GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

School of Civil Engineering

Course: B. Tech Civil Engineering

Scheme: 2017 – 2021

Date of BoS: 12.11.2017

Curriculum

Semester 1									
Sl. No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**CAT I/II**	**ETE**
1	BTCE1001	Introduction to Civil Engineering	0	0	2	1	50	-	50
2	BCSE1002	Computer Programming and Problem Solving	0	0	4	2	50	-	50
3	PSSO1001	Psychology and Sociology	2	0	0	2	20	50	100
4	MATH1001	Multivariable Calculus	3	0	0	3	20	50	100
5	MATH1002	Exploration with CAS- I	0	0	2	1	50	-	50
6	PHYS1001	Engineering Physics	3	0	0	3	20	50	100
7	PHYS1002	Engineering Physics Lab	0	0	2	1	50	-	50
8	CHEM1001	Engineering Chemistry	3	0	0	3	20	50	100
9	CHEM1003	Engineering Chemistry Lab	0	0	2	1	50	-	50
10	BTME1002	Product Design using Graphics	0	0	4	2	50	-	50
11	SLBT-1001	Basic English (Soft Skill-1)	0	0	4	2	50	-	50
12	JAPA1001/FREN1001/GERN1001	Japanese-I/French-I/German-I	0	0	2	1	50	-	50
		Total	**11**	**0**	**22**	**22**			

Semester II									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**CAT I/II**	**ETE**
1	BEEE1002	Basic Electrical and Electronics Engineering	3	0	0	3	20	50	100
2	BCSE1003	Application Oriented Programming using Python	0	0	4	2	50	-	50
3	UHVE1001	Universal Human Values and Ethics	0	0	4	2	50	-	50
4	MATH1003	Matrices and Differential Equations	3	0	0	3	20	50	100
5	MATH1004	Exploration with CAS- II	0	0	2	1	50		50
6	PHYS1003	Physics of Materials	3	0	0	3	20	50	100
7	PHYS1005	Advanced Physics Lab	0	0	2	1	50		50
8	ENVS1001	Environmental Science	3	0	0	3	20	50	100

9	BEEE1003	Basic Electrical and Electronics Engineering Lab	0	0	2	1	50		50
10	BTME1003	Product Manufacturing	0	0	2	1	50		50
11	SLBT1002	English Proficiency and Aptitude Building-1 (Soft Skill-2)	0	0	4	2	50		50
12	JAPA1002/FREN1002/GERN1002	Japanese-II/French-II/German-II	0	0	2	1	50		50
		Total	**12**	**0**	**22**	**22**			

Semester III

Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**CAT I/II**	**ETE**
1	MATH2001	Functions of Complex Variables and Transforms	3	0	0	3	20	50	100
2	BTME2001	Engineering Mechanics	3	0	0	3	20	50	100
3	BTCE2001	Fluid Mechanics	3	0	0	3	20	50	100
4	BTCE2002	Surveying	3	0	0	3	20	50	100
5	BTCE2003	Construction Engineering	3	0	0	3	20	50	100
6	BTCE2004	Fluid Mechanics Lab	0	0	2	1	50	-	50
7	BTCE2005	Surveying Practices	0	0	2	1	50	-	50
8	BTCE2006	Construction Engineering Lab	0	0	2	1	50	-	50
9	BTCE2007	PBL-1	0	0	2	1	50	-	50
10	SLBT2001	English Proficiency and Aptitude Building - 2 (Soft Skill - 3)	0	0	4	2	50	-	50
		Total	**15**	**0**	**12**	**21**			

Semester IV

Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**CAT I/II**	**ETE**
1	MATH2003	Probability and Statistics	3	0	0	3	20	50	100
2	BTME2002	Engineering Thermodynamics	3	0	0	3	20	50	100
3	BTCE3003	Geotechnical Engineering	3	0	0	3	20	50	100
4	BTCE2008	Mechanics of Materials	3	0	0	3	20	50	100
5	BTCE2009	Hydrology & Hydraulic Systems	3	0	0	3	20	50	100
6	BTCE2010	Water Supply & Treatment Systems	3	0	0	3	20	50	100

7	BTCE2011	Mechanics of Materials Lab	0	0	2	1	50	-	50
8	BTCE2012	Water Quality Analysis Lab	0	0	2	1	50	-	50
9	BTCE2013	PBL-2	0	0	2	1	50	-	50
10	SLBT2022	English Proficiency and Aptitude Building - 3 (Soft Skill - 4)	0	0	4	2	50	-	50
11	BTCE3006	Geotechnical Engineering Lab	0	0	2	1	50	-	50
		Total	**18**	**0**	**12**	**24**			

Semester V

Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	MATH3010	Numerical Methods	2	0	0	2	20	50	100
2	BTCE3001	Structural Analysis	3	0	0	3	20	50	100
3	BTCE3002	Design of Reinforced Concrete Structures	3	0	0	3	20	50	100
4	BTCE3010	Transportation Engineering	3	0	0	3	20	50	100
5	BTCE3004	Waste Water Treatment & Disposal Systems	3	0	0	3	20	50	100
6	MATH252	Numerical Methods Lab	0	0	2	1	50		50
7	BTCE3005	Structural Analysis Lab	0	0	2	1	50		50
8	BTCE3007	PBL-3	0	0	2	1	50		50
9	SLBT3001	English Proficiency and Aptitude Building - 4 (Soft Skill-5)	0	0	4	2	50		50
10	BTCE3008	CAD Lab - I (AUTOCAD) (Skill Course- 1)	0	0	4	2	50		50
11	BTCE3011	Transportation Engineering Lab	0	0	2	1	50		50
		Total	**14**	**0**	**16**	**22**			

Semester VI

Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BTMG3002	Organisational Behaviour	3	0	0	3	20	50	100
2	BTCE3009	Design of Steel Structures	3	0	0	3	20	50	100
3	SLBT3002	Campus to Corporate (Soft Skill - 6)	0	0	4	2	50	-	50
4	BTCE3040	PBL-4 (PRIMA VEERA)	0	0	2	1	50	-	50
5	BTCE3013	CAD Lab - II (STAAD PRO) (Skill Course-1)	0	0	4	2	50	-	50
6	BTCE3014	Advanced Structural Analysis	3	0	0	3	20	50	100

7	BTCE3016	Program Elective (from basket) - 1 (Quantity Surveying & Estimating)	3	0	0	3	20	50	100
8	BTCE3026	Program Elective (from basket) - 2 (Pollution Controlling & Monitoring)	3	0	0	3	20	50	100
9	BTCE9002	Disruptive Technologies	3	0	0	0	0		0
		Total	**18**	**0**	**10**	**20**			

Semester VII

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	UC23	Management Course (From Basket)	3	0	0	3	20	50	100
2	UE3	Humanities Course (from basket)	3	0	0	3	20	50	100
3		Program Elective (from basket) - 3	3	0	0	3	20	50	100
4		Program Elective (from basket) - 4	3	0	0	3	20	50	100
5		Program Elective (from basket) - 5	3	0	0	3	20	50	100
6	BTCE4001	Internship	0	0	0	1	50	-	50
7	BTCE9998	Project Work -1	0	0	6	3	50	-	50
		Total	**15**	**0**	**6**	**19**			

Semester VIII

Sl No	Course Code	Name of the Course					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BTCE9999	Project Work -2	0	0	18	9	50	-	50
2	UC4	Comprehensive Examination	0	0	0	0	0	-	0
3	UC28	Professional Ethics and Values	0	0	0	0	0	-	0
		Total	**0**	**0**	**18**	**9**			

List of Electives

Sl No	Course Code	Name of the Electives					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	BTCE3015	Advanced Concrete Design	3	0	0	3	20	50	100
2	BTCE3016	Quantity Surveying & Estimating	3	0	0	3	20	50	100
3	BTCE3017	Bridge Engineering	3	0	0	3	20	50	100
4	BTCE3018	Applications of Matrix Methods in Structural Analysis	3	0	0	3	20	50	100
5	BTCE3019	Expansive Soil and Ground Improvement Techniques	3	0	0	3	20	50	100

6	BTCE3020	Advanced Geotechnical Engineering	3	0	0	3	20	50	100
7	BTCE3021	Highway Pavement Design	3	0	0	3	20	50	100
8	BTCE3022	Traffic Engineering	3	0	0	3	20	50	100
9	BTCE3023	Advanced Transportation Engineering	3	0	0	3	20	50	100
10	BTCE3024	Ground Water Engineering	3	0	0	3	20	50	100
11	BTCE3025	Advanced Hydrology	3	0	0	3	20	50	100
12	BTCE3026	Pollution Control and Monitoring	3	0	0	3	20	50	100
13	BTCE3027	Industrial Waste Treatment and Disposal	3	0	0	3	20	50	100
14	BTCE3028	Air and Noise Pollution	3	0	0	3	20	50	100

