEMATICS – II**

(FOR CIVIL & CHEMICAL ENGINEERS)

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **12 Hrs**

Formation of PDE by eliminating arbitrary constants and eliminating arbitrary functions – Solutions of standard types of first order equations – Lagrange's equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12 Hrs**

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation, one-dimensional heat equation – Steady state solution of two dimensional heat equation (Cartesian coordinates only)– Fourier series solutions.

UNIT III LAPLACE TRANSFORMS I **12 Hrs**

Transforms of simple functions – Properties of Transforms – Inverse Transforms – Transforms of Derivatives and Integrals.

UNIT IV LAPLACE TRANSFORMS II **12 Hrs**

Periodic functions – Initial and final value theorems – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients.

UNIT V FOURIER TRANSFORM **12 Hrs**

Statement of Fourier integral theorem – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's theorem.

Total no. of hrs: 60

TEXT BOOKS

1. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw Hill Publishing Co., (2005).
3. Singaravelu, Transforms and Partial Differential Equations, Meenakshi Agency, (2017).

REFERENCES

1. Kreyszig E., Advanced Engineering Mathematics (10th ed.), John Wiley & Sons, (2011).
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17ET1	**Subject Name : ENGINEERING SURVEYING I**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	**ETL**	2	0/0	2/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :) To introduce the principles of various surveying methods and applications to Civil Engineering projects

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	Understand the principles of basic survey instruments in civil engineering fields
CO2	Understand the concept of contouring and the ways of plotting
CO3	Students are expected to carryout surveying works related to land and civil engineering projects.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		M		L			H			
CO2	H	M		M		L			H			
CO3	H	M		M		L			H			

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17ET1 ENGINEERING SURVEYING I

UNIT I : INTRODUCTIONS AND CHAIN SURVEYING 8 Hrs

Definition - principles - classification - survey instruments - ranging and chaining - reciprocal ranging - setting perpendiculars –errors - traversing.

UNIT II : COMPASS SURVEYING AND PLANE TABLE SURVEYING 7 Hrs

Prismatic compass - surveyor's compass - bearing - systems and conversions - local attraction – magnetic declination - dip - adjustment of error - plane table instruments and accessories – merits and demerits - methods - radiation - intersection - resection.

UNIT III : LEVELLING AND APPLICATIONS 12 Hrs

Level line - horizontal line - levels and staves - sprit level - bench marks - temporary and permanent adjustments - fly and check leveling - reciprocal leveling - longitudinal and cross sections.

UNIT IV : CONTOURING 8 Hrs

Contouring - methods –characteristics and uses of contours - plotting - calculation of areas and volumes- earth work volume.

UNIT V : THEODOLITE SURVEYING 10 Hrs

Theodolite - vernier - description and uses - temporary and permanent adjustments of vernier transit – swing- horizontal angles - vertical angles – measurements of angles and distances - omitted measurements.

Total No. of Hours: 45

TEXT BOOKS

*Kanetkar T.P., “Surveying and Levelling ", vols. I and II, United Book Corporation, Pune, 1994.

*Punmia B.C., “Surveying ", Vols. I and II, Laxmi Publications, Mumbai, 1999.

*N.N basak., “ Surveying and Levelling ", Tata McGraw Hill, New Delhi, 2004.

REFERENCES

*Clark D., Plane and Geodetic Surveying ", vols. I and II and C.B.S. Publishers,New Delhi, Sixth edition, 1991.

*James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ", Tata McGraw Hill, New Delhi, 1995

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17002	**Subject Name : MECHANICS OF FLUIDS**	**Ty/Lb/ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To know the importance, application and inter-relationship of various properties of fluid.
To study theories those explain the behavior and performance of fluid when the fluid is flowing through the pipe. To understand the utilization of dimensional analysis as a tool in solving problems in the field of fluid mechanics.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn about the basics of fluid mechanics and various properties of fluids
CO2	To learn about the various forces on plane and curved surfaces and the concepts of buoyancy
C03	To have a clear understanding about fluid kinematics and dynamics
C04	To study the basics of boundary layer flow and flow through pipes
C05	To study about various models like distorted models and various dimensionless numbers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				M	M						
CO2	H	M										
C03	H											H
C04	H				M							
C05	H	H		M								

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H
C04	H	H
C05	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17002 **MECHANICS OF FLUIDS**

UNIT I: DEFINITIONS AND FLUID PROPERTIES **8 Hrs**

Definitions - Fluid and Fluid Mechanics - Dimensions and Units - Fluid properties –Viscosity, Compressibility, Surface tension and Capillarity, Continuum - concept of system and control volume.

UNIT II: FLUID STATISTICS **11 Hrs**

Pascal's law and Hydrostatic equation - buoyancy -meta centric height – pressure measurement – gauges and manometers.

UNIT III: FLUID KINEMATICS **10 Hrs**

Stream, streak and path lines - classification of flows - continuity equation - stream and potential functions –flow nets – velocity and acceleration measurement-Problems

UNIT IV: FLUID DYNAMICS **12 Hrs**

Euler and Bernoulli's equations - application of Bernoulli's equation - discharge measurement -Hagen Poiseuille equation .

UNIT V: FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS **19 Hrs**

Darcy Weisbach formula -Major and minor losses of flow in pipes – pipes in series and in parallel – Dimensional analysis - Buckingham π -theorem.

Total No of Hours: 60

TEXT BOOKS

*Dr.R. K. Bansal., "Fluid Mechanics and Hydraulic Machines ", Laxmi Publications 2015.

*Fox, Robert W. And McDonald, Alan T., “Introduction to Fluid Mechanics ",John Willey & sons

REFERENCES

*Streeter, Victor l. And Wylie, Benjamin E., “Fluid Mechanics ", McGraw-Hill Ltd., 1998.

*Natarajan M.K., “Principles of Fluids Mechanics ", Anuradha Agencies, Kumbakonam, 1995

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17003	**Subject Name : STRENGTH OF MATERIALS**	**T y/ Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Mechanics of solids	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge about deflection in beams by various methods
To impart knowledge about analyzing the structural elements by energy concepts and finding stresses and deflection
To impart knowledge about behavior of columns, critical loads and design of columns

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, Students will have

CO1	through knowledge in analysis of indeterminate beams and use of energy method for estimating the slope and deflections of beams and trusses.
CO2	they will be in a position to assess the behaviour of columns,
C03	To knew beams and failure of materials.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M					M	
CO2	H	H	H	H		M					M	
CO3	H	H	H	H		M					M	

COs / PSOs	**PSO1**	**PSO2**
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17003 STRENGTH OF MATERIALS

UNIT I : ENERGY PRINCIPLES 11 Hrs

Strain energy and strain energy density - Strain energy in tension, shear, flexure and torsion - Castigliano's & Engessor's energy theorems- Principle of Virtual Work- Application of energy theorems for computing deflection in Determinate structures – Maxwell's reciprocal theorem.

UNIT II : DEFLECTIONS 13 Hrs

Methods of Deflection Determination of Deflection curve – computation of slopes and deflections in Determinate Beams - Double Integration method – Macaulay's method – Area Moment method –Conjugate Beam method.

UNIT III : INDETERMINATE BEAMS 13 Hrs

Propped Cantilever and Fixed Beams - Fixed End Moments and Reactions for Standard cases of Loading - Continuous Beams - Theorem of Three Moments - Analysis of Continuous Beams - S.F. and B.M. Diagrams for Continuous Beams.

UNIT IV: COLUMNS 13Hrs

Eccentrically Loaded Short Columns Middle Third Rule - Core of Section - Columns of Unsymmetrical Sections - Rankine – Gordon Formula Eccentrically Loaded Long Columns. Theories of Failure - Principal Stress, Principal Strain, Shear Stress, Strain Energy and Distortion Energy Theories.

UNIT V: BENDING OF BEAMS 10Hrs

Bending of Beams of Symmetrical and Unsymmetrical Sections – Box sections and its importance — Winkler Bach Formula - Shear Center Simple problems

Total No of Hours :60

TEXT BOOKS

Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.

Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.

* R.S. Khurmi, "Engineering Mechanics of Solids ", Prentice Hall of India, New Delhi, 1997.
* S.S Ratan, "Strength of Materials ", Tata McGraw Hill Publishing Company, New Delhi, 2008

REFERENCES

* Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions, New Delhi,1994..
* William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions, New Delhi, 1994

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17L04	**Subject Name : STRENGTH OF MATERIALS AND CONCRETE LAB**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Strength of Materials ,Concrete and construction technology	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

Learn the properties of different materials like steel, concrete, timber, bricks and other materials

Study the behavior of different structural elements and develop skill in use of measuring instruments

COURSE OUTCOMES (COs) : (3- 5)

CO1	To do tests on cement as per IS codes of practice
CO2	To do tests on fine and coarse aggregates according to IS codes of Practice;
CO3	To do tests on fresh and hardened concrete as per IS codes of practice

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M					M		M	
CO2	H			M					M		M	
CO3	H			M					M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17L04 STRENGTH OF MATERIALS AND CONCRETE LAB

STRENGTH OF MATERIALS LAB

1. Tension test on mild steel and for steel rods.
2. Compression test on wooden specimen
3. Double shear test on mild steel and aluminum rods.
4. Torsion test on mild steel rod.
5. Impact test on metal specimen
6. Hardness tests on metals like mild steel, brass, copper and aluminum.
7. Deflection test on metal beam
8. Compression test on helical spring

Total No of Hours: 15

CONCRETE LAB

1. Tests on Cement

    a.Specific Gravity,
    b. Normal consistency,
    c. Initial and Final setting time of cement
2. Test on Aggregate

    a. Sieve analysis
    b. Specific gravity
    c. Water Absorption
3. Tests on Freshly Mixed Concrete

    Compaction Factor,
    Slump Value.

Total No of Hours: 15

References:

1. Davis H.E. Trophell.G.E & Hanck, G.F.W. , The Testing Of Engineering Materials – Mcgrew Hill, International Book Co.

2. Timoshenko S.P, &Young, D.H. Strength of Materials – East West Press Ltd. 3. Relevant 813 code. Venon john, Engineering Materials, 3rt Edition, McMillan Co.Ltd.,

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BMA17010	**Subject Name : NUMERICAL METHODS (FOR MECHANICAL & CIVIL ENGINEERS)**	**Ty / Lb/ ETL**	**L**	**T/ S.Lr**	**P/ R**	**C**
	Prerequisite: Mathematics III For Mechanical & Civil Engineers	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To understand the basic concepts in solution of algebraic and transcendental equations.
To understand the basic concepts in interpolation.
To understand the basic concepts in numerical differentiation and integration.
To understand the basic concepts in numerical solutions of ODE.
To understand the basic concepts in numerical solutions of PDE.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course, the student will be able to:

CO1	They will able to solve the non linear non linear equation
CO2	The students will have a clear perception of the power of numerical techniques,
CO3	They would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		M					M			
CO2	H	M		M					M			
C03	H	M		M					M			

COs / PSOs	PSO1	PSO2
CO1	M	H
CO2	M	H
C03	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	√											

Approval	

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DEPARTMENT OF CIVIL ENGINEERING

BMA17010 NUMERICAL METHODS

(FOR MECHANICAL & CIVIL ENGINEERS)

UNIT I : SOLUTION OF EQUATIONS 12 Hrs

Solution of Algebraic and Transcendental equations – Method of false position – Iteration method – Newton-Raphson method –Linear system– Applications of: Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method.