Minor in Program

1	BTCE2002	Surveying	3	0	0	3	20	50	100
2	BTCE2003	Construction Engineering	3	0	0	3	20	50	100
3	BTCE2008	Mechanics of Materials	3	0	0	3	20	50	100
4	BTCE2010	Water Supply & Treatment System	3	0	0	3	20	50	100
5	BTCE3010	Transportation Engineering	3	0	0	3	20	50	100

Honours in Program

1	BTCE4002	Pre Stressed Concrete Structures	3	0	0	3	20	50	100
2	BTCE4003	Dynamics of Structures and Earthquake Engineering	3	0	0	3	20	50	100
3	BTCE4004	Natural Disaster Mitigation and Management	3	0	0	3	20	50	100
4	BTCE4005	Water Resources Systems Engineering	3	0	0	3	20	50	100
5	BTCE4006	Transport Planning and Management	3	0	0	3	20	50	100

Detailed Syllabus

Name of The Course	Fluid Mechanics			
Course Code	BTCE2001			
Prerequisite	MATH1003			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objective:

1. Introducing concepts, laws, observations, models of fluids at rest and in motion and understanding fluid behavior for engineering design and control of fluid system.
2. To enable the students to understand mass, energy and momentum balances for determining resultant interactions of flows and engineered and natural systems.

Course Outcomes:

On completion of this course, the students will be able to

CO1	To find frictional losses in a pipe when there is a flow between two places.
CO2	Calculation of conjugate depth in a flow and to analyse the model and prototype.
CO3	Find the dependent and independent parameters for a model of fluid flow.
CO4	Explain the various methods available for the boundary layer separation.
CO5	

Text Books

1. R. K. Bansal (2010), A Textbook of Fluid Mechanics and Hydraulic Machines 9th Ed. Laxmi Publication, ISBN-9788131808153.

Reference Books

1. P. N. Modi and S. M. Seth (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications. ISBN- 9788189401269.
2. V.L. Streeter, (2001), Fluid Mechanics, McGraw Hill Book Co. ISBN – 9780071156004.

Course Content:

Unit I: Fluid Properties and Hydrostatics **9 Hours** Aspects of Communication; Sounds of syllables; Past tense and plural endings; Organizational techniques in Technical Writing; Paragraph Writing, Note taking, Techniques of presentation
Unit II: Fluid Dynamics **10 Hours** Control volume – Fluid Kinematics - Types of flows; Steady flow, Unsteady flow, Uniform and Non Uniform flow, Rotational flow, Irrotational flow, 1-D, 2-D, 3-D flows– Streamline and Velocity potential lines- Euler and Bernoulli's equations and their applications – moment of momentum – Momentum and Energy correction factors – Impulse – Momentum equation-Navier-Stokes Equations-Applications
Unit III: Open Channel Flow **10 Hours** Flow through pipes – Open Channels and Measurement pipe flow: Darcy's law – Minor losses – Multi reservoir problems – pipe network design – Moody's diagram – Hagen Poiseuille equation – Turbulent flow. Specific Energy – Critical flow concept – specific force – Hydraulic jump – uniform flow and gradually varying flow concepts. – Measurement of pressure – flow – velocity through pipes and open channels.
Unit IV: Dimensional Analysis **7 Hours** Dimensional homogeneity – Raleigh and Buckingham π theorems – Non-dimensional numbers – Model laws and distorted models-Module quantities-Specific quantities.
Unit V: Boundary layers **9 Hours** Boundary layers – Laminar flow and Turbulent flow – Boundary layer thickness – momentum – Integral equation – Drag and lift-Separation of boundary layer-Methods of separation of boundary layer.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Surveying			
Course Code	BTCE2002			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To teach the students basics of surveying and expose different techniques of surveying.
2. To help the students to learn the field applicability of the different survey methods.
3. To teach students about types of errors encountered in different types of surveying.

Course Outcomes

On completion of this course, the students will be able to

CO1	Learn about basics involved in different types of surveying like tape, compass, leveling, and theodolite (total station).
CO2	Demonstrate skills in performing measurement of distance, angles, leveling, and curve setting.
CO3	Develop skills for estimating distance between given points, area of a given plot and earthwork involved in cuttings and fillings.
CO4	Develop skill to carry out tachometry, geodetic surveying wherever situation demands.
CO5	Develop skills to apply error adjustment to the recorded reading to get an accurate surveying output.

Text Books

1. Punmia B.C. (2005), Surveying, Volume 1, 16th Edition Laxmi Publications. ISBN: 9788170080794
2. Punmia B.C. (2005), Surveying, Volume 2, 15th Edition Laxmi Publications. ISBN: 9788170080800
3. Satheesh Gopi (2010), GPS Principles and Applications, Tata Mc Graw Hill publishing company Ltd. ISBN: 9780070141704

Reference Books

1. Subramaniyan R. (2010), Surveying and Levelling, Oxford University Press. ISBN: 9780195684247.
2. Kanetkar T.P. (2006), Surveying and Levelling, Vol I, Pune. ISBN: 9788185825113.
3. Kanetkar T.P. (2008), Surveying and Levelling, Vol II, Pune. ISBN: 9788185825007

Course Content:

Unit I: Plane Surveying and Theodolite **10 Hours** Introduction to plane surveying, conventional tape measurement, electronic distance measurement – Meridians, Azimuths and bearings – Theodolites – Temporary and permanent adjustment – Horizontal and Vertical angle measurements – Electronic total station.
Unit II: Leveling and Contouring **9 Hours** Differential levelling, Longitudinal & cross section leveling, Refraction & curvature correction, Reciprocal leveling -Tachometry – Stadia tachometry, tangential tachometry & substance tachometry- Contouring.
Unit III: Calculation of Earthwork and GPS **9 Hours** Area, volume calculation of earth work – Introduction to Global positioning system – GPS surveying methods.
Unit IV: Curve Surveying **7 Hours** Definitions, designation of curve, elements of simple curve - Settings of simple circular curve, Compound and reverse curve- Transition curve – Introduction to vertical curves.
Unit V: Geodetic surveying **10 Hours** Introduction to geodetic surveying, Triangulation surveying – Base line measurement & correction, Satellite station. Surveying adjustments – Principle of least square and adjustment of triangulation network.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Construction Engineering				
Course Code	BTCE2003				
Prerequisite	-				
Corequisite	-				
Antirequisite	-				
		L	T	P	C
		3	0	0	3

Course Objectives

1. To teach students different types of modern construction materials and their uses.
2. To make the students to learn different types of cement, mineral and chemical admixtures, aggregates and their engineering properties and uses.

Course Outcomes

On completion of this course, the students will be able to

CO1	Develop ability to choose the modern construction materials appropriate to the climate and functional aspects of the buildings
CO2	Supervise the construction technique to be followed in brick and stone masonry, concreting, flooring, roofing and plastering etc.
CO3	Understand the properties of cement and its laboratory testing methods.
CO4	Determine quality of fine aggregate and course aggregate.
CO5	Learn about the different properties of concrete.

Text Books

1. Shetty, M.S. (2010), Concrete Technology, S. Chand & Company Ltd. ISBN- 9788121900034.
2. IS: 10262-2009, Guidelines for concrete mix design proportioning, BIS, New Delhi.

Reference Books

1. Neville. A.M. (2010) Specification of Properties of Concrete, Standard Publishers Distributors. ISBN-9780273755807
2. Gambhir, M. L. (2012), Concrete Technology, McGraw- Hill. ISBN- 9780070151369.