UNIT II : INTERPOLATION 12Hrs

Newton forward and backward differences – Central differences – Sterling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT III : NUMERICAL DIFFERENTIATION AND INTEGRATION 12Hrs

Numerical Differentiation with interpolation polynomials – Numerical Integration by Trapezoidal and Simpson's (both 1/3 rd & 3/8 th) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

UNIT IV: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS 12 Hrs

Taylor's series – Euler's & Modified Euler's method – Runge Kutta method of fourth order for first & second order differential equations – Milne's predictor-corrector method – Adam-Bashforth's predictor-corrector method.

UNIT V: NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12 Hrs

Finite difference solutions for one dimensional heat equation (both implicit & explicit) – Bender-Schmidt method – Crank-Nicolson method – One dimensional wave equation – Two dimensional Laplace and Poisson equations – Liebmann's method.

Total No. of Hours: 60

TEXT BOOKS

1. Veerarajan T., Numerical Methods, Tata McGraw Hill Publishing Co., (2007).
2. Sastry S.S., Introductory Methods of Numerical Analysis, Prentice Hall of India, (2012).

REFERENCES

1. Kandasamy P., Thilagavathy, Gunavathy K., Numerical Methods (Vol.IV), S.Chand & Co., (2008).
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17ET3	**Subject Name : ENGINEERTING SURVEY- II**	**T y/ Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Engineering Survey- I	**ETL**	01	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : This subject deals with geodetic measurements and Control Survey methodology and its adjustments. The student is also exposed to the Modern Surveying.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student will posses knowledge about Tachometric surveying,
CO2	To knew Control surveying, Survey adjustments, Astronomical surveying and Photogrammetric.
CO3	Have knowledge to modern methods of surveying like Photogrammetry, Total station, Hydrographic survey and cartography.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H								M		M	M
CO2	H								M		M	M
CO3	H								M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	M
CO2	H	M
CO3	H	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

DEPARTMENT OF CIVIL ENGINEERING

BCE17ET3 ENGINEERTING SURVEY- II

UNIT I: ENGINEERING SURVEYS 9 Hrs

Curve ranging - Horizontal and vertical curves - Simple Curves - setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves

UNIT II : TACHEOMETRIC SURVEYING 9 Hrs

Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Anallactic lens – Subtense bar.

UNIT III : CONTROL SURVEYING 9 Hrs

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line – Instruments and accessories - Corrections - Satellite station - Reduction to centre - Trignometric levelling – Single and reciprocal observations - Modern trends.

UNIT IV : SURVEY ADJUSTMENTS 9 Hrs

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values –weighted observations - Principle of least squares - Normal equation – Correlates.

UNIT V: PHOTOGRAMMETRY - 9 Hrs

Photogrammetry - Introduction - Terrestrial and aerial Photographs - Stereoscopy -Parallax – Electromagnetic distance measurement - Carrier waves - Principles – Instruments Hydrographic Surveying – Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem - Strength of fix –Sextants and station pointer - River surveys - Measurement of current and discharge -

Total No of Hours: 45

TEXT BOOKS

* Bannister A. and Raymond S., “Surveying”, ELBS, Pune, Sixth Edition, 1992.
* Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
* Kanetkar T.P., “Surveying and Levelling " , Vols. I and II, United Book Corporation, Pune, 1994.
* Punmia B.C., “Surveying ", Vols. I, II and III, Laxmi Publications, New Delhi, 1999.

REFERENCES

* Clark D., “Plane and Geodetic Surveying " , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
* James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17004	**Subject Name : APPLIED HYDRAULIC ENGINEERING**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Mechanics of fluids	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To study theories those explain the behavior and characteristics of fluid in an open channel .
To study the velocity and discharge measurement in open channel.
To understand the working principle of hydraulic machines and its uses

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels
CO2	They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions
C03	They will have knowledge in hydraulic machineries

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		M							M	M
CO2	H	M		M							M	M
CO3	H	M		M							M	M
COs / PSOs	PSO1		PSO2									
CO1	H		H									
CO2	H		H									
CO3	H		H									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								

Approval	

DEPARTMENT OF CIVIL ENGINEERING

BCE17004 APPLIED HYDRAULIC ENGINEERING

FLOW IN OPEN CHANNEL

UNIT I: INTRODUCTION 8 Hrs

Open channel flow - types and regime of flow - velocity distribution in open channel - specific energy - critical flow and its computation.

UNIT II: UNIFORM AND RAPIDLY VARIED FLOW 14 Hrs

Uniform flow - velocity measurement - manning's and Chezy's formula - determination of roughness coefficients - most economical sections- Rectangular, Circular and Trapezoidal channel sections .Hydraulic jump - types - energy dissipation – surges

HYDRAULIC MACHINES

UNIT III: ROTODYNAMIC PUMPS 12 Hrs

Introduction – classification – Rotodynamic pumps: centrifugal pumps – work done – losses - specific speed - minimum speed to start the pump- multistage pumps- parallel and series.

UNIT IV: POSITIVE DISPLACEMENT PUMPS 12 Hrs

Positive displacement pumps - reciprocating pump –work done- slip - air vessels(theory only)

UNIT V: TURBINES 14 Hrs

Classification – Pelton wheel turbine –work done-Francis turbine –work done- draft tube –Kaplan turbine –work done.

Total No of Hours: 60

TEXT BOOKS

1. Subramanian k., “Flow in open channels ", Tata McGraw Hill Publishing Company, New Delhi, 1994

2. Dr. R.K.Bansal., "Fluid Mechanics and Hydraulic Machines ", Lakshmi Publications (p) ltd., Pune, 2015.

3. Kumar K.L., “Engineering Fluid Mechanics ", Eurasia publishing house (p) ltd. New Delhi,

(7th edition), 1995.

REFERENCES

1. Ven Te Chow, “Open-channel hydraulics ", McGraw Hill Co., 1996 - , New York.

2. Ramamirtham S., “Fluid mechanics, Hydraulics and Fluid Machines ", Dhanpat Rai

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17L03	**Subject Name : FLUID MECHANICS & HYDRAULIC MACHINERY LAB**	**Ty/Lb/ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Mechanics of fluids and hydraulics	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To learn the aim, working principle, components and function of hydraulic equipments.

To get hand-on experience in the operation of hydraulic machines.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Measure theoretical discharge in pipes, Venturimeter, orificemeter and notches
CO2	Demonstrate and conduct experiment to find characteristic curves of various pumps
CO3	Demonstrate and conduct experiment to find characteristic curves of various turbines

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M								M	M
CO2	H	M	M								M	M
CO3	H	M	M								M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17L03 FLUID MECHANICS & HYDRAULIC MACHINERY LAB

UNIT I : FLOW MEASUREMENT **6 Hrs**

i. Venturimeter.
ii. Orifice meter.

UNIT II : LOSSES IN PIPES **6 Hrs**

Estimation of major energy and minor losses in pipes

UNIT III : PUMPS **10 Hrs**

Performance characteristics of

i. Rated speed centrifugal pump.
ii. Gear pump.
iii. Reciprocating pump.

UNIT IV : TURBINES **8 Hrs**

Performance characteristics of Pelton wheel turbine and Francis turbine.

Total No of Hours: 30 hrs

TEXT BOOKS

* Dr. R. K.Bansal., "Fluid Mechanics And Hydraulic Machines ", Lakshmi Publications (P) Ltd.New Delhi 2005.
* Fox, Robert w. and Mcdonald, Alan T., "Introduction to Fluid Mechanics ",John Willey & Sons, New Jersey

REFERENCES

* Streeter, Victor L. And Wylie, Benjamin e., "Fluid Mechanics ", McGraw-Hill Ltd.New Delhi, 1998.
* Natarajan M.K., "Principles of Fluids Mechanics ", Anuradha agencies, Vidayal karuppur, kumbakonam, 1995

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17006	**Subject Name : STRUCTURAL ANALYSIS I**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Strength of Materials	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : This course introduces students to the classical methods of structural analysis, i.e., methods for calculating forces and displacements in structures due to given loads and imposed deformations. Both determinate and indeterminate structures are covered.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Analysis trusses, frames and arches
CO2	Analyse structures for moving loads
CO3	Will be conversant with classical methods of analysis.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H				H			M	
CO2	H	H		H				H			M	
CO3	H	H		H				H			M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17006 STRUCTURAL ANALYSIS I

UNIT I : DEFLECTION OF DETERMINATE STRUCTURES 12Hrs

Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid Plane Frames.

UNIT II: SLOPE DEFLECTION METHOD 12Hrs

Analysis of continuous Beams – cantilever beams - Continuous beams and rigid frames (with and without sway) - Symmetry and Asymmetry -Portal Frames.

UNIT III: MOMENT DISTRIBUTION METHOD 12Hrs

Stiffness and carry over factors –Balance – Distribution and carryover of moments - Analysis of continuous Beams - Plane rigid frames with and without sway – Structural frames

UNIT IV: SPACE STRUCTURES 12 Hrs

Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

UNIT V: MOVING LOADS AND INFLUENCE LINES (DETERMINATE) 12 Hrs

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin jointed frames – Influence lines for shear force and bending moment in beam sections

Total No of Hours: 60

TEXT BOOKS

* R.Vaidyanathan,P.Perumal,, Comprehensive Structural Analysis Vol 1 and vol.2, Laxmi Publications,2004
* Bhavikatti S.S Structural Analysis Vol 1 and vol.2 ,Vikas Publishing House Pvt. Ltd New Delhi
* S.Ramamrutham,R.Narayan,Theory of structures,Dhanpatrai publications,1993

REFERENCES

* Analysis of Structures: Strength and Behaviors T.S. Thandavamoorthy, oxford University press, New Delhi, 2005.

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17007	**Subject Name : DESIGN OF CONCRETE STRUCTURES - I**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Strength of materials	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart comprehensive knowledge on the design of reinforced concrete structural elements such as beams, columns, slabs and footings.
To bring about an understanding of the behaviour of reinforced concrete and the design philosophies

COURSE OUTCOMES (COs) : (3- 5) The student shall knew

CO1	to design and detailing a slab
CO2	to design and detailing a column
CO3	to design and detailing a footing.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H				M	M		M	M
CO2	H	H	H	H				M	M		M	M
CO3	H	H	H	H				M	M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

BCE17007 DESIGN OF CONCRETE STRUCTURES - I

UNIT I: INTRODUCTION AND LIMIT STATE DESIGN OF BEAMS 12 Hrs

Properties of different grades of concrete and steel, Permissible stresses, - advantages of limit state method over other methods - understanding the behavior of R.C.C. members. Introduction to IS 456-2000, SP: 16. Characteristic values, partial safety factor, stress strain relationship - stress block parameters, failure criteria Analysis, design and detailing of singly reinforced & doubly reinforced beam.

UNIT II: LIMIT STATE DESIGN FOR SLABS 12 Hrs.

Design and detailing of one-way and two-way slab panels as per IS code provisions.

UNIT III: LIMIT STATE DESIGN FOR BOND ,ANCHORAGE SHEAR AND TORSION 12 Hrs

Behavior of RC beams in shear and torsion-shear and torsion reinforcement-Limit State Design of R C members for combined bending shear and torsion- use of design aids

UNIT IV : LIMIT STATE DESIGN OF COLUMNS 12 Hrs

Basic assumptions - Types of columns – Slenderness' limits for column- minimum eccentricity - Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load.- column under compression and bi axial bending using IS 456;2000.Examples for practices

UNIT V: LIMIT STATE DESIGN OF FOOTINGS 12 Hrs

Design and detailing of isolated footing for column subjected to axial loads, Design and detailing of Axially and eccentrically loaded Rectangular footings-Design and detailing of Combined Rectangular footings for Two Columns.

Total No of Hours: 60

TEXT BOOKS

* N.Krishna Raju "Design of Reinforced Concrete Structures", CBS publishers & Distributors. Latest Edition, IS456:200.
* S.Ramamrudham ,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.

REFERENCES

* Ashok K. Jain Reinforced concrete- Limit state design- New chand & Bros, Roorkee 1997.
* IS: 456- 2000 "Indian Standard for Plain and reinforced concrete – code of practice "Bureau of Indian Standard
* A.P Arul Manikam "Structural Engineering"
* Design aids to IS 456-1978 (SP16)
* SP34 Handbook on Concrete Reinforcement and Detailing, BIS 1987.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BEE17I04	**Subject Name : ENERGY CONSERVATION TECHNIQUES**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To study the various energy saving and management techniques applied to building and construction with relevance to environment.

COURSE OUTCOMES (COs) : (3- 5) At the end of the course the student shall

CO1	Possess knowledge on basic energy conservation systems
CO2	Design energy efficient buildings
CO3	Able to do energy audit and identify conservative measures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	M	M				
CO2	H	H		H	H	H	M	M				
CO3	H	H		H	H	H	M	M				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		√										
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BEE17I04 ENERGY CONSERVATION TECHNIQUES

UNIT I : INTRODUCTION 9 Hrs

Fundamentals of energy- Energy Production Systems-Heating, Ventilating and Airconditioning – Solar Energy and Conservation – Energy Economic Analysis – Energy conservation and audits – Domestic energy consumption – savings - challenges –primary energy use in buildings - Residential – Commercial – Institutional and public buildings – Legal requirements for conservation of fuel and power in buildings.

UNIT II : ENVIRONMENTAL 9 Hrs

Energy and resource conservation – Design of green buildings – Evaluation tools for building energy – Embodied and operating energy – Peak demand – Comfort and Indoor Air quality – Visual and acoustical quality – Land, water and materials ..

UNIT III: DESIGN 9Hrs

Natural building design consideration – Energy efficient design strategies – Contextual factors – Longevity and process Assessment – Renewable Energy Sources and design – Advanced building Technologies – Smart buildings – Economies and cost analysis.

UNIT IV: SERVICES 9 Hrs

Energy in building design – Energy efficient and environment friendly building – Thermal phenomena – thermal comfort – Indoor Air quality – Climate, sun and Solar radiation, - Psychometrics – passive heating and cooling systems - Energy Analysis – Active HVAC systems - Preliminary Investigation – Goals and policies – Energy audit – Types of Energy audit– Energy flow diagram – Energy consumption / Unit Production – Identification of wastage- Priority of conservative measures.

UNIT V: ENERGY MANAGEMENT 9 Hrs

Energy management of electrical equipment - Improvement of power factor – Management of maximum demand – Energy savings in pumps – Fans – Compressed air systems – Energy savings in Lighting systems – Air conditioning systems – Applications .

Total No. of Hours: 45

REFERENCES

1. Moore F., Environmental Control system Mc Graw Hill, Inc. 1994.
2. Brown, GZ, Sun, Wind and light: Architectural design strategies, John Wiley & Sons,1985.
3. Cook, J, Award – Winning passive Solar Design, Mc Graw Hill, 1984.
4. J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations, Blackwell Publishing, 2003.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17008	**Subject Name : SOIL MECHANICS**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Engineering Geology	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Provide the description and classification of soil and analysis of stresses in soils under different loading conditions;
To develop an understanding of the principles of effective stress in saturated soils, and its application to one dimensional compression and consolidation

COURSE OUTCOMES (COs) : (3- 5)

CO1	Ability to determine Index properties and classify the soil
CO2	Determine engineering properties through standard tests
CO3	Knowledge of Properties of soil

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					M	M	M				
CO2	H					M	M	M				
CO3	H					M	M	M				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17008 SOIL MECHANICS

UNIT I: SOIL CLASSIFICATION AND COMPACTION 10 Hrs

Nature of soil - phase relationships - soil description and classification for engineering purposes - IS classification system - soil compaction - theory, comparison of laboratory and field compaction methods – Factors influencing compaction behaviour of soils.

UNIT II: SOILWATER AND WATER FLOW 9 Hrs

Soil water - static pressure in water - Effective stress concepts in soils - capillary stress - permeability measurement in the laboratory and field - factors influencing permeability of soil - seepage - introduction to flow nets - simple problems.

UNIT III: STRESS DISTRIBUTIONS AND SETTLEMENT 9 Hrs

Effective stress concepts in solids - stress distribution in soil media - use of influence charts - components of settlement - factors influencing settlement of soil - immediate and consolidation settlement - Tergazhi's one dimensional consolidation theory - computation of rate of settlement.

UNIT IV: SHEAR STRENGTH 8 Hrs

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass - Pore pressure parameters - Liquefaction.

UNIT V: SLOPE STABILITY 9 Hrs

Slope failure mechanisms - types - infinite slopes - finite slopes - total stress analysis for saturated clay - method of slices - friction circle method - use of stability number.

Total : 45 Hrs

TEXT BOOKS

*V.N.S. Moorthy, “soil mechanics and foundation engineering”, UBS publications and distribution Ltd, New Delhi, 1999.

*Gopal Ranjan and Rao A.S.R., “Basic and Applied Soil Mechanics” Wiley eastern ltd., New Delhi, 1997.

*Arora K.R., “Soil mechanics and Foundation Engineering”, Standard publishers and distributors, New Delhi,1997.

REFERENCES

*Holtz R.D. and Kovacs W.D., “Introduction to geotechnical engineering”, Prentice - hall, New Delhi, 1995.

*Mccarthy D.F., “Essentials of soil mechanics and foundations”, Prentice - Hall, New Delhi, 1997.

*Sutten B.H.C., “Solving problems in soil mechanics", Longman group scientific and technical, U.K. England, 1994

*Dass, B.M, “Principles of geotechnical engineering”, Thompson books

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17L06	**Subject Name : GEOTECHNICAL ENGINEERING LABORATORY**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Soil Mechanics	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To illustrate some of the principles taught during the soil mechanics course.
To impart knowledge of laboratory and index testing methods commonly used in Soil & foundation engineering.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Knowledge to determine Index properties of the soils like water content, specific gravity and Atterberg limits
CO2	Knowledge engineering properties like field density, shear strength, permeability, compaction and consolidation
CO3	Test the soil to assess its ability to withstand the load

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H		H			H			
CO2	H			H		H			H			
CO3	H			H		H			H			

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17L06 GEOTECHNICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

1. Specific gravity of soil solids
2. Grain size distribution - Sieve analysis - Hydrometer analysis
3. Atterberg limits test – Liquid limit, Plastic limit and shrinkage limit tests
4. Field density Test
5. Determination of moisture - Density relationship using standard proctor.
6. Permeability determination (constant head and falling head methods)
7. Direct shear test on cohesion less soil
8. Unconfined compression test in cohesive soil
9. Tri axial compression test in cohesion less soil
10. Laboratory Vane shear test in cohesive soil
11. One dimensional Consolidation test (Determination of coefficient of consolidation only)

Total No of Hrs = 30 hrs

REFERENCES

* "Soil Engineering Laboratory Instruction Manual ", Published by the Engineering College Co-operative Society, Chennai, 1996.
* Lambe T.W., "Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.
* "I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time..

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17010	**Subject Name : STRUCTURAL ANALYSIS II**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Structural Analysis I	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To impart extended knowledge on the concepts taught in Structural Analysis I (Determinate to indeterminate structures.)

To understand the basic concepts of finite element analysis.

COURSE OUTCOMES (COs) : (3- 5)

CO1	analysis suspension bridges and arches
CO2	will be conversant with classical methods of analysis.
CO3	analyse structures by finite element method

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H			**M**	**M**			**M**	**M**
CO2	H	H		H			**M**	**M**			**M**	**M**
C03	H	H		H			**M**	**M**			**M**	**M**

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
C03	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17010 STRUCTURAL ANALYSIS II

UNIT I : ARCHES 12 Hrs

Arches structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects

UNIT II : SUSPENSION BRIDGES 12 Hrs

Analysis of suspension bridges – Un stiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

UNIT III: MATRIX METHOD FOR INDETERMINATE FRAMES 12Hrs

Equilibrium and compatibility - Determinate Vs indeterminate structures –Indeterminacy - primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams. Element and global stiffness and flexibility matrices– Co-ordinate transformations – transformations of stiffness matrices - Analysis of Continuous Beams.

UNIT IV : PLASTIC ANALYSIS OF STRUCTURES 12 Hrs

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

UNIT V : FINITE ELEMENT METHOD 12 Hrs

Introduction- Discretisation of a structure- Displacement functions- Truss element- Beam element- Plane stress and plane strain- Triangular elements

Total No of Hours: 60

TEXT BOOKS

* R.Vaidyanathan,P.Perumal,, Comprehensive Structural Analysis Vol 1 and vol.2, Laxmi Publications,2004
* S.Ramamrutham,R.Narayan,Theory of structures,Dhanpatrai publications,1993
* Bhavikatti S.S Structural Analysis Vol 1 and vol.2 ,Vikas Publishing House Pvt. Ltd New Delhi

REFERENCES

*Matrix analysis of framed structures – William Weaver, Jr & James M.Gere, CBS Publishers & Distributors, Delhi, 1995
*Structural Analysis – A Matrix Approach – G.S.Pandit & S.P.Gupta, Tata McGraw-Hill, New Delhi ,1998
* Manicka Selvam V.K.,Elementary Matrix Analysis of Structures, Khanna Publishers Mumbai,1990.
*Coates R.C., Coutie M.G. and Kong F.K., Structural Analysis, ELBS and Nelson, Newjersey,1990.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code:	**Subject Name :**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
BAR17I03	**DESIGN OF CONCRETE STRUCTURES – II**					
	Prerequisite: Design of Concrete Structures – I	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To bring an exposure on advanced topics in structural design comprising of RCC structures
To understand the design methods of specialized components of RCC structures

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Design retaining walls, staircase and water tanks.
CO2	Design Slab using yield line theory
CO3	Design masonry walls for axial and eccentrical loads

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H		H	M	M	M		M	
CO2	H	H	M	H		H	M	M	M		M	
CO3	H	H	M	H		H	M	M	M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		√										
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BAR17I03 DESIGN OF CONCRETE STRUCTURES – II

UNIT I : RETAINING WALLS **11 Hrs**

Design of retaining walls – cantilever and counter fort.

UNIT II : DESIGN OF STAIRCASE AND FLAT SLAB **8 Hrs**

Introduction to ductile detailing & provisions of IS 13920 - Design of Staircases - Design of flat slabs.

UNIT III: DESIGN OF WATER TANK **11 Hrs**

Design of circular and rectangular water tanks resting on ground. Design of staging and foundations.

UNIT IV: YIELD LINE THEORY. **7 Hrs**

Application of virtual work method to square, rectangular, circular and triangular slabs.

UNIT V BRICK MASONRY **8 Hrs**

Design of masonry walls and pillars as per NBC and I.S.codes.

Total No of Hours : 45

TEXT BOOKS

* Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hal of India, Private, Limited New Delhi, 1997
* Krishna Raju N. Design of RC structures, CBS Publishers and distributors, New Delhi, 1995.
* S.Ramamrudham,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.
* Dayarathnam.P, Brick and Reinforced Brick Structures, Oxford and IBH Publishing House, 1999.

REFERENCES

* Mallick and Gupta, Reinforced Concrete Design, Oxford and IBH, Delhi, 1997
* Design Aides to IS 456-1978 (SP-16)
* Code of Practice for Plain and Reinforced Concrete – IS456-2000.
* IS 1905:1987, Code of practice for structural use of unreinforced masonry Bureau of Indian Standards

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17011	**Subject Name : FOUNDATION ENGINEERING**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Soil mechanics	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To import knowledge on common method of sub soil investigation, selection of foundation and design of foundation..