Course Content:

Unit I: Properties of Construction Materials 9 Hours Physical and Mechanical properties of construction materials – Bricks - Stones - Structural Steel and Aluminum – Roofing Material – Physical descriptions of asbestos sheets, GI sheets, tubes and light weight roofing materials - Timber and its Products – Modern materials – Neoprene - Thermo Cole - Vinyl flooring - decorative panels and laminates - anodized aluminum - architectural glass and ceramics - Ferro cement – PVC - Polymer base materials and FRP.
Unit II: Construction Technology 9 Hours Introduction to Masonry design, Principles of construction– Bonding – Reinforced brick work — Stone masonry – Hollow block masonry - Pointing - Plastering – DPC Floor and Roof Construction: Floors, General Principles – Types of floors – Floor coverings – Types of roofs.
Unit III: Properties of cement 9 Hours ASTM classification of Cement – Properties of Cement - Testing of Cement – Field Testing – Laboratory Testing methods – Setting time of cement – soundness of cement – fineness and compressive strength of cement - Heat of Hydration.
Unit IV: Fine Aggregate and Coarse Aggregate 9 Hours Fine aggregate – Properties and testing methods – Bulking of Sand – sieve analysis – fineness modulus of sand - Cement mortar – properties and uses, Chemical Admixtures- Plasticizer – super plasticizer – air entraining agents etc.
Unit V: Properties of Concrete 9 Hours Concrete – selection of materials for concrete - water cement ratio - Properties of fresh concrete - workability – measurement of workability – Strength of concrete – gain of strength with age – testing of hardened concrete -

Compressive strength - Tensile strength – Flexural strength – modulus of elasticity of concrete – Introduction to Mix Design of concrete.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Fluid Mechanics Lab			
Course Code	BTCE2004			
Prerequisite	BTCE2001			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To enable the students to learn Bernoulli's Theorem.
2. To teach the students V- Notch, Rectangular Notch, Trapezoidal Notch, Venturimeter and Orifice meter.

Course Outcomes

On completion of this course, the students will be able to

CO1	Verify Bernoulli's Theorem.
CO2	Understand the concept of Metacentric Height.
CO3	Understand the functions of V- Notch and Rectangular Notch.
CO4	Explain the uses of Venturimeter and Orificemeter.
CO5	Understand about losses in Pipes.

Text Books

1. R. K. Bansal (2010), A Textbook of Fluid Mechanics and Hydraulic Machines 9th Ed. Laxmi Publication, ISBN-9788131808153.

Reference Books

1. P. N. Modi and S. M. Seth (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications. ISBN- 9788189401269.
2. V.L. Streeter, (2001), Fluid Mechanics, McGraw Hill Book Co. ISBN – 9780071156004.

COURSE CONTENT

List of Experiments:

1. Verification of Bernoulli's Theorem
2. Metacentric Height
3. Calibration of V- Notch
4. Calibration of Rectangular Notch
5. Calibration of Trapezoidal Notch
6. Calibration of Venturimeter
7. Calibration of Orificemeter
8. Losses in Pipes

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	Surveying Practices			
Course Code	BTCE2005			
Prerequisite	BTCE2002			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To teach the students basics of surveying and expose different techniques of surveying.
2. To help the students to learn the field applicability of the different survey methods.
3. To teach students about types of errors encountered in different types of surveying.

Course Outcomes

On completion of this course, the students will be able to

CO1	Learn about basics involved in different types of surveying like tape, compass, leveling, and theodolite (total station).
CO2	Demonstrate skills in performing measurement of distance, angles, leveling, and curve setting.
CO3	Develop skills for estimating distance between given points, area of a given plot and earthwork involved in cuttings and fillings.
CO4	Develop skill to carry out tachometry, geodetic surveying wherever situation demands.
CO5	Develop skills to apply error adjustment to the recorded reading to get an accurate surveying output.

Text Books

1. Punmia B.C. (2005), Surveying, Volume 1, 16th Edition Laxmi Publications. ISBN: 9788170080794
2. Punmia B.C. (2005), Surveying, Volume 2, 15th Edition Laxmi Publications. ISBN: 9788170080800
3. Satheesh Gopi (2010), GPS Principles and Applications, Tata Mc Graw Hill publishing company Ltd. ISBN: 9780070141704

Reference Books

1. Subramaniyan R. (2010), Surveying and Levelling, Oxford University Press. ISBN: 9780195684247.
2. Kanetkar T.P. (2006), Surveying and Levelling, Vol I, Pune. ISBN: 9788185825113.
3. Kanetkar T.P. (2008), Surveying and Levelling, Vol II, Pune. ISBN: 9788185825007

COURSE CONTENT

List of Experiments:

1. Chain Survey- Determination of area by perpendicular offsets
2. Chain Survey- Measurement of distance by chaining & ranging
3. Compass Survey- Plotting & adjustment of closed traverse
4. Theodolite Survey- Measurement of horizontal angles by method of repetition
5. Measurement of Vertical Angles and Determination of Height of an Object
6. Plane Table Survey- Radiation method
7. Levelling- Rise & Fall method
8. Levelling- Height of collimation method
9. Trignometrical Levelling- Single plane method
10. Curve Surveying- Setting out a simple circular curve by Rankine's method
11. Contouring- To determine the contours for a given location
12. GPS Survey- Coordinates & Distance measurement using GPS
13. Total Station- Measurement of Altitude of Given Elevated Points
14. Total Station- Measurement of distance & coordinates of given points
15. Stereoscope- Use of stereoscope for 3D viewing
16. Stereoscope- Determination of height of objects from a stereo pair using the parallax bar

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	Construction Engineering Lab			
Course Code	BTCE2006			
Prerequisite	BTCE2003			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To know the concept and procedure of different type of test conducted on cement, aggregate and concrete.
2. To understand the properties of different building materials and their Civil Engineering Significance.
3. To understand the IS Code provision of testing different types of building materials.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Learn about basics involved in different types of surveying like tape, compass, leveling, and theodolite (total station).
CO2	Demonstrate skills in performing measurement of distance, angles, leveling, and curve setting.
CO3	Develop skills for estimating distance between given points, area of a given plot and earthwork involved in cuttings and fillings.
CO4	Determine specific gravity of coarse and fine aggregate
CO5	Understand non-destructive and destructive methods of testing.

Text Books

1. Rangwala, (2011), *Engineering Materials*, 38th edition, Charotar Publishing House Pvt. Ltd. ISBN: 978-93-80358-26-0.

Reference Books

1. S. K. Duggal, (2008), *Building Materials*, 3rd Edition, New Age International Publishers, ISBN: 978-81-224-2392-1.
2. Sushil Kumar (2010), *Building Construction*, Standard Publishers Distributors, ISBN: 978-81-801-4168-3.
3. M. S. Shetty, (2009), *Concrete Technology: Theory and Practice*, S. Chand Publishers, ISBN: 978-81-219-0003-4.

COURSE CONTENT

List of Experiments:

1. To determine the water content required producing a cement paste of normal consistency and also determining initial and final setting time of a given cement sample.
2. To determine the fineness of cement by Blain air permeability apparatus.
3. To determine the specific gravity of given sample of OPC.
4. To determine the particle size distribution of fine and coarse aggregate by sieve analysis method.
5. Determination of specific gravity of coarse and fine aggregate.
6. To determine the silt content in the given sample of fine aggregate and also determine necessary adjustment for the bulking of fine aggregate and draw curve between water content and bulking.
7. To determine the consistency of the concrete mixes for different W/C ratio by slump test with and without admixture.
8. To determine the workability of concrete mix of given proportion by compaction factor test.
9. To cast concrete cubes and to determine compressive strength of concrete by non-destructive and destructive method of testing.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	**PBL 1**				
Course Code	**BTCE2007**				
Prerequisite	**BTCE2002, BTCE2003**				
Corequisite	-				
Antirequisite	-				
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Objectives

1. To supplement the theoretical knowledge with project based learning.
2. To enable students to have a clear understanding in the courses.
3. To equip students with more technical knowledge and practical exposure.

Course Outcomes

On completion of this course, the students will be able to

CO1	Compare between chain survey, compass survey and theodolite survey.
CO2	Understand GPS survey.
CO3	Survey any area by Total Station.
CO4	Understand high performance concrete and self-compacting concrete.
CO5	Carry out Mix Design for preparing M40 grade of concrete.

Text Books

1. Punmia B.C. (2005), Surveying, Volume 1, 16th Edition Laxmi Publications. ISBN: 9788170080794.
2. Punmia B.C. (2005), Surveying, Volume 2, 15th Edition Laxmi Publications. ISBN: 9788170080800.
3. Rangwala, (2011), *Engineering Materials*, 38th edition, Charotar Publishing House Pvt. Ltd. ISBN: 978-93-80358-26-0.
4. Ashok Kumar Jain, Dr. B.C. Punmia, Arun Kumar Jain (2009), *Building Construction*, Laxmi Publications Pvt. Ltd, ISBN: 978-81-318-0428-5.

Reference Books

1. Kanetkar T.P. (2006), Surveying and Leveling, Vol I, Pune. ISBN: 9788185825113.
2. Kanetkar T.P. (2008), Surveying and Leveling, Vol II, Pune. ISBN: 9788185825007
3. M. L. Gambhir, (2009), *Concrete Technology*, Tata McGraw Hill Education, ISBN: 978-00-701-5136-9.
4. P. C. Varghese, (2009), Engineering Materials, 1st edition, PHI Learning, ISBN: 978-81-203-2848-8.