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students will have the ability to select type of foundation required for the soil at a place
CO2	Able to design shallow, foundation, deep foundation and retaining structures.
CO3	At the end of this course student acquires the capacity to investigate the soil condition and to select and design a suitable foundation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H		H		H				
CO2	H	H	H	H		H		H				
CO3	H	H	H	H		H		H				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17011 FOUNDATION ENGINEERING

UNIT I: SOIL EXPLORATION 9 Hrs

Scope and objectives - method of exploration - auguring and boring - wash boring and rotary drilling - depth of boring - spacing and depth of bore hole - sampling - representative and undisturbed - sampling techniques - split spoon sampler, thin tube sampler, stationary piston sampler - bore log and report - penetration tests (SPT and SCPT) - Selection of foundation.

UNIT II: SHALLOW FOUNDATION 12 Hrs

Introduction - location and depth of foundation - codal provision - bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - factors affecting bearing capacity - problems-bearing capacity from in situ tests (SPT, SCPT and plate load) allowable bearing pressure - components of settlement - determination of settlement of foundation on granular and clay deposit - total and differential settlement - allowable settlement - codal provision.

UNIT III: FOOTINGS AND RAFTS 8 Hrs

Types of foundation - contact pressure distribution below footings, design of footings, isolated footing, combined footing, mat foundation - types - Applications - proportioning- floating foundation - codal provision.

UNIT IV: PILE FOUNDATION 8 Hrs

Types of piles and their function - factors influencing the selection of pile - load carrying capacity of single pile in granular and cohesive soils - static formulae - dynamic formulae (engineering news and hiley's) - capacity from insitu tests (SPT and SCPT) - negative skin friction - uplift capacity - group capacity by different methods (feld's rule, converse - Labarra formula and block failure criterion) - settlement of pile groups -interpretation of pile load test (routine test only) - under reamed piles - capacity under compression and uplift .

UNIT V: RETAINING WALLS 8Hrs

Plastic equilibrium in soils - active and passive states - Rankine's theory - cohesionless, effect of water table andcohesive soil - coloumb's wedge theory - condition for critical failure plane - earth pressure on retaining wallsof simple configurations - Rebhann and Culmann's graphical method - stability analysis of retaining walls.

Total No of Hours: 45

TEXT BOOKS

*Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and distributors,New Delhi,1997.
*Gopal Ranjan and Rao, "A.S.R. Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi, 1997.
*V.N.S. Moorthy, "Soil Mechanics and Foundation Engineering", UBS Publications and distribution Ltd, New Delhi, 1999.

REFERENCES

*Bowles J.E. "Foundation Analysis and Design", McGraw hill, 1994.
*Dass, B.M , "Principles of Geotechnical Engineering", Thompson Books, Singapore ,5th edition, 2003
*Kaniraj, S.R, "Design Aids in Soil Mechanics and Foundation Engineering", Tata Mcgraw Hill Publishing Company Ltd, New Delhi, 2002
*Swamisaran, "Analysis and Design of Structures - Limit State Design", Oxford Ibh Publishing co Pvt Ltd. New Delhi, 1998

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17009	**Subject Name : TRANSPORTATION ENGINEERING**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Soil Mechanics. Survey I,II	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To understand the aspects of design, construction and maintenance of tracks for the safe and¬ efficient movement of public and goods. To have an overall knowledge of the design and construction of Highway, airport, docks, harbors and ports as a whole .

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students completing this course would have acquired knowledge on planning, design, construction
CO2	the students will have the ability to Plan and Design various civil Engineering aspects of Railways,
CO3	Knowledge of Airports and Harbour.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H		M			H		M			M	
CO2	H		M			H		M			M	
CO3	H					H		M			M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17009 TRANSPORTATION ENGINEERING

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9 Hrs

Significance of highway planning –History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9 Hrs

Typical cross sections of Urban and Rural roads — Cross sectional elements - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves - Gradients, Special consideration for hill roads - Hairpin bends – Lateral and vertical clearance at underpasses.

UNITIII RAILWAYS PLANNING CONSTRUCTION AND MAINTENANCE 10 Hrs

Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings. Tunneling Methods, drainage and ventilation –Calculation of Materials required for track laying - Construction and maintenance of tracks – Modern methods of construction & maintenance

UNIT IV AIRPORT PLANNING & DESIGN 9 Hrs

Airport planning, components of airports, airport site selection Runway design- orientation, geometric design and correction for gradients Terminal area, airport layout, airport buildings, passenger facilities, parking area and airport zoning

UNIT V HARBOUR ENGINEERING 8 Hrs

Definition of terms - harbors, ports, docks, tides and waves. Harbors – requirements, classification – site investigation for locations, planning and layouts Terminal facilities – port buildings, warehouse, transit sheds, inter-modal transfer facilities, mooring accessories, navigational aids coastal structures piers, breakwaters, wharves, jetties, quays.

Total No of Hrs = 45 hr

TEXT BOOKS

*Saxena Subhash C and Satyapal Arora, A Course In Railway Engineering, Dhanpat Rai And Sons, Delhi, 1998.

*Khanna S K, Arora M G and Jain S S, Airport Planning And Design, Nemchand And Brothers, Roorkee, 1994.

*Khanna K And Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.

* Kadiyali l r, Principles and Practice of Highway Engineering, Khanna technical Publications, Delhi

* Dr K.P.Subramaniyam, Transportation Engineering, Scitech Publishers, Chennai 2003

REFERENCES

* IRC standards, 2002

* Bureau of Indian Standards (bis) publications on highway materials, 1998

* Rangwala, Railway Engineering, Charotar Publishing House, Mumbai, 1995

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17ET4	**Subject Name : WATER RESOURCES & IRRIGATION ENGINEERING**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Applied hydraulic engineering	ETL	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To impart knowledge and skills on Planning, design, operation and management of reservoir system

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students will come to know about water resources and management in India
CO2	Students will come to know the irrigation management practices of the past, present and future
CO3	The student will gain knowledge on different methods of irrigation including canal irrigation.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				M	H	H	M			M	L
CO2	H				M	H	H	M			M	L
CO3	H				M	H	H	M			M	L

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17ET4 WATER RESOURCES & IRRIGATION ENGINEERING

UNIT I :WATER RESOURCES 8 Hrs

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-levees and flood walls.

UNIT II WATER RESOURCE MANAGEMENT 8Hrs

Economics of water resources planning; – National Water Policy – Consumptive and non- consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water

UNIT III : IRRIGATION ENGINEERING 9 Hrs

Irrigation – Need and mode of Irrigation – Merits and demerits of irrigation – Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – . Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and Demerits – Sprinkler irrigation – Drip irrigation

UNIT IV : DIVERSION AND IMPOUNDING STRUCTURES 10 Hrs

Weirs – elementary profile of a weir – weirs on pervious foundations - Types of Impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch Dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams

UNIT V: CANAL IRRIGATION 10 Hrs

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

Total No of Hours: 45

TEXT BOOKS

* Asawa, G.L., “Irrigation Engineering”, New Age International Publishers, New Delhi, 2000.
* Sharma, R.K., and Sharma, T.K., “Irrigation Engineering”, S.Chand and Company,New Delhi, 2000.

REFERENCES

* Basak, N.N., “Irrigation Engineering”, Tata McGraw-Hill Publishing Co., New Delhi, 2000.
* Garg, S.K., “Irrigation Engineering,” Laxmi Publications, New Delhi, 1999.
* Gupta, B.L., and Amir Gupta, “Irrigation Engineering”, SatyaPraheshan, New Delhi

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17012	Subject Name : **DESIGN OF STEEL STRUCTURES**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Structural analysis I & II	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: To introduce the student to material behaviour and Load and Resistance Factor Design methodology.
To design and analyze tension members and compression members.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students would have knowledge on the design of structural steel members subjected to compressive, tensile and bending forces, as per current code .
CO2	To know to design structural systems such as roof trusses and gantry girders.
CO3	To design and analyze beams and connections

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M	M	M				
CO2	H	H	H	H		M	M	M				
CO3	H	H	H	H		M	M	M				

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17012 DESIGN OF STEEL STRUCTURES

UNIT I INTRODUCTION 12 Hrs

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Connections using rivets, welding, bolting – Design of bolted and welded joints – Eccentric connections - Efficiency of joints.

UNIT II TENSION MEMBERS 12 Hrs

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

UNIT III COMPRESSION MEMBERS 12 Hrs

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of laced and battened type columns – Design of column bases – Gusseted base

UNIT IV BEAMS 12 Hrs

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – Design of plate girders - Intermediate and bearing stiffeners – Flange and web splices.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 12 Hrs

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; end bearing – Design of gantry girder.

Total No of Hours: 60

TEXTBOOKS:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2 nd Edition, 2013.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
2. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005
3. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, IK International Publishing House Pvt. Ltd., 2009
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2009.
5. IS 800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17013	Subject Name: **CONSTRUCTION MANAGEMENT**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: NONE	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

To make the students aware of the various construction techniques and practices.

To introduce a concepts of projects formulation

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student should be able to plan construction projects, schedule the activities using network diagrams,
CO2	Determine the cost of the project, control the cost of the project by creating cash flows and budgeting and to use the project information as decision making tool
CO3	Knowledge about different methods of planning

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					H	M	M		M		H
CO2	H					H	M	M		M		H
CO3	H					H	M	M		M		H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				√								
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17013 CONSTRUCTION MANAGEMENT

UNIT I : NETWORK TECHNIQUES 12 Hrs

Introduction to network techniques - Use of CPM and PERT for planning - Scheduling and control of construction work, bar charts Error in networks, Types of nodes and node numbering systems.

UNIT II : CONSTRUCTION PLANNING 12 Hrs

Basic concepts in the development of construction plan - Planning for construction and site facilities using networks - Preparation of construction schedules for jobs, materials, and equipment using CPM. .

UNIT III : COST CONTROL OF CONSTRUCTION 12 Hrs

Construction quality control and inspection - Significance of variability and estimation of risks - Construction cost control - Crashing of networks.

UNIT IV : QUALITY AND SAFETY DURING CONSTRUCTION 12 Hrs

Importance of Quality and safety – Organizing for quality and safety – safety measures – Prevention of fire at construction site – Elements and organization of quality - Quality assurance techniques.

UNIT V MANAGEMENT INFORMATION SYSTEM 12 Hrs

Definition of MIS – Requirement of MIS – Database approach – Types of project information – Accuracy and use of information.

Total No of Hours: 60

TEXT BOOKS

* Chitkara, K.K "Consruction Project Management Planning "Scheduling And Control, Tata Mc Graw – Hill Publishing Co., Newdelhi, 1998.
* S. Seetharaman - Construction Engineering & Management, Dhanpat Rai Publications ,Pune,1995.

REFERENCES

* Construction Management - Sangareddy And Meyyappan,Prathibha Publications,Cbe,1994.
* Moder. J., C. Phillips And Davis, "Project Management With Cpm, Pert And Precedence Diagramming,1999
* Prasanna Chandra, " Project Management ", Tmh ,New Delhi,1997.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17L15	Subject Name: **PROJECT**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: ALL	Lb	0	0/4	0/8	8

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering.

COURSE OUTCOMES (COs) : (3- 5) Students will be able to

CO1	Work in a team and develop multidisciplinary ,research skills
CO2	Explore innovative ideas in civil engineering field
CO3	Develop projects based on industrial and field requirements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17L15 **PROJECT**

OBJECTIVE

The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to civil engineering. Every project work shall have a guide who is a member of the faculty of the university.