COURSE CONTENT

Thrust areas of projects with tentative project titles

1. Comparative study of chain survey, compass survey and theodolite survey.
2. Studies on GPS survey.
3. Surveying B – block in GU campus by Total Station.
4. Studies on high performance concrete.
5. Studies on self-compacting concrete.
6. Studies on structural light weight concrete.
7. Mix Design for preparing M40 grade of concrete.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

Name of The Course	Mechanics of Materials			
Course Code	BTCE2008			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to know the concept of stresses and strains.
2. To make the students to understand the concept of shear force and bending moment.
3. To enable the students to calculate deflection in beams and trusses.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand the concepts of stress and strain.
CO2	Analyse shear force and bending moment for different types of beams.
CO3	Calculate deflections in beams and trusses.
CO4	Calculate deflections in beams and trusses.
CO5	Learn about the different properties of concrete.

Text Books

1. Ramamrutham S. and Narayanan R. (2008), Strength of Materials, 3rd Edition, Dhanpat RaiPublications Company, ISBN: 9788187433545.

Reference Books

1. Gere J. M. and Thimoshenko S. P. (2008), Mechanics of Materials, 8th Edition, CBS Publishers & Distributors, ISBN: 9780534417932.
2. Popov E. P. (2009), Engineering Mechanics of Solids, 2nd Edition, Prentice Hall Publisher, ISBN: 9788120321076.
3. Bansal R. K. (2010), Strength of Materials, 4th Edition, Laxmi Publications, ISBN: 9788131808146.

Course Content:

Unit I: Stresses – Strains and Torsion 9 Hours Axial Stress and Strain - Solution of simple problems – Tapered Section - One Dimensional Loading of members of varying cross-section – Stress - Strain Diagram of mild steel - Concepts of Elastic Constants - Principle stresses and strains - Mohr's circle – Introduction to torsion - Torsion of shafts of circular section - torque and twist - shear stress due to torque.
Unit II: Shear Force and Bending Moment 9 Hours Types of beams, supports and loadings - shear force and bending moment diagram - bending stresses and shear stresses in beams.
Unit III: Deflection of Beams 9 Hours Introduction - Theory of bending - deflection of beams by Macaulay's method - moment area method - conjugate beam method – Strain energy method - Castigliano's theorem.
Unit IV: Deflection of Plane Trusses 9 Hours Analysis of statically determinate plane trusses by method of joints - calculation of deflection in statically determinate trusses by Unit load method - Strain energy method - Williot Mohr's diagram.
Unit V: Theory of Columns 9 Hours Theory of Columns - long column and short column - Euler's formula - Rankine's formula - Secant formula - beam column.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	**Hydrology& Hydraulic Systems**				
Course Code	**BTCE2009**				
Prerequisite	**BTCE2001**				
Corequisite	-				
Antirequisite	-				
	L	**T**	**P**	**C**	
	3	**0**	**0**	**3**	

Course Objectives

1. To make the students to understand the concept of weather and hydrology.
2. To enable the students to know the functions of pumps and turbines.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand the concepts of hydrologic design and hydrologic features.
CO2	Define diurnal and monsonic wind systems.
CO3	Know the precipitation potential & analyze precipitation data.
CO4	Understand different types of pumps and their functions.
CO5	Classify different types of turbines.

Text Books

1.Subramanya K. (2008), Engineering Hydrology, Tata McGraw Hill Co., Graw Hill Co. ISBN: 9780074624494.

Reference Books

1. Varshney R.S. (2012), Engineering Hydrology, Nem Chand & Brothers Publishers. ISBN: 8185240688.
2. Das (2009), Hydrology & Soil Conservation Engineering, Prentice-Hall of India. ISBN: 9788120335868.
3. Modi P. N. and Seth S. M. (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications, ISBN-9788189401269.
4. Bansal R. K. (2010), A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publication, ISBN-9788131808153.

Course Content:

Unit I: Introduction **9 Hours** Definition – Development of hydrology – hydrologic design – Hydrologic features – Importance in Engineering – Hydrological budget.
Unit II: Hydro Meteorology **9 Hours** Weather and hydrology – General circulation Temperature humidity – Wind – Diurnal and monsonic wind systems.
Unit III: Precipitation and Abstraction **9 Hours** Formation of precipitation – forms of precipitation – types of precipitation – Rainfall measurement – gauges – recorders – processing precipitation data – check for consistency – supply of missing data – Aerial mean mass curve technique – Intensity duration frequency curves. Process of evaporation, transpiration – Infiltration factors affecting evaporation – Measurement of evaporation and infiltration indices – Horton's equation.
Unit IV: Pumps **9 Hours** Centrifugal pump – velocity triangle – characteristic curves – specific speed – applications – Reciprocating pump – types – Indicator diagram – acceleration and friction – air vessels.
Unit V: Turbines **9 Hours** Classification – Pelton Turbine – Francis Turbine – Kaplan Turbine - velocity triangle – characteristic curves – specific speed.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Water Supply and Treatment Systems			
Course Code	BTCE2010			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To make the students to understand the basic principles and concepts of unit operations and processes involved in water treatment.
2. To enable the students to learn design of unit operations and processes involved in water treatment.

Course Outcomes

On completion of this course, the students will be able to

CO1	Define water demand.
CO2	Understand about treatment of raw water.
CO3	Differentiate between slow sand filters and rapid sand filters.
CO4	Understand disinfection processes in water treatment.
CO5	Explain water supply networks.

Text Books

1. Garg S.K. (2010), Environmental Engineering Vol. I Water Supply Engineering, Khanna Publishers. ISBN: 9788174091208
2. H.S.Peavy, D.R.Rowe & George Tchobanoglous (2005), Environmental Engineering, McGraw-Hill Company, New Delhi. ISBN: 9789380358246

Reference Books

1. Nathanson, Jerry A. (2007), Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control, 5th ed., PHI Learning Private Limited ISBN: 978-81-203-3836-4
2. Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition. ISBN: 9788185594590
3. Metcalf and Eddy (2003), Wastewater Engineering, Treatment and reuse, Tata McGraw-Hill Edition, Fourth edition. ISBN:9780070495395

Course Content:

Unit I: Water sources- classification and Distribution **8 Hours** Water demand, Factors governing water demands and seasonal variations, Effect of population dynamics on water demand, Principles for forecasting of water-demand and its calculations, Self-purification of surface water bodies – Oxygen sag curve, permissible values for drinking water.
Unit II: Water Treatments Units **9 Hours** Physicochemical Principles applied in water treatment, Unit operations, principles and processes for pretreatment and treatment of raw water, pre-chlorination and chlorination, principles and objectives for designing chlorination systems, General design considerations for designing water treatment plants.
Unit III: Unit Operations & Processes **10 Hours** Principles, functions and design of screen, grit chambers, flash mixers, flocculators, sedimentation tanks and sand filters- Slow sand and rapid sand filters, layouts – Flash mixer – Clariflocculator – Slow sand and rapid sand filters.
Unit IV: Disinfection Processes in Water treatment **9 Hours** Principles, Objectives, Unit Operations & Advanced Processes in Water treatment, Disinfection – Aeration – iron and manganese removal, Defluoridation and demineralization – Water softening.

Unit V: Water supply systems	**9 Hours**
Various water supply systems - Water supply networks - Various water storage systems.	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	**Mechanics of Materials Lab**			
Course Code	**BTCE2011**			
Prerequisite	**BTCE2008**			
Corequisite	-			
Antirequisite	-			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives

1. To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Conduct tension and compression tests on the components.
CO2	Determine hardness, impact strength, fatigue strength of the specimens
CO3	Measure strain and load using specific gauges.
CO4	Measure torsion in mild steel.
CO5	Perform compression and tension test on helical springs.

Text Books

1. Gere J. M. and Thimoshenko S. P. (2008), Mechanics of Materials, 8th Edition, CBS Publishers & Distributors, ISBN: 9780534417932.

Reference Books

1. Popov E. P. (2009), Engineering Mechanics of Solids, 2nd Edition, Prentice Hall Publisher, ISBN: 9788120321076.
2. Bansal R. K. (2010), Strength of Materials, 4th Edition, Laxmi Publications, ISBN: 9788131808146.

List of Experiments

1. Tension test on a mild steel rod, thin and twisted bars.
2. Compression test on Bricks, Concrete blocks.
3. Double shear test on Mild steel and Aluminium rods.
4. Impact test on metal specimen (Charpy test and Izod test).
5. Hardness test on metals (Steel, Copper and Aluminium) - Brinnell Hardness Number.
6. Hardness test on metals (Steel, Copper and Aluminium) - Rockwell Hardness Number.
7. Deflection test – Verification of Maxwell theorem.
8. Compression and tension test on helical springs.
9. Fatigue test on Steel.
10. Torsion test on mild steel.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

Name of The Course	Water Quality Analysis Lab			
Course Code	BTCE2012			
Prerequisite	BTCE2010			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To enable the students to understand the basic principles and concepts of unit operations and processes involved in water treatment.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Determine the pH of a given water sample.
CO2	Determine the total solids, suspended solids, dissolved solids and volatile solids in wastewater.
CO3	Determine the turbidity and specific conductivity of the given water samples.
CO4	Determine the Alkalinity of given water sample
CO5	Determine the chloride concentration of a given water sample.

Text Books

1. Garg S.K. (2010), Environmental Engineering Vol. I Water Supply Engineering, Khanna Publishers. ISBN: 9788174091208
2. H.S.Peavy, D.R.Rowe & George Tchobanoglous (2005), Environmental Engineering, McGraw-Hill Company, New Delhi. ISBN: 9789380358246

Reference Books

1. Nathanson, Jerry A. (2007), Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control, 5th ed., PHI Learning Private Limited ISBN: 978-81-203-3836-4
2. Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition. ISBN: 9788185594590
3. Metcalf and Eddy (2003), Wastewater Engineering, Treatment and reuse, Tata McGraw-Hill Edition, Fourth edition. ISBN:9780070495395

List of Experiments:

1. To determine the pH of a given water sample.
2. To determine the total solids, suspended solids, dissolved solids and volatile solids in wastewater.
3. To determine the turbidity and specific conductivity of the given water samples.
4. To determine the Alkalinity of given water sample.
5. To determine total hardness, permanent hardness and temporary hardness for given water sample.
6. To determine the chloride concentration of a given water sample.
7. To determine amount of sulphates in a given sample
8. To determine the dissolved oxygen content in a given water sample.
9. To determine BOD of the given wastewater sample.
10. To determine the COD of given sample.
11. To determine the optimum dosage of coagulant for turbidity removal of a given water sample.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	**PBL-2**				
Course Code	**BTCE2013**				
Prerequisite	**BTCE2008, BTCE2009, BTCE2010**				
Corequisite	-				
Antirequisite	-				
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Objectives

1. To supplement the theoretical knowledge with project based learning.
2. To equip students with more technical knowledge and practical exposure.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Calculate deflection of beams
CO2	Calculate critical load for columns with different boundary conditions.
CO3	Study different types of pumps and turbines.
CO4	Study water treatment unit.
CO5	Study water supply network.

Text Books

1. Gere J. M. and Thimoshenko S. P. (2008), Mechanics of Materials, 8th Edition, CBS Publishers & Distributors, ISBN: 9780534417932.
2. Modi P. N. and Seth S. M. (2011), Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Publications, ISBN-9788189401269.
3. Garg S.K. (2010), Environmental Engineering, Vol. I, Water Supply Engineering, Khanna Publishers. ISBN: 9788174091208

Reference Books

1. Bansal R. K. (2010), Strength of Materials, 4th Edition, Laxmi Publications, ISBN: 9788131808146.
2. Bansal R. K. (2010), A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publication, ISBN-9788131808153.
3. Rangwala (1999), Water supply & Sanitary Engineering, Charotar Publishing House, Anand-16th Edition. ISBN: 9788185594590

List of projects:

1. Calculation of deflection of beams.
2. Calculation critical load for columns with different boundary conditions.
3. Study of different types of pumps.
4. Study of different types of turbines.
5. Study of water treatment unit.
6. Study of water supply network.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

Name of The Course	**Structural Analysis**				
Course Code	**BTCE3001**				
Prerequisite	**BTCE2008**				
Corequisite	-				
Antirequisite	-				
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

Course Objectives

1. To enable the students to understand the concept of static indeterminacy.
2. To make the students to learn different methods for the analysis of statically indeterminate structures.

Course Outcomes

On completion of this course, the students will be able to

CO1	Analyze statically indeterminate beams by three moment theorem.
CO2	Determine the support reactions for statically indeterminate structures by strain energy method.
CO3	Understand influence line diagram for analysing beam.
CO4	Analyse different types of arches.
CO5	Apply approximate methods for analysis of multi-storeyed frames

Text Books

1. Vazirani & Ratwani (2003), Analysis of Structures, Vol. 1 & II, Khanna Publishers, ISBN: 0125249853.

Reference Books

1. S. Ramamrutham (2004), Theory of Structures, 5thEdition, Dhanpat Rai Publications, ISBN: 978041528091
2. C. S. Reddy (2010), Structural Analysis, 3rd Edition, Tata McGraw Hill, ISBN:9780070702769.
3. Kenneth M. Leet, Gilbert A, Uang C. M. (2010), Fundamentals of Structural Analysis, 4th Edition, Tata McGraw Hill,ISBN:9780071289382

Course Content:

Unit I: Theorem of Three Moments **9 Hours** Static indeterminacy - Theorem of three moments - analysis of propped cantilevers - fixed & continuous beam - bending moment and shear force diagram.
Unit II: Strain Energy Method **9 Hours** Static indeterminacy - Strain energy method - analysis of indeterminate structures, beams, pin jointed and rigid jointed structures - temperature effect - bending moment and shear force diagram.
Unit III: Influence Line **9 Hours** Influence line - influence lines for bending moment and shear force for beams, Muller Breaslau's principle - Maxwell's reciprocal theorem - Maxwell Betti's theorem.
Unit IV: Analysis of Arches **9 Hours** Two hinged and three hinged parabolic arches - circular arches - cables - tension forces in towers - influence line for horizontal thrust and bending moment.
Unit V: Approximate Methods for Analysis of Multi-storeyed Frames **9 Hours** Substitute frame method - portal method - cantilever method and Kani's method.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Design of Reinforced Concrete Structures			
Course Code	BTCE3002			
Prerequisite	BTCE2003, BTCE2008			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To make the students to learn design of beams by working stress method.
2. To enable the students to understand the limit state method of design of beams, columns and slabs.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand the behavior of structural members and the concept of design.
CO2	Calculate moment of resistance for different types of RC beam sections.
CO3	Design any RC beam by limit state method.
CO4	Understand the difference between one way slab and two way slab.
CO5	Know the concept of short column and long column.

Text Books

1. Gambhir, M.L., (2011), "Fundamentals of Reinforced Concrete Design", Prentice-Hall of India. ISBN: 9788120330481.
2. S Unnikrishna Pillai & Devdas Menon, (2005), Reinforced Concrete Design, Tata Mcgraw Hill, ISBN: 9780070141100.
3. Varghese, P.C., (2009), Limit State Design of Reinforced Concrete, 2nd ed. ISBN: 9788120320390.

Reference Books

1. Varghese (2005), Advanced Reinforced Concrete Design, Prentice-Hall of India.
2. Gurcharan Singh (2005), Design of R.C.C. Structures in S. I. Units, Standard Publishers Distributors.
3. B. C. Punmia (2003), Design of reinforced concrete structures, Lakshmi Publishers.
4. IS:456 (2000) & SP:16

Course Content:

Unit I: Material Properties and Design Concepts **9 Hours**

Material properties: Compressive strength, tensile strength, design stress-strain curve of concrete - modulus of elasticity - grades of concrete - different types and grades of reinforcing steel - design stress-strain curve of steel.Introduction to design concepts, elastic behaviour of rectangular section, under, balanced and over reinforced section. Deflection and cracking in beams and slabs using IS code provisions. Design of singly reinforced beams by working stress method.

Unit II: Introduction to Limit State Design **9 Hours**

Philosophy and principle of limit state design along with the assumptions, partial safety factors, characteristic load and strength. Introduction to stress block parameters, concept of balanced, under reinforced and over reinforced sections, limit state of collapse in flexure of rectangle and flanged sections with examples. Limit state of collapse in shear and torsional strength of sections with examples.

Unit III: Limit state design of beams **9 Hours**

Design principles and procedures for critical sections for bending moment and shear forces. Flexural and shear design example of singly and doubly reinforced simply supported and cantilever beams using the codal provision. Detailing of longitudinal and shear reinforcement, anchorage of bars, check for development length. Reinforcement requirements, slenderness limits for beams for lateral stability. Flexural and shear design of simply supported T and L beams. Design of rectangular section for torsion.