Fourteen periods per week shall be allotted in the time table for this important activity and this time shall be utilized by the students to receive directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars the progress made in the project. Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

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DEPARTMENT OF CIVIL ENGINEERING

ELECTIVE SYLLABUS

(PART TIME)

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E01	**Subject Name : ENVIRONMENTAL ENGINEERING**	**Ty/Lb/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: None	Ty	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge in fundamental theory and design of conventional water treatment facilities.
To impart knowledge in fundamental theory and design of conventional wastewater treatment facilities .
To impart knowledge on the principles used to design advanced wastewater treatments.

COURSE OUTCOMES (COs) : (3- 5)

CO1	an insight into the structure of drinking water supply and waste water systems, including water transport, treatment and distribution
CO2	an understanding of water quality and waste water criteria and standards, and their relation to public health
CO3	the ability to design and evaluate water supply and waste water project alternatives on basis of chosen

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M		H		H	H				M
CO2	H	M	M		H		H	H				M
CO3	H	M	M		H		H	H				M
COs / PSOs	PSO1		PSO2									
CO1	H		H									
CO2	H		H									
CO3	H		H									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E01 ENVIRONMENTAL ENGINEERING

UNIT I : PLANNING FOR WATER SUPPLY SYSTEMS 9 Hrs

Scope of environmental engineering – role of environmental engineer – Public water supply systems – objectives – design period – population forecasting – water demand – sources of water – sources selection – water quality – characterization – sources of wastewater –estimation of storm runoff.

UNIT II: WATER TREATMENT 9 Hrs

Screening - types of screening - plain sedimentation – sedimentation with coagulation – settling & flotation - filtration - disinfection

UNIT III : SEWAGE TREATMENT – PRIMARY TREATMENT 9 Hrs

Objectives – unit operations & processes – principles, functions and design of screen, grit chambers and primary sedimentation tanks.

UNIT IV : SEWAGE TREATMENT – SECONDARY TREATMENT 9 Hrs

Secondary treatment – activated sludge process and trickling filter; other treatment methods – stabilization ponds and septic tanks – advances in sewage treatment.

UNIT V: SEWAGE DISPOSAL AND SLUDGE MANAGEMENT 9 Hrs

Methods – dilution – self purification of surface water bodies – oxygen sag curve – land disposal – sewage farming – deep well injection – soil dispersion system. Thickening – sludge digestion – biogas recovery - drying beds – conditioning and dewatering – sludge disposal.

Total No of Hours: 45

TEXT BOOKS

* Garg, S.K., Environmental Engineering, Vols. I &II, Khanna Publishers, New Delhi, 1994
* C.S.Shah, Water Supply And Sanitation, Galgotia Publishing Company, New Delhi, 1994

REFERENCES

* Manual on Water Supply And Treatment, Ministry Of Urban Development, Government Of India, New Delhi, 1999.
* Manual on sewerage and sewage treatment, CPHEEO, Ministry Of Urban Development, Government Of India, New Delhi, 1993.
* H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, Mcgraw-Hill Book Company, New Delhi, 1995.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E02	**Subject Name : DESIGN OF COMPOSITE STRUCTURES**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite :Design of steel and concrete structures	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop an understanding of the behaviour and design study of Steel concrete composite elements and structures

COURSE OUTCOMES (COs) : (3- 5)
At the end of this course students will be in a position to

CO1	Design composite beams, columns, trusses and box-girder bridges including the related connections.
CO2	They will get exposure on case studies related to steel-concrete constructions of buildings
CO3	Apply the concepts of composite construction in engineering

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M			M		M	
CO2	H	H	H	H		M			M		M	
CO3	H	H	H	H		M			M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E02 DESIGN OF COMPOSITE STRUCTURES

UNIT I INTRODUCTION 9 Hrs

Introduction to steel - concrete composite construction – Coes – Composite action – Serviceability and - Construction issues.

UNIT II DESIGN OF CONNECTIONS 9 Hrs

Shear connectors – Types – Design of connections in composite structures – Degree of shear connection – Partial shear interaction

UNIT III DESIGN OF COMPOSITE MEMBERS 9 Hrs

Design of composite beams, slabs, columns, beam – columns - design of composite trusses.

UNIT IV COMPOSITE BOX GIRDER BRIDGES 9 Hrs

Introduction - behaviour of box girder bridges - design concepts.

UNIT V CASE STUDIES 9 Hrs

Case studies on steel - concrete composite construction in buildings - seismic behaviour of composite structures.

Total No of Hours : 45

REFERENCES:

1. Johnson R.P., “Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings”, Vol.I, Blackwell Scientific Publications, 2004.
2. Oehlers D.J. and Bradford M.A., “Composite Steel and Concrete Structural Members, Fundamental behaviour”, Pergamon press, Oxford, 1995.
3. Owens.G.W and Knowles.P, ”Steel Designers Manual”, Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E03	**Subject Name : INDUSTRIAL STRUCTURES**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Design of steel and concrete structures	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : This course deals with some of the special aspects with respect to Civil Engineering structures in industries.

COURSE OUTCOMES (COs) : (3- 5)
At the end of this course the student shall be able to.

CO1	Discuss the planning and functional requirements of Industrial structures**.**
CO2	Discover the need to learn about the design concepts, and constructional aspects of Industrial structure.
CO3	Analyse and evaluate the importance of various construction materials for Industrial Construction.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		M	M		M		M	
CO2	H	H	H	H		M	M		M		M	
CO3	H	H	H	H		M	M		M		M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

BCE17E03 INDUSTRIAL STRUCTURES

UNIT I: PLANNING 9Hrs

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

UNIT II: FUNCTIONAL REQUIREMENTS 9Hrs

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

UNIT III: DESIGN OF STEEL STRUCTURES 9Hrs

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

UNIT IV: DESIGN OF R.C. STRUCTURES 9Hrs

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

UNIT V: PREFABRICATION 9Hrs

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

Total No. of Hours: 45

TEXT BOOKS

*Reinforced Concrete Structural elements – P. Purushothaman

*Pasala Dayaratnam – Design of Steel Structure - 1990

REFERENCES

*Henn W. Buildings for Industry, Vols. I and II, London Hill Books, 1995

*Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990

*Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E04	**Subject Name** **SMART STRUCTURES AND SMART MATERIALS**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Concrete and Construction Technology	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE: This course is designed to give an insight into the latest developments regarding smart materials and their use in structures. Further, this also deals with structures which can self adjust their stiffness with load.

COURSE OUTCOMES (COs) : (3- 5)
At the end of this course the student shall be able to

CO1	Understand the physical principles underlying the behavior of smart materials;
CO2	Understand the engineering principles in smart sensor, actuator and transducer technologies;
CO3	Use principles of measurement, signal processing, drive and control techniques necessary to developing smart structures and products
CO4	Appreciate and suggest improvement on the design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H	H	H	H	H			M	M
CO2	H			H	H	H	H	H			M	M
CO3	H			H	H	H	H	H			M	M
CO4	H			H	H	H	H	H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H
CO4	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

BCE17E04 SMART STRUCTURES AND SMART MATERIALS

UNIT I: INTRODUCTION 9Hrs

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

UNIT II: MEASURING TECHNIQUES 9Hrs

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

UNIT III: SENSORS 9Hrs

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT IV: ACTUATORS 9Hrs

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro rheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

UNIT V: SIGNAL PROCESSING AND CONTROL SYSTEMS 9Hrs

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

Total No of Hours : 45

TEXT BOOKS

*Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.

REFERENCES

*L. S. Srinath – Experimental Stress Analysis – Tata McGraw Hill, 1998.

*J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw Hill, 1998.

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E05	**Subject Name** **ESTIMATION AND QUANTITY SURVEYING**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: NIL	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To study the functional planning of buildings as per standards; To study the estimate types and terms involved in estimation; To study the important specifications necessary for the works in buildings; To study the concepts of tenders and contracts;

COURSE OUTCOMES (COs) : (3- 5)

At the end of this course the student shall be able to

CO1	Prepare various types of estimation and find out the quantity of works involved.
CO2	Carry out analysis of rates and bill preparation.
CO3	Prepare specifications for various items of construction works
CO4	Estimate the quantity of works involved in road works, water supply and sanitary works

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	H	H		H		M		M	H		H	H
CO2	H	H		H		M		M	H		H	H
CO3	H	H		H		M		M	H		H	H
CO4	H	H		H		M		M	H		H	H

COs / PSOs	**PSO1**	**PSO2**
CO1	H	H
CO2	H	H
CO3	H	H
CO4	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

DEPARTMENT OF CIVIL ENGINEERING

BCE17E05 ESTIMATION AND QUANTITY SURVEYING

UNIT I : ESTIMATION 9 Hrs

Types of estimates- units of measurements-methods of estimates – advantages- estimation of load bearing and framed structures –estimate of quantities in residential building- calculation of quantities of brick work, RCC, PCC, white washing ,color washing and painting / varnishing – calculation of brick work and RCC works in arches – estimate of joineries for paneled and glazed doors ,windows, ventilators, handrails etc.

UNIT II: ESTIMATE OF OTHER STRUCTURES 9 Hrs

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads-estimation of retaining walls and culverts.

UNIT III: SPECIFICATIONS AND TENDERS 9 Hrs

Data –schedule of rates- analysis of rates-specifications-sources-detailed and general specifications – tenders- e-tender contracts- contracts types– preparation of tender notice and documents-arbitration and legal requirements

UNIT IV: VALUATION 9 Hrs

Necessity – basics of value engineering –capitalized value – depreciation and its methods – escalation _ value of building – calculation of standard rent – mortgage- lease.

UNIT V: REPORT PREPARATION AND CASH FLOW 9 Hrs

Principle of report preparation – report on estimate of residential building- commercial building -culvert – roads – water supply and sanitary installations – tube wells – open wells.

Total No of Hrs = 45 hrs

TEXT BOOKS

* B.N.Dutta, Estimating And Costing In Civil Engineering –UBS publishers and distribution Pvt Ltd, 2003.
* Mr. B.Kanagasabapathy, M/S. Ehilalarasi Kanagasabapathy,Practical Valuation – Vol I, Thiruchirappalli, 1995.
* Kohl, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & CompanyLtd., 2004.
* Rangwala, “Estimating, Costing and Valuation”, Charotar Publishing House Pvt Ltd., 2012.

REFERENCES

* G.S.Birdie, A Text Book On Estimating And Costing, Dhanpat Rai And Sons, New Delhi,1995.
* Mr. B.Kanagasabapathy, M/S. Ehilalarasi Kanagasabapathy, Fixation of Fair Rent , Thiruchirappalli, 1995.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E06	**Subject Name** **HOUSING PLANNING AND DESIGN**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Building Drawing Practice	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : A house plan is a set of construction or working drawings that define all the construction specifications of a residential house A truly successful project is one where project goals are identifies early on and where the interdependencies of all building systems are coordinated concurrently from the planning and programming phase.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Plan the buildings, as per the law and rules and regulations
CO2	Analyze the slum clearance project and prepare plan for plot map cost flow
CO3	identify the financing agencies and its functions

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	H	H				H		H			H	
CO2	H	H				H		H			H	
CO3	H	H				H		H			H	

COs / PSOs	**PSO1**	**PSO2**
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E06 HOUSING – PLANNING AND DESIGN

UNIT I: INTRODUCTION TO HOUSING 9Hrs

Definition of Basic Terms – House, Home, Household, Apartments - Objectives of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Local bodies' Bye-laws at Urban and Rural Level and Development Control Regulations, Institutions for Housing at National, State and Local levels.

UNITII: HOUSING PROGRAMMES 9Hrs

Basic Concepts – Contents and Standards for Housing Programmes - Sites and Services, Neighbourhood, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programme, Role of Public, Private and Non-Government Organisations.

UNIT III: PLANNING AND DESIGN OF HOUSING PROJECTS 9Hrs

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems).

UNIT IV: CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9Hrs

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation.

UNIT V: HOUSING FINANCE AND PROJECT APPRAISAL 9Hrs

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

Total No of Hours : 45

TEXT BOOKS

* Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
* Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

REFERENCES

* Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 200.
* UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.
* National Housing Policy, 1994, Government of India.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E07	**Subject Name** **BUILDING TECHNOLOGY AND HABITAT ENGINEERING**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: none	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Recognise the various materials used in building construction
CO2	Understand the importance of climate and its influence in construction
CO3	Understand the importance of thermal control, ventilation and air movement in building.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				H		H				M	
CO2	H				H		H				M	
CO3	H				H		H				M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

BCE17E07 BUILDING TECHNOLOGY AND HABITAT ENGINEERING

UNIT I BUILDING STONES 9Hrs

Requirement of good building stone- characteristics - testing.Lime: Properties- Classifications -Manufacture - Testing of lime. Pozzolona: Natural and Artificial pozzolonas. Timber - Defects - Seasoning - Decay - Preservation, Tiles- Flooring and roofing tiles-specification-tests. Paints varnishes and distempers, Common constituents, types and desirable properties.

UNIT II MISCELLANEOUS MATERIALS 9Hrs

Insulating Materials - Thermal and sound insulating material desirable properties and type. Geosynthetics and its applications .Lintels –Arches – Stairs- different types and its components. Doors, Windows and Ventilations - Classification - Technical terms-Classification and Types

UNIT III ROOF 9Hrs

Types of roofs – wooden trusses .Finishing works - Plastering, pointing, painting, white washing, colour washing, distempering; Damp proofing ant termite treatment.

UNIT IV CLIMATE AND COMFORT 9Hrs

Global climatic factors – Elements of climates –Classification of tropical climates- site climate .The desirable conditions- Thermal comfort factors-Thermal comfort indices – Effective temperature

UNIT V THERMAL CONTROL 9Hrs

Means of thermal control – Mechanical control- structural control- ventilation and air movement

Total No of Hours : 45

REFERENCES:

* Gurucharan Singh, Building materials,,1996
* Rangwala S. C, Engineering Materials, Charotar Publishing House, 1992, Anand
* Punmia B. C, Building Construction, Laxmi Publlications, 1999, New Delhi.
* Rangwala S. C, Building Construction, Charotar Publishing House, 1992, Anand
* Huntington W.C, Building Construction, John Wiley, 1959, New York.
* Koenigsberger,Manual of Tropical Housing and Building, Orient Longman Ltd

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E08	**Subject Name** **COST EFFECTIVE BUILDINGS**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Concrete and Construction Technology	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Identify the cost effective techniques and environmental friendly materials in construction
CO2	Identify the effects of global warming in construction
CO3	Understand the green building and its benefits in construction field.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			H	H		H			H	H
CO2	H	H			H	H		H			H	H
CO3	H	H			H	H		H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17E08 COST EFFECTIVE BUILDINGS

UNIT I: INTRODUCTION TO COST EFFECTIVE CONSTRUCTION 12Hours

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime-Poszolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials-Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.

UNIT II: TECHNOLOGIES & METHODS IN CONSTRUCTION 12 Hours

Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof - Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies

UNIT III: GLOBAL WARMING & THE RELEVANCE OF GREEN BUILDINGS 07 Hours

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions - Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits- Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials- Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT IV: GREEN BUILDING 07 Hours

Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings - Embodied Energy in Materials-Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT V: GREEN DESIGN 07 Hours

Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only)

Total No of Hours : 45

REFERENCES:

* K S Jagadeesh, B V Venkatta Rama Reddy & K S Nanjunda Rao ,Alternative Building Materials and Technologies , New Age International Publishers.
* Asko Sarja ,Integrated Life Cycle Design of Structures , SPON Press.
* D S Chauhan and S K Sreevasthava , Non conventional Energy Resources , New Age International Publishers.
* Laurie Backer, Buildings How to Reduce Cost, Cost Ford.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E09	**Subject Name** **INDUSTRIAL WASTE MANAGEMENT**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Environmental engineering	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on various environmental legislations.
To understand the treatment of industrial wastes.
To impart knowledge on the pollution potential of major industries and the methods of controlling the same.

COURSE OUTCOMES (COs) : (3- 5)
After successful completion of this course, the students should be able to

CO1	Suggest the industrial waste disposal methods on land and water environment.
CO2	Conduct waste audit in an industry and implement waste minimization techniques.
CO3	Identify the impacts on environment due to various industrial effluents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M	H	H	H	H		M	H	H
CO2	H			M	H	H	H	H		M	H	H
CO3	H			M	H	H	H	H		M	H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E09 INDUSTRIAL WASTE MANAGEMENT

UNIT I: INTRODUCTION 9Hrs

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Hazardous Wastes – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes – Pollution Control Boards.

UNIT II: CLEANER PRODUCTION 9Hrs

Waste management Approach – Waste Audit – Volume and strength reduction – material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III: TREATMENT OF INDUSTRIAL WASTEWATER 9Hrs

Equalisation – Neutralisation – removal of suspended and dissolved organic solids - Chemical oxidation – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management.

UNIT IV: 4. TREATMENT AND DISPOSAL OF HAZARDOUS WASTES 9Hrs

Physio chemical treatment – solidification – incineration – Secured landfills – Legal Provisions.

UNIT V: CASE STUDIES 9Hrs

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants.

Total No. of Hours: 45

TEXT BOOKS

*M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford IBH Publication, 1995.

*W .W. Eckenfelder Jr., Industrial Water Pollution Control, McGraw-Hill Book Company, New Delhi, 1994.

REFERENCES

*T.T.Shen, Industrial Pollution Prevention, Springer, 1999.

*R.L.Stephenson and J.B.Blackburn, Jr., Industrial Wastewater Systems Hand book, Lewis Publisher, New York,

*H.M.Freeman, Industrial Pollution Prevention Hand Book, McGraw Hill Inc., New Delhi, 1995.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E10	**Subject Name** **CLEANER PRODUCTION**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: NIL	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop a basic knowledge about the cleaner production and apply the same in the field application.

To educate the students on complete management principles related to Cleaner Production and Control of Industrial Pollution.

COURSE OUTCOMES (COs) : (3- 5)

The students completing the course will have an

CO1	insight to sustainable development and cleaner production concept
CO2	ability to plan and implement cleaner production program
CO3	ability to conduct waste audit in an industry and implement waste minimization techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	H	H			H	M
CO2	H	H		H	H	H	H	H			H	M
CO3	H	H		H	H	H	H	H			H	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

BCE17E10 CLEANER PRODUCTION

UNIT I : INTRODUCTION 9 Hrs

Sustainable Development - Indicators of Sustainability - Sustainability Strategies - Barriers to Sustainability – Cleaner Production (CP) in Achieving Sustainability - Environmental Policies and Legislations - Regulations to Encourage Pollution Prevention and Cleaner Production – Regulatory versus Market Based Approaches

UNIT II : CLEANER PRODUCTION CONCEPT 9 Hrs

Definition - Importance - Benefits - Promotion - Barriers - Role of Industry, Government and Institutions - Environmental Management Hierarchy - Source Reduction Techniques - Process and equipment optimisation, reuse, recovery, recycle, raw material substitution.

UNIT III: CLEANER PRODUCTION PROJECT DEVELOPMENT AND IMPLEMENTATION 9 Hrs

Overview of CP Assessment Steps and Skills, Preparing for the Site Visit, Information Gathering, and Process Flow Diagram, Material Balance, Establishing a Program - Organizing a Program - Preparing a Program Plan - Measuring Progress - Pollution Prevention and Cleaner Production Awareness Plan - Waste audit - Environmental Statement.

UNIT IV: LIFE CYCLE ASSESSMENT 9 Hrs

Elements of LCA - Life Cycle Costing - Eco Labelling - Design for the Environment – International Environmental Standards - ISO 14001 - Environmental audit.

UNIT V: CASE STUDIES 9 Hrs

Industrial applications of CP, LCA, EMS and Environmental Audits.

Total No of Hours : 45

REFERENCES

* Paul L Bishop (2000) " Pollution Prevention: Fundamentals and Practice " McGraw-Hill International New York.

*World Bank Group (1998) "Pollution Prevention and Abatement Handbook"

*"Towards Cleaner Production ", World Bank and UNEP, Washington D.C.

*Prasad modak, C.Viswanathan and Mandar parasnis (1995)"Cleaner Production Audit ", Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E11	**Subject Name** **ARCHITECTURE AND TOWN PLANNING**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: NONE	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge on architectural design of structures as per the zoning regulations

COURSE OUTCOMES (COs) : (3- 5)
After successful completion of this course, the students should be able to

CO1	perform architectural design of structures
CO2	suggest the land requirement as per the zoning regulations
CO3	perform Land scape design

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M			H	H	H	M		H	M
CO2	H	H	M			H	H	H	M		H	M
CO3	H	H	M			H	H	H	M		H	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E11 ARCHITECTURE AND TOWN PLANNING

UNIT I: ARCHITECTURAL DEVELOPMENT: 9Hrs

Natural and built environment, historic examples, factors influence architectural development.

UNIT II: PRINCIPLES OF ARCHITECTURAL DESIGN: 9Hrs

Design methods, primary elements, form, space, organization, circulation, proportion and scale, ordering principles;

UNIT III: FUNCTIONAL PLANNING OF BUILDINGS: 9Hrs

Planning, designing and construction, general building requirements, permit and inspection (as per the National building Code);

UNIT IV: EVOLUTION OF TOWNS: 9Hrs

History and trends in town planning: origin and growth, historical development of town planning in ancient valley civilizations; Objects and necessary of town planning; Surveys and analysis of a town; New Concepts in town planning: Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning;

UNIT V: PLANNING PRINCIPLES, PRACTICE AND TECHNIQUES: 9Hrs

Elements of City plan, Estimating future needs, Planning standards, Zoning - its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan; Concepts of Urban planning, Design and Landscaping.

Total No of Hours: 45

TEXT BOOKS

* B. Gallion and S. Eisner, The Urban Pattern: City planning and Design - C B S publishers, 5th edition, 2005.

*D. K. Francis Ching, Architectures: Form, Space and Order, John Wiley, 2nd edition 1996.

REFERENCES

*****National Building Code of India 2005, BIS, New Delhi.

*S. Eisner, A. B. Gallion and S. Eisner, The Urban Pattern: City planning and Design, John Wiley 6th edition 1996.

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E12	**Subject Name** **DAM ENGINEERING**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Irrigation Engineering	TY	2	1/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart a knowledge on types of dam,its functions and design principles.

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course, the student will be able to:

CO1	Analyse and design gravity dams
CO2	Analyse and design earth and rockfill dams
	Design spillways and energy dissipation structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H		H			M	M
CO2	H	H	H	H	M	H		H			M	M
CO3	H	H	H	H	M	H		H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
Co3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E12 DAM ENGINEERING

UNIT I: INTRODUCTION 9Hrs

Types of Dam, merits and demerits, dam site selection, selection of dam, Forces acting on gravity Dam, Methods of analysis of gravity Dam, Modes of failure and stability requirements, Design criteria and factor of safety.

UNIT II: GRAVITY DAM 9Hrs

Elementary profile of a gravity dam, Low and high gravity dams, Zoning of dams, Galleries in dams,Temperature control in mass concrete; gravity dams subjected to earthquakes.

UNIT III: BUTTRESS AND ARCH DAMS 9Hrs

Buttress and Arch dams, Types, selection, merits and demerits, Elementary design Principles of Arch and Buttress dams.