Unit IV: Limit State Design of Slabs **9 Hours** Introduction to one way and two way slabs, design of one way cantilever, simply supported and continuous slab, design of two way slabs.
Unit V: Limit State Design of Compression Members **9 Hours** General design aspects of compression members. Design of short axially loaded columns with reinforcement detailing. Design of columns with uniaxial bending and biaxial bending using SP- 16 charts, design of long column.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Geotechnical Engineering			
Course Code	BTCE3003			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the fundamental concepts of soil mechanics.
2. To make the students to understand bearing capacity of soil and its importance.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand the theory of compaction.
CO2	Apply Darcy's law.
CO3	Explain Newmark's influence chart
CO4	Understand compressibility and consolidation
CO5	Calculate shear strength of soils.

Text Books

1. K.R.Arora (2011), Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, ISBN: 978-81-801-4112-6.
2. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations, Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.

Reference Books

1.Gopal Ranjan, A.S.R Rao (2000), Basic and Applied Soil Mechanics 2nd Edition, New Age International. ISBN: 978-81-224-1223-9.
2. William Powrie, Soil Mechanics: Concepts and Applications, Second Edition, Spon Press. ISBN: 978-04-153-1156-4.
3. Karl Terzaghi, Soil Mechanics in Engineering Practice, Warren Press. ISBN: 978-14-465-1039-1.
4. Aysen (2004), Problem Solving in Soil Mechanics, Taylor & Francis Group. ISBN: 978-04-153-8392-9.

Course Content:

Unit I: Weight volume relations and Index properties 12 Hours Distribution of soil in India, Soil - Types, 3-phase diagram, Weight-volume relations, Classification, Index properties (Atterberg's limits), Theory of compaction, Importance of geotechnical engineering.
Unit II: Soil water and Permeability 8 Hours Soil water - Effective and neutral stresses – Flow of water through soils – Permeability – Darcy's law –Seepage and flow-nets - Quick sand conditions.
Unit III: Stress distribution in soils 8 Hours Vertical pressure distribution- Boussinesq's equation for point load and uniformly distributed loads of different shapes– Newmark's influence chart – Westergaard's equation – Isobar diagram – Pressure bulb - Contact pressure, Earth Pressures Theories.
Unit IV: Compressibility and Consolidation 8 Hours Compressibility – e-log p curve – Pre-consolidation pressure - Primary consolidation – Terzaghi'sconsolidation theory - Laboratory consolidation test – Determination of C_v by Taylor's and Casagrande's methods.
Unit V: Shear strength of soils 9 Hours Stress analysis by Mohr's circle - Mohr's strength theory – Shear strength of soils – Mohr-Coloumb strength envelope – Laboratory shear tests – Direct shear test – Triaxial compression – Unconfined compression test –

Vane shear test – Shear strength of saturated cohesive soils – Shear strength of cohesion less soils - conditions for liquefaction.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Waste Water Treatment and Disposal Systems			
Course Code	BTCE3004			
Prerequisite	BTCE2010			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To teach students the basic principles and concepts of unit operations and processes involved in wastewater treatment.
2. To develop student's skill in the basic design of unit operations and processes involved in wastewater treatment.
3. To develop a student's skill in evaluating the performance of wastewater treatment plants.

Course Outcomes

On completion of this course, the students will be able to

CO1	Demonstrate an ability to recognize the type of unit operations and processes involved in wastewater treatment plants.
CO2	Demonstrate an ability to choose the appropriate unit operations and processes required for satisfactory treatment of wastewater.
CO3	Demonstrate an ability to design individual unit operation or process appropriate to the situation by applying physical, chemical, biological and engineering principles.
CO4	Demonstrate ability in design of wastewater treatments units in a cost effective and sustainable way and evaluate its performance to meet the desired health and environment related goals.
CO5	Recognize the importance of wastewater treatment to protect the water resources.

Text Books

1. Garg.S.K, (2010), Environmental Engineering-Sewage Disposal and Air Pollution Engineering, 1st Edition, Khanna Publishers, ISBN- 978-81-740-9230-4.
2. Metcalf & Eddy, (2002), Wastewater Engineering Treatment & Reuse, Tata McGraw-Hill Education, ISBN: 978-00-704-9539-5

Reference Books

1. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, (2001), Environmental Engineering, Tata McGraw-Hill Education, ISBN No: 978-00-710-0231-8.
2. Hammer & Hammer Jr., Water and Wastewater Technology, 7th Edition, ISBN-978-81-203-4601-7.
3. Rakesh Kumar, R.N.Singh, (2009), Municipal Water and Wastewater Treatment, Teri Press, ISBN: 978-81-799-3188-2.
4. Dr.P.N.Modi, (2008), Sewage Treatment Disposal and Wastewater Engineering, 2nd Edition, ISBN-978-81-900-8932-4.
5. Shyam. R.Asolekar, Soli. J.Arceivala, Wastewater Treatment for Pollution Control and Reuse, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-00-706-2099-5.

Course Content:

Unit I: Wastewater Treatment **9 Hours** Physical, chemical and biological principles involved in wastewater treatment and designing of unit-operations and processes. Permissible standards for wastewater disposal.
Unit II: Pre and Primary Treatment **10 Hours** Objectives-Unit operations and processes-Principles, functions and design of flash mixers, screens, sedimentation tanks and sand filters-Disinfection-Aeration, grit chambers and primary sedimentation tanks.
Unit III: Secondary Treatment **8 Hours**

Secondary Treatment-Activated Sludge Process and Trickling filters; other treatment methods-Stabilization Ponds and Septic Tanks-Advances in Sewage Treatment.
Unit IV: Sewage Disposal and Sludge Management 9 Hours Methods-Dilution-Self-purification of surface water bodies-Oxygen Sag Curve-Land disposal-Sewage Farming-Deep well injection-Soil dispersion system-Thickening-Sludge digestion-Bio-gas recovery, Drying beds-Conditioning and Dewatering-Sludge disposal. Introduction to solid waste management, landfills and EIA.
Unit V: Waste Disposal System 9 Hours Wastewater Treatment-Typical layouts-Screens-Grit Chamber-Sedimentation tanks-Trickling filter-Activated Sludge, sludge Digester-Septic tanks-Soil Dispersion System-Waste Stabilization pond.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Geotechnical Engineering Lab			
Course Code	BTCE3006			
Prerequisite	BTCE3003			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To enable the students to understand fundamental concepts of soil mechanics.
2. To make the students learn the importance of index properties like grain size, consistency limits, soil classification.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Determine moisture content of soil
CO2	Determine the specific gravity of soil
CO3	Determine the grain size distribution curve for given soil sample
CO4	Determine in-situ density of compacted soils
CO5	Determine coefficient of permeability of given soil sample

Text Books

1. Dr. K. R.Arora (2011), Soil Mechanics and Foundation Engineering, Standard Publishers Distributors, Delhi, ISBN: 978-81-801-4112-6.
2. Arun Kr. Jain, B. C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.

Reference Books

1. Gopal Ranjan, A.S.R Rao (2000), Basic and Applied Soil Mechanics 2nd Edition, New Age International. ISBN: 978-81-224-1223-9.
2. Karl Terzaghi, Soil Mechanics in Engineering Practice, Warren Press. ISBN: 978-14-465-1039-1.

List of Experiments:

1. To determine moisture content of soil.
2. To determine the specific gravity of soil fraction passing 4.75mm I.S sieve by density bottle/Pycnometer bottle.
3. To determine the grain size distribution curve for given soil sample by sieve analysis and hydrometer analysis.
4. To determine the consistency limits (i.e Liquid limit, Plastic limit & Shrinkage limit)of given samples
5. To determine in-situ density of compacted soils by using core cutter & pouring cylinder methods.
6. To determine the relative density of given coarse grained materials
7. To determine the maximum dry density and optimum moisture content for the given soil sample.
8. To determine coefficient of permeability of given soil sample by constant head and variable head method.
9. To determine unconfined compressive strength of a given soil sample
10. To determine shear strength of a given soil specimen using vane shear apparatus
11. To determine shear strength of a given soil specimen using direct shear apparatus
12. To determine the shear parameters of soil by Undrained Triaxial Test

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50	-	50	100

Name of The Course	**PBL-3**				
Course Code	**BTCE3007**				
Prerequisite	**BTCE3001, BTCE3002, BTCE3003, BTCE3004**				
Corequisite	-				
Antirequisite	-				
		L	**T**	**P**	**C**
		0	**0**	**2**	**1**

Course Objectives

1. To supplement the theoretical knowledge with project based learning.
2. To enable students to have a clear understanding in the courses.
3. To equip students with more technical knowledge and practical exposure.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Analyze statically indeterminate structures by strain energy method.
CO2	Design a two storey residential building.
CO3	Design a five storey RCC commercial building.
CO4	Study compressibility and consolidation of soil.
CO5	Study waste water treatment plant.