UNIT IV: EARTH DAM 9Hrs

Earth Dam their component and functions, causes of failure. Factors influencing the design of an earthdam. Design criteria for Earth Dam.

UNIT V: SPILLWAY 9Hrs

Elementary idea of design for spillway and energy dissipaters.

Total No of Hours: 45

TEXT BOOKS

* R.S. Varshney “Concrete Dams”, by 1982, NCB, Roorkee
*Design of Small Dams, USBR 1960, Calcutta, Oxford and IBH
*W.P. Creager, J. Justin,.Daud Hinds, “Engineering for Dams” Vol. I-III, Wiley, N.Y., USA.
* IS: 6512-1984, Criteria for Design of solid Gravity Dams.
*IS:1893-1984, , Criteria for Earthquake resistant Design of structures.

REFERENCES

* NPTEL course materials from different IITs

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E19	**Subject Name** **PRESTRESSED CONCRETE STRUCTURES**	**T / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Deisgn of concrete structures I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : Prestressing methods, principles and concepts are essential for the basic concept of the subject .
Analysis of prestress and the resultant stresses using different concepts is dealt here;
Determination of losses in concrete & Anchorage zone stresses in end block can be brought out using IS method

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student shall have a knowledge on methods of prestressing
CO2	Student should be able to design various prestressed concrete structural elements.
CO3	Possesses a knowledge on composite construction

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H	H	H	M		M	M
CO2	H	H	H	H		H	H	H	M		M	M
CO3	H	H	H	H		H	H	H	M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

BCE17E19 PRESTRESSED CONCRETE STRUCTURES

UNIT I : INTRODUCTION – THEORY AND BEHAVIOUR 9Hrs

Basic concepts – Advantages – Materials required – Systems and methods of pre -stressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons .

UNIT II : DEFLECTION 9Hrs

Deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of pre-stress – Losses of prestress - types - losses due to elastic deformation of concrete - shrinkage of concrete - creep of concrete - friction - anchorage slip – Estimation of crack width

UNIT III : DESIGN 9Hrs

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria.

UNIT IV : CIRCULAR PRESTRESSING 9Hrs

General features & Design of prestressed concrete tanks – Prestressed concrete Poles, Shapes, Features &

Design- Prestressed concrete sleepers – Development – Types- Design, Static & dynamic loads

UNIT V : COMPOSITE CONSTRUCTION 9Hrs

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members– General aspects – pretension pre-stressed bridge decks – Post tensioned pre-stressed bridge decks –Advantages over R.C.C bridges- Design Principles of post tensioned prestressed concrete slab bridge deck, T Beam slab bridge deck & Continuous two span beam deck

Total No of Hours: 60

TEXT BOOKS

*Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi, 2011

* S.Ramamrutham, Prestressed concrete,Dhanpatrai Publishing company,2014

*Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH Publishing Co.Pvt. Ltd. 1997.

*Rajagopalan.N, Prestressed Concrete, Alpha Science, 2002.

REFERENCES

*Ramaswamy G.S., Modern Prestressed Concrete Design, Arnold Heinimen, New Delhi, 1990

*Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E20	**Subject Name PREFABRICATED STRUCTURES**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: NIL	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

COURSE OUTCOMES (COs) : (3- 5)
The student shall be able to

CO1	design some of the prefabricated elements
CO2	Understand the construction methods in using prefabricated elements
CO3	utilize the various code provisions regarding progressive collapse.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		M			M	M
CO2	H	H	H	H		H		M			M	M
CO3	H	H	H	H		H		M			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E20 PREFABRICATED STRUCTURES

UNIT I: INTRODUCTION 9Hrs

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

UNIT II: PREFABRICATED COMPONENTS 9Hrs

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

UNIT III: DESIGN PRINCIPLES 9Hrs

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV: JOINT IN STRUCTURAL MEMBERS 9Hrs

Joints for different structural connections – Dimensions and detailing – Design of expansion joints.

UNIT V: DESIGN FOR ABNORMAL LOADS 9Hrs

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Total No. of Hours: 45

TEXT BOOKS

*****CBRI, Building materials and components, India, 1990

*Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES

*****Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.

*Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E13	**Subject Name** **STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Structural Analysis I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To develop systematically from basic principles of structural dynamics the characteristic of dynamic behaviour of the structure, namely, response spectrum;
To expose important aspects of various theories of cause of earthquake and measurement of its effects on the structure as loads

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course, student will be able to

CO1	Identify, formulate and solve free and forced vibrations response of structural systems
CO2	The knowledge to analyse structures subjected to dynamic loading
CO3	The knowledge to design the structures for seismic loading as per code provisions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		M				M
CO2	H	H	H	H		H		M				M
CO3	H	H	H	H		H		M				M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

DEPARTMENT OF CIVIL ENGINEERING

BCE17E13 STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING

UNIT I : SINGLE DEGREE OF FREEDOM SYSTEMS 9 hrs

Formulation of equation of motion-free and forced vibrations-response to dynamic Loading-effect of damping

UNIT II : MODAL ANALYSIS 9 hrs

Free and forced vibration of un-damped and damped MDOF systems- equation of Motions- evaluation of natural frequencies and modes

UNIT III : INTRODUCTION TO EARTH QUAKE ENGINEERING 9 hrs

Elements of engineering seismology- characteristics of earth quake engineering- earth quake history- Indian seismicity.

UNIT IV : BEHAVIOUR OF STRUCTURES AND SOIL 9 hrs

Performance of structures under past earth quakes- lessons learnt from past earth Quakes- behavior of soil under earth quake loading- soil liquefaction- soil structure Interaction effects.

UNIT V : EARTH QUAKE RESISTANT DESIGN 9 hrs

Concept of Earth quake resistant design- provisions of seismic code IS-1893 (part I)- 2002- response spectrum- design spectrum- seismic coefficient- design of buildings.

Total No of Hours: 45

TEXT BOOKS

1. Clough R. W, and Penzien J, Dynamics of structures, Second Edition, Mc Graw- Hill International edition,New Delhi, 1993
2. Mario Paz, structural dynamics- theory and computations, Third Editions CBS Publishers,New Delhi, 1990.

REFERENCES

1. Minoru Wakabayashi, Design of earth quake resistant buildings,Mc Graw- Hill book company, New York 1986
2. Anil K Chopra, Dynamics Of Structures- Theory and applications to Earth quake engineering, Prentice hall inc, 2001

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E14	Subject Name **BRIDGE STRUCTURES**	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Design of concrete structures I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course, students will be able to

CO1	understand the basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
CO2	identify the sizing of bridge elements ie., develop a clear understanding of conceptual design
CO3	understand the load flow mechanism and identify loads on bridges and carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H		H			M	M
CO2	H	H	H	H		H		H			M	M
CO3	H	H	H	H		H		H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

DEPARTMENT OF CIVIL ENGINEERING

BCE17E14 BRIDGE STRUCTURES

UNIT I: INTRODUCTION 9Hrs

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders.

UNIT II: STEEL BRIDGES 9Hrs

Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

UNIT III: REINFORCED CONCRETE SLAB BRIDGES 9Hrs

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading.

UNIT IV: REINFORCED CONCRETE GIRDER BRIDGES 9Hrs

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT V: PRESTRESSED CONCRETE BRIDGES 9Hrs

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters -Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder –Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.

Total No. of Hours: 45

TEXT BOOKS

* Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
* Ponnuswamy S., " Bridge Engineering ", Tata McGraw Hill, New Delhi, 1996.

REFERENCES

* Phatak D.R., " Bridge Engineering ", Satya Prakashan, New Delhi, 1990.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E15	**Subject Name** **STORAGE STRUCTURES**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Design of steel structures Design of concrete structures I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :
To introduce the student to basic theory and concepts of design of storage structures like steel and concrete tanks, bunkers and silos.

COURSE OUTCOMES (COs) : (3- 5)
At the end of the course the student shall be able to

CO1	design concrete storage structures
CO2	design steel material storage structures
CO3	Design prestressed water tanks

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H	M	H	M			M
CO2	H	H	H	H		H	M	H	M			M
CO3	H	H	H	H		H	M	H	M			M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval	

BCE17E15 STORAGE STRUCTURES

UNIT I: STEEL WATER TANKS 15Hrs

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays – Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNITII: CONCRETE WATER TANKS 15Hrs

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT III: STEEL BUNKERS AND SILOS 5Hrs

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV: CONCRETE BUNKERS AND SILOS 5Hrs

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

UNIT V: PRESTRESSED CONCRETE WATER TANKS 5Hrs

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

Total No. of Hours: 45

TEXT BOOKS

*****Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.

*Krishna Raju N Advanced Reinforced Concrete Design, CBS Publishers, New Delhi, 1998.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E16	**Subject Name** **TALL BUILDINGS**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Structural analysis I & II	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To introduce various aspects of planning of Tall Buildings ; To know about different types of loads ; To introduce various structural systems for medium rise buildings with their behaviour and analysis; To introduce various structural systems for high rise buildings with their behaviour and analysis; To impart knowledge about stability analysis of various systems and to know about advanced topics.

COURSE OUTCOMES (COs) : (3- 5)

CO1	At the end of this course the student should have an understanding on the behaviour of tall buildings subjected to lateral building.
CO2	The students should have knowledge about the rudimentary principles of designing tall buildings as per the existing codes.
CO3	implement design philosophies for the development of high rise structures

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H		H	H	H	M		M	M
CO2	H	H	H	H		H	H	H	M		M	M
CO3	H	H	H	H		H	H	H	M		M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E16 TALL BUILDINGS

UNIT I: INTRODUCTION 9Hrs

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

UNIT II: THE VERTICAL STRUCTURE PLANE 9Hrs

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

UNIT III: Common high-rise building structures and their Behaviour under load 9Hrs

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT IV: APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDING 9Hrs

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading – Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UNIT V: OTHER HIGH-RISE BUILDING STRUCTURE 9Hrs

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

Total No. of Hours :45

TEXT BOOKS

*Wolfgang Schueller " High-Rise Building Structures", John Wiley&Sons.

*Bryan Stafford Smith And Alex Coull, " Tall Building Structures ", Analysis And Design, John Wiley And Sons, Inc., 1991.

REFERENCES

*Coull, A. and Smith, Stafford, B. " Tall Buildings ", Pergamon Press, London, 1997.

*LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.

*Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E17	**Subject Name HYDROLOGY**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Applied Hydraulics	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To get exposure in the field of hydrology; To know the basic concepts in hydrology. To study the features of precipitation, evaporation and infiltration; To learn basics, estimation, and modeling of runoff;. To understand estimation, forecasting and control of flood; To familiarize computer applications in hydrology

COURSE OUTCOMES (COs) : (3- 5)

CO1	The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation
CO2	The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing
CO3	The students will know the basics of groundwater and hydraulics of subsurface flows

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H		H			M	M
CO2	H	H		H	H	H		H			M	M
CO3	H	H		H	H	H		H			M	M

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Approval												

BCE17E17 HYDROLOGY

UNIT I: INTRODUCTION 9Hrs

Definition & Scope- Practical applications-Hydrological cycle – Transitory systems- formation, Types and forms of precipitation – Winds and their movement–Climate & weather season in India-Catchment area

UNITII: PRECIPITATION 9Hrs

Measurement of Precipitation-Recording & Non- Recording Rain Gauges-Intensity duration Analysis-Intensity frequency duration Analysis- Average depth of precipitation over an areas-Depth area duration analysis-Rain gauge network.