Text Books

1. Vazirani & Ratwani (2003), Analysis of Structures, Vol. 1 & II, Khanna Publishers, ISBN: 0125249853.
2. Gambhir, M.L., (2011), "Fundamentals of Reinforced Concrete Design", Prentice-Hall of India. ISBN: 9788120330481.
3. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations, Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.
4. Garg.S.K, (2010), Environmental Engineering-Sewage Disposal and Air Pollution Engineering, 1st Edition, Khanna Publishers, ISBN- 978-81-740-9230-4.

Reference Books

1. S. Ramamrutham (2004), Theory of Structures, 5thEdition, Dhanpat Rai Publications, ISBN: 978041528091.
2. S Unnikrishna Pillai & Devdas Menon, (2005), Reinforced Concrete Design, Tata Mcgraw Hill, ISBN: 9780070141100.
3. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations, Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.
4. Metcalf & Eddy, (2002), Wastewater Engineering Treatment & Reuse, Tata McGraw-Hill Education, ISBN: 978-00-704-9539-5

Thrust areas of projects with tentative project titles

1. Analysis of statically indeterminate structures by strain energy method.
2. Design of a two storey residential building.
3. Design of a five storey RCC commercial building.
4. Study of compressibility and consolidation of soil.
5. Study of shear strength of soil.
6. Study of waste water treatment plant.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

Name of The Course	CAD Lab-I (AUTOCAD)			
Course Code	BTCE3008			
Prerequisite	BTCE3002			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To enable the students to understand the regulations as per National Building Code.
2. To make the students to learn the functional requirements and building rules.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Understand AUTOCAD commands and draw lines, circles and different types of polygon.
CO2	Draw plan, elevation and cross-sectional views of one storey residential building.
CO3	Drawing of staircases.
CO4	Draw plan, elevation and cross-sectional views of two storey residential building.
CO5	Draw plan, elevation and cross-sectional views of workshop with trussed roof.

Text Books

1. V. B. Sikka (2012), "Civil Engineering Drawing", S.K.Kataria & Sons, New Delhi. ISBN: 978-93-5014-272-1
2. N. Kumaraswamy (2012), A. Kameswara Rao "Building Planning & Drawing", Charotar Publishing House Pvt. Ltd. ISBN: 9789380358581
3. AUTOCAD Manuals

Reference Books

1. S.C Rangwala (2013), "Civil Engineering Drawing", Charotar Publishing House Pvt. Ltd. ISBN: 978-93-80358-68-0
2. Richard B. Eaton (2005), "Building Construction Drawing", Donhead Publisher. ISBN: 9780821805633.
3. Padmini Murugesan (1997), Civil Engineering Drawing, Prithiba Publishers and Distributors. ISBN: 81-7525-282-0.

List of Experiments:

1. AUTOCAD commands, drawing of lines, circles and different types of polygon.
2. Drawing plan, elevation and cross-sectional views of one storey residential building.
3. Drawing of staircases.
4. Drawing plan, elevation and cross-sectional views of two storey residential building.
5. Drawing plan, elevation and cross-sectional views of five story commercial building.
6. Drawing plan, elevation and cross-sectional views of three story hospital building.
7. Drawing plan, elevation and cross-sectional views of ten story college building.
8. Drawing plan, elevation and cross-sectional views of workshop with trussed roof.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	Design of Steel Structures			
Course Code	BTCE3009			
Prerequisite	BTCE3001			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the concepts of steel design.
2. To make the students to learn different types of roofs.

Course Outcomes

On completion of this course, the students will be able to

CO1	Explain different types of connections in steel structures.
CO2	Design laterally supported and laterally unsupported steel beams.
CO3	Design columns, single and double lacings and battens.
CO4	Understand the concept of plate girders, gantry girders and roof trusses.
CO5	Calculate different types of loadings on roof trusses

Text Book

1. Ramachandra (2004), Design of Steel structures, Vol. I & Vol. II, 4th Edition, Standard Publishers Distributors, ISBN: 9780071544115.

Reference Books

1. Vajrani V. N., Ratwani M. M. and Mehra H. (2012), Design and Analysis of Steel Structures, 18th Edition, Oscar Publications, ISBN: 9788174092953.
2. Syal I. C. (2009), Design of Steel Structures, Standard Publishers Distributors, New Delhi, ISBN: 9788180141270.
3. Ramchandra (2006), Non Linear Analysis of Steel Structures, Standard Publishers Distributors, ISBN:9788180140785.
4. IS: 800-2007 & Steel Table.

Course Content

Unit I: Introduction and Design of Connection **8 Hours** Introduction, Types and properties of structural rolled steel sections, Design of connections – Riveted - Welded - Bolted – Solution of simple problems.
Unit II: Design of beams **8 Hours** Simple and built-up beams – design of laterally supported and unsupported beams - concept of shear.
Unit III: Design of Compression Members and Tension Members **8 Hours** Design of column – built up section – single and double lacing – batten – Column bases – design of tension members.
Unit IV: Plate Girders **8 Hours** Plate girders - design of plate girders - curtailment of flange plates – Concept of stiffeners and splices.
Unit V: Roof Trusses **8 Hours** Types of roof trusses - Calculation of dead load, live load, wind load – Analysis and design of roof truss – Design of purlins.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Transportation Engineering			
Course Code	BTCE3010			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To teach the students about the different transportation systems.
2. To familiarise with various components involved in their respective modes and their basic design concepts.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand different types of transportation modes.
CO2	Explain different highway cross section elements.
CO3	Interpret traffic characteristics and road user & vehicular characteristics.
CO4	Understand materials testing and specification.
CO5	Explain CBR method of design and rigid pavement design.

Text Books

1. Khanna.S.K and Justo. C.E.G., (2011), Highway Engineering, Ninth Edition.

Reference Books

1. Kadiyali.L.R, and Lal.N.B, (2005), Principles andPracticeofHighwayEngineering, Fourth Edition, Khanna Publishers, ISBN- 9788174091659.
2. Chakroborthy Partha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.
3. Rao.G.V, (1996), Principlesof Transportation and Highway Engineering, Tata McGraw-Hill Co, ISBN-9780074623633.
4. Khisty.C.J, and Lall.B.K, (2003), Transportation Engineering, Indian Edition, Prentice-Hall of India, ISBN- 9788120322127.

Course Content

Unit I: Highway and Traffic Planning **8 Hours**

Introduction to Transportation modes – Highway alignment and field surveys – Master Plan – Transport economics – Traffic Studies – Volume, speed, origin and destination studies.
Introduction to Multi-modal Transportation, Automated Transport systems, High urban transport, Impact of transport on environment.

Unit II: Highway Geometrics **14 Hours**

Highway classification (Rural and Urban roads), Road Geometrics – Highway cross section elements – camber – Sight Distance, Horizontal Alignment Design, Super Elevation, Extra widening, Transition curves, Set back distance, Design of Vertical curves.

Unit III: Traffic Engineering **6 Hours**

Traffic characteristics, road user & vehicular characteristics, traffic studies, traffic operations, traffic control devices, intelligent transport systems, Intersections, Interchanges, Parking Layout & Road signs.

Unit IV: Highway Materials and Construction **8 Hours**

Material requirement for pavements – Soil classification for Highway – Soil tests – CBR and Plate Load Test, Aggregate – materials testing and specification, Bitumen – material testing and specification construction of bituminous and rigid pavements, Highway Maintenance – Material recycling.

Unit V: Highway Design **9 Hours**

Pavement Analysis – Factors affecting pavement thickness – Soil – Wheel load – Temperature – environmental factors; Flexible Pavement Design – Axle Load surveys – CBR method of Design, Rigid Pavement Design – IRC method.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Advanced Structural Analysis			
Course Code	BTCE3014			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the behaviour of indeterminate structures.
2. To help the students to know the concepts of elastic analysis and plastic analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand the concept of kinematic indeterminacy.
CO2	Analyze framed structures by moment distribution method.
CO3	Understand the concept of plastic analysis.
CO4	Determine flexibility matrix.
CO5	Analyze beams by stiffness matrix method.

Text Books

1. Ashok K. Jain, (2009), Advanced Structural Analysis with Finite Element & Computer Applications, Nem Chand & Brothers, ISBN 978-81-852-4081-7.
2. Hibbeler, R. C. (2005), Structural Analysis (5th Ed.), Pearson Education India, ISBN-10: 0131470892.
3. S. S. Bhavikatti, (2005), Structural Analysis, 2nd edition, Vikas Publishing House, ISBN: 812-59-171-60.