UNITIII EVAPORATION & INFILTRATION 9Hrs

Introduction- Evaporation process- Factors affecting Evaporation- Evaporation Eestimation-Evaporation measurement- Evapotranspiration- Factors affecting infiltration-measurement of infiltration- Infiltration Equations

UNITIV: STREAM FLOW MEASUREMENT & HYDROGRAPH ANALYSIS 9Hrs

Introduction-Measurement of stage-discharge measument –area velocity method (Current meter method)-moving boat method- Stage discharge relationships – Flow measurements – Features of hydrograph- base flow-Hydrograph seperation

UNIT V: GROUND WATER HYDROLOGY 9Hrs

Occurrence of ground water – Types of aquifer – Dupuit's assumptions – Darcy's law – Estimation of aquifer parameters – Pump tests.

Total No. of Hours : 45

REFERENCES

* Jeya Rami Reddy.P,Hydrology, Laxmi Publications, New Delhi, 2004.

*Subramanya K.,Hydrology,Tata McGraw Hill Co., New Delhi, 1994

*Patra.K.C, Hydrology and Water Resources Engineering, Narosa Publications, 2008, 2 nd Edition, New Delhi.

* Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology,McGraw Hill Publications, New York, 1995

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17E18	**Subject Name** **MUNICIPAL SOLID WASTE MANAGEMENT**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Environmental Engineering	TY	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The student is expected to know about the various effects and legislations for the municipal solid waste.

To understand the various sources, characterization, processing and the disposal methods of municipal solid wastes.

COURSE OUTCOMES (COs) : (3- 5)

After completion of the course, student will be able to:

CO1	understand the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
CO2	ability to plan waste minimisation and design storage, collection, transport, processing and disposal of municipal solid waste
CO3	identify and design waste containment systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			H	H	H	H	H	M		M	H
CO2	H			H	H	H	H	H	M		M	H
CO3	H			H	H	H	H	H	M		M	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17E18 MUNICIPAL SOLID WASTE MANAGEMENT

UNIT I: SOURCES AND TYPES 9Hrs

Sources and types of solid wastes in a Municipality; Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

UNIT II: ON-SITE STORAGE & PROCESSING 9Hrs

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

UNIT III: COLLECTION AND TRANSFER 9Hrs

Methods of Collection – types of vehicles – Manpower – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT IV: OFF-SITE PROCESSING 9Hrs

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, options under Indian conditions.

UNIT V: DISPOSAL 9Hrs

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills.

Total No. of Hours : 45

TEXT BOOKS

*George Techobanoglous et.al., Integrated Solid Waste Management, McGraw Hill Publishers, 1993.

*B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, Waste Management, Springer, 1994.

REFERENCES

*Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 200

*R.E.Landreth and P.A.Rebers, Municipal Solid Wastes – problems and Solutions, Lewis Publishers, 1997

*Bhide A.D. and Sundaresan, B.B., Solid Waste Management in Developing Countries; INSDOC, 1993.

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17SE1	**Subject Name** **REPAIR AND REHABILITATION OF STRUCTURES**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Concrete and Construction Technology	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

1. To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration.

2. To make the students to gain the knowledge on assessment of distressed structures, repairing of structures and demolition procedures.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	suggest maintenance and repair strategies
CO2	assess the durability of concrete due to various climatic conditions
CO3	suggest the suitable materials for repair, rehabilitation and retrofitting techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H			H	H
CO2	H	H	H	H	H	H	H	H			H	H
CO3	H	H	H	H	H	H	H	H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

DEPARTMENT OF CIVIL ENGINEERING

BCE17SE1 REPAIR AND REHABILITATION OF STRUCTURES

UNIT I MAINTENANCE AND REPAIR STRATEGIES **9** hrs

Maintenance- Repair and Rehabilitation. Facts of Maintenance - Importance of Maintenance- Various aspects of Inspection- Assessment procedure for evaluating a damaged structure, Causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE **9** hrs

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES **9** hrs

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength and High-performance concrete, Vacuum concrete, Self-compacting concrete, Whisper concrete Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS **9** hrs

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, Cathodic protection.

UNIT V RETROFITTING AND DEMOLITION TECHNIQUES **9** hrs

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – Engineered demolition methods - Case studies.

Total No of Hours: 45

TEXTBOOKS:

* Shetty M.S., "Concrete Technology - Theory and Practice", S. Chand and Company, 2008.

* Gambhir. M.L., "Concrete Technology", McGraw Hill, 2013

* Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.

REFERENCES:

* Ravi Shankar. K. Krishnamoorthy. T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

* Dov Kominetzky. M.S., "Design and Construction Failures”, Galgotia Publications Pvt. Ltd., 2001

* CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

* Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17SE2	**Subject Name** **INTELLIGENT BUILDINGS**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: NONE	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

1. To enable students to establish a broad knowledge on the concepts of intelligent buildings.
2. To enable students to understand that intelligence of a building can be achieved by integration and optimization of building structure, services systems, information technology, management and valued-added services.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Student will possess sound knowledge on interdisciplinary concepts
CO2	Student understand the requirements for intelligent buildings characteristics
CO3	Student will learn the modern security system in buildings

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H					M	
CO2	H	H	H	H	H	H					M	
CO3	H	H	H	H	H	H					M	

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Sthrength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17SE2 INTELLIGENT BUILDINGS

UNIT I : Intelligent building characteristics: 9 Hrs

Features and benefits of intelligent buildings. The anatomy of intelligent buildings. Environmental aspect. The marketplace and other driving forces behind the emergence of intelligent buildings.

UNIT II : Building automation systems & controls: 9 Hrs

Philosophy, system configuration, system modules, distributed systems, communication protocol and on-line measurements. Fire protection, security and energy management. Control objectives. Sensors, controllers and actuators. Control system schematics system design. Microprocessor based controllers & digital controls. Examples of sub-systems such as: Digital Addressable Lighting Interface (DALI)

UNIT III : Modern intelligent vertical transportation systems: 9 Hrs

Sky lobby, double-deck lifts, twin lifts, advanced call registration systems, large scale monitoring systems, applications of artificial intelligence in supervisory control, energy saving measures related to lift systems/escalator systems, other modern vertical transportation systems, such as: gondola systems, materials handling systems, etc.

UNIT IV : Communication and security systems: 9 Hrs

Voice communication systems, local area network, wireless LAN, Digital TV, CCTV, digital CCTV, teleconferencing, cellular phone system, and CABD. SMATV. Data networking. Short- and long-haul networks. Wideband network. Office automations. Public address/sound reinforcement systems. Digital public address system. Modern security systems

UNIT V : Integrating the technologies and systems: 9 Hrs

The impact of information technology on buildings and people. Shared tenant services. Interaction and integration between building structure, systems, services, management, control and information technology. Application & design software packages.

Total No of Hours: 45

REFERENCES

*Clements-Croome, Derek, Intelligent Buildings: An introduction, Routledge, 2014

*Shengwei Wang, Intelligent Buildings and Building Automation, Spon Press, 2010

*Jim Sinopoli, Smart Building Systems for Architectures, Owners and Builders, Elsevier, 2010 4. P. Manolescue, Integrating Security into Intelligent Buildings, Cheltenharn, 2003

*Dobbelsteen, Smart Building in a Changing Climate, Techne Press, 2009

*Oliviero, Cabling [electronic resource]: The Complete Guide to Copper and Fiberooptic Networking, John Wiley & Sons, 2014

*W.T. Grondzik, & A.G. Kwok, Mechanical and Electrical Equipment for Buildings, Wiley, 2015

DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17SE3	Subject Name FINITE ELEMENT ANALYSIS	TY / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Structural analysis I & II	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

The objective is to equip students with fundamentals of finite element principles so as to enable them to understand the behaviour of various finite elements and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and thermal engineering applications.

COURSE OUTCOMES (COs) : (3- 5)

After successful completion of this course, the students should be able to

CO1	Students will be in a position to develop computer codes for any physical problems using FE techniques
CO2	apply the concept of the differential equilibrium equations and their relationship in the analysis of structures
CO3	apply numerical methods to FEM for structural analysis

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H							H	H
CO2	H	H	H	H							H	H
CO3	H	H	H	H							H	H
COs / PSOs	PSO1		PSO2									
CO1	H		H									
CO2	H		H									
CO3	H		H									

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							
Approval												

BCE17SE3 FINITE ELEMENT ANALYSIS

UNIT I: INTRODUCTION – VARIATIONAL FORMULATION 8Hrs

General filed problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

UNIT II: FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS 8Hrs

One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

UNIT III: FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS 9Hrs

Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices –boundary conditions – solution techniques.

UNIT IV: ISOARAMETRIC ELEMENTS AND FORMULATION 10Hrs

Natural coordinates inn 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT V: APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION 10 hrs

Equations of elasticity – plane elasticity problems – axis symmetric problems in elasticity Bending of elastic plates –Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow.

Total No. of Hours : 45

TEXT BOOKS

*J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill Book Co., Intl. Edition, 1985.

REFERENCES

*Rienkiewics, “The finite element method, Basic formulation and linear problems”, Vol.1, 4/e, McGraw-Hill,Book Co.

*S.S.Rao, “The Finite Element Method in Engineering”, Pergaman Press, 1989.

*C.S.Desai and J.F.Abel, “Introduction to the Finite Element Method”, Affiliated East West Press 1972

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DEPARTMENT OF CIVIL ENGINEERING

Subject Code: BCE17SE4	**Subject Name** **ENVIRONMENTAL IMPACT ASSESSMENT**	**TY / L/ ETL**	**L**	**T / S.Lr**	**P/ R**	**C**
	Prerequisite: Environmental Engineering	TY	1	0/1	1/1	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE

To know the objectives, capability, and limitations of environmental impact assessment.

To learn methodologies and legal aspects of environmental impact assessment;

COURSE OUTCOMES (COs) : (3- 5)

CO1	carry out scoping and screening of developmental projects for environmental and social assessments
CO2	explain different methodologies for environmental impact prediction and assessment
CO3	plan environmental impact assessments and environmental management plans

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		H	H	H	H	H			H	H
CO2	H	H		H	H	H	H	H			H	H
CO3	H	H		H	H	H	H	H			H	H

COs / PSOs	PSO1	PSO2
CO1	H	H
CO2	H	H
CO3	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					√							

Approval	

BCE17SE4 ENVIRONMENTAL IMPACT ASSESSMENT

UNIT I: INTRODUCTION 9Hrs

Impact of development on environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – Historical development – EIA capability and limitations – Legal provisions on EIA.

UNIT II: METHODOLOGIES 9Hrs

Methods of EIA – Strengths, weaknesses and applicability – Appropriate methodology – Case studies.

UNIT III: PREDICTION AND ASSESSMENT 9Hrs

Socio Economic Impact – Assessment of Impact on land, water and air, energy impact; Impact on flora and fauna; Mathematical models; public participation – Reports – Exchange of Information – Post Audit – Rapid EIA.

UNIT IV: MATHEMATICAL MODELS FOR ASSESSMENT 9Hrs

Use the mathematical models in EIA – Water quality, air quality and noise; assumptions and limitations.

UNIT V: ENVIRONMENTAL MANAGEMENT PLAN 9Hrs

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna, addressing the issues related to the project affected people.

Total No. of Hours: 45

TEXT BOOKS

*Canter, R.L. Environmental Impact Assessment, McGraw Hill Inc., New Delhi, 1996.

*S.K.Shukla and P.R.Srivastava, Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, 1992.

REFERENCES

* John G.Rau and David C Hooten (Ed)., Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1990.

* Environmental Assessment Source book, Vol. I, II & III. The World Bank, Washington, D.C., 1991.

* Judith Petts, Hand book of Environmental Impact Assessment Vol. I & II, Blackwell Science, 1999.