Reference Books

1. R. L. Jindal (1996), Indeterminate Structures, Tata McGraw Hill Publishing House.
2. Negi L. S. (2002), Theory & Problems in Structural Analysis, Tata McGraw Hill Publishing House.
3. G. S. Pandit & Gupta S. P. (1998), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.

Course Content:

Unit I: Slope deflection method **9 Hours** Kinematic indeterminacy - Slope deflection method - analysis of continuous beams and portals - bending moment and shear force diagram.
Unit II: Moment distribution method **8 Hours** Moment distribution method - analysis of propped cantilever beams and continuous beams - analysis of portals - bending moment diagram and shear force diagram.
Unit III: Plastic Analysis **9 Hours** Plastic moment of resistance - shape factor - collapse load - analysis of continuous beams and portals.
Unit IV: Flexibility matrix **9 Hours** Concept of flexibility matrix - analysis of continuous beams - plane frames and pin jointed plane trusses.
Unit V: Stiffness matrix **9 Hours** Stiffness matrix for beam element - analysis of continuous beams - plane frames & pin jointed plane trusses.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Transportation Engineering Lab			
Course Code	BTCE3011			
Prerequisite	BTCE3010			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To enable the students to know testing of different highway materials as per IS/IRC guidelines.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Understand aggregate crushing value test.
CO2	Explain aggregate impact test.
CO3	Perform Los Angeles abrasion test.
CO4	Understand ductility test of bitumen.
CO5	Explain California Bearing ratio test.

Text Books

1. Khanna.S.K., and Justo. C.E.G., (2011), Highway Engineering, Ninth Edition, Nem.

Reference Books

1. Kadiyali.L.R., and Lal.N.B., (2005), Principles and Practice of Highway Engineering, Fourth Edition, Khanna Publishers, ISBN- 9788174091659.
2. Chakroborthy Partha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.
3. Rao.G.V., (1996), Principles of Transportation and Highway Engineering, Tata McGraw-Hill Co, ISBN-9780074623633.
4. Khisty.C.J., and Lall.B.K., (2003), Transportation Engineering, Indian Edition, Prentice-Hall of India, ISBN-9788120322127.

List of Experiments:

1. Aggregate Crushing Value Test
2. Aggregate Impact Test
3. Los Angeles Abrasion Test
4. Shape Test
5. Penetration Test of Bitumen
6. Ductility Test of Bitumen
7. Softening Point Test of Bitumen
8. Flash and Fire Point Test of Bitumen
9. Viscosity Test of Bitumen
10. Spot Test
11. California Bearing Ratio Test

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	PBL-4			
Course Code	BTCE3012			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	2	1

Course Objectives

1. To develop the capacity of students in correlating theoretical knowledge into practical systems pertaining to civil engineering domain.
2. To foster collaborative learning skills.
3. To develop self-directed inquiry and life-long skills.
4. To enhance the communication skills of the students by providing opportunities to discuss in groups and to present their observations, findings and report both in oral and written format.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Identify, formulate, and solve engineering problems.
CO2	Understand specifications of various items of works and schedule of rates and prepare valuation reports.
CO3	Submit a project report comprising of the application and feasibility of the project.
CO4	Work and communicate efficiently in multidisciplinary teams.
CO5	Develop an understanding of professional and ethical responsibility.

Text Books

1. B.N. Datta (2010), Estimating and costing, USBPD, ISBN 9788174767295.

Reference Books

1. Rangwala (2011), Specifications of Estimating, Costing and Valuation, Charotar Publishing House Pvt. Ltd. ISBN 9789380358543.
2. Vazirani, V. N. (2013), Civil Engineering Estimating Costing & Valuation, Khanna publishers. ISBN 9788174091277.

List of Projects:

1. Determination of volume of excavation of earth.
2. Estimation for concrete and steel in footings.
3. Form work required for footings.
4. Estimation for brick walls and plastering.
5. Form work required for columns including scaffolding and shuttering.
6. Estimation for concrete and steel in columns.
7. Form work required for slabs including scaffolding and shuttering.
8. Estimation for concrete and steel in slabs.
9. Form work required for beams including scaffolding and shuttering.
10. Estimation for concrete and steel in beams.
11. Rate analysis for various items of works.
12. Preparation of bills.
13. Studies of PWD and CPWD practices.
14. Bar bending schedule.
15. Valuation of the building.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks

50		**50**	**100**

Name of The Course	**CAD Lab – II (STAAD PRO)**				
Course Code	**BTCE3013**				
Prerequisite	**BTCE3001, BTCE3002, BTCE3009**				
Corequisite	-				
Antirequisite	-				
	L	**T**	**P**	**C**	
	0	**0**	**2**	**1**	

Course Objectives

1. To teach the students to understand the details of STAAD – PRO software package.
2. To enable the students to know the behaviour of RCC and Steel structures.
3. To enable the students to design different components of structures

Course Outcomes:

On completion of this course, the students will be able to

CO1	Understand the details of STAAD – PRO software package.
CO2	Know the behavior of RCC and Steel structures.
CO3	Know the bending moment diagram drawn in tension face and shear force diagram.
CO4	Design different components of structures.
CO5	Design steel trusses.

Text Book

1. V. N. Vazirani & M. M. Ratwani, (1998), Analysis of Structures, Khanna Publishers
2. STAAD PRO Manuals

Reference Books

1. R. L. Jindal, (1996), Indeterminate Structures, Tata McGraw Hill Publishing House.
2. G. S. Pandit & Gupta S. P., (1998), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.
3. Wang C. K., (1996), Matrix Method of Structural Analysis, Jon Wiley publications.
4. IS:456 (2000), IS:800

5. Ramachandra (2004), Design of Steel structures, Vol. I & Vol. II, 4th Edition, StandardPublishers Distributors, ISBN: 9780071544115.

6. Gambhir, M.L., (2011), "Fundamentals of Reinforced Concrete Design", Prentice-Hall of India. ISBN: 9788120330481.

List of experiments:

1. Analysis and design of simply supported RCC beam.
2. Analysis and design of cantilever RCC beam.
3. Analysis and design of continuous RCC beam.
4. Analysis and design of simply supported Steel beam.
5. Analysis and design of continuous Steel beam.
6. Analysis and design of RCC columns with different end conditions.
7. Analysis and design of Steel columns with different end conditions.
8. Analysis and design of steel trusses.
9. Analysis and design of RCC portal frames.
10. Analysis and design of steel portal frames.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

Name of The Course	**Internship**			
Course Code	**BTCE4001**			
Prerequisite	**-**			
Corequisite	-			
Antirequisite	-			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives

1. To make the students to understand the details of STAAD – PRO software package.
2. To enable the students to know the behaviour of RCC and Steel structures.
3. To enable the students to design different components of structures

Course Outcomes:

On completion of this course, the students will be able to

CO1	Apply engineering knowledge in solving real-life problems.
CO2	Attain new skills and be aware of the state-of-art in engineering disciplines of their own interest.
CO3	Get exposure to real-life-working environment & practices, and to attain the professionalisms.
CO4	Work with multi-tasking professionals and multidisciplinary team.
CO5	Prepare a technical report, to improve presentation and other soft skills.

Course Content

Exposure to real life problems at various reputed industries engaged in areas of Civil Engineering.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

Name of The Course	Project Work - 1			
Course Code	BTCE9998			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	0	0	6	3

Course Objectives

1. To develop the capacity of students in correlating theoretical knowledge into practical systems either to perform creative works or to perform analysis and hence to suggest solutions to problems, pertaining to civil engineering domain.
2. Foster collaborative learning skills.
3. Develop self-directed inquiry and life-long skills.
4. To enhance the communication skills of the students by providing opportunities to discuss in groups and to present their observations, findings and report in formal reviews both in oral and written format.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Submit a project synopsis comprising of the application and feasibility of the project.
CO2	Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health care, safety and sustainability.
CO3	Work and communicate efficiently in multidisciplinary teams.
CO4	Identify, formulate, and solve engineering problems.
CO5	Develop an understanding of professional and ethical responsibility.

Course Content

Project work is of duration of two semesters and is expected to be completed in the eighth semester. Each student group consisting of not more than five members is expected to design and develop a complete system or make an investigative analysis of a technical problem in the relevant area. The project batches are expected to fix their topics, complete preliminary studies like literature survey, field measurements etc. in the seventh semester.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		50	100

Name of The Course	**Project Work – 2**				
Course Code	**BTCE9999**				
Prerequisite	-				
Corequisite	-				
Antirequisite	-				
		L	**T**	**P**	**C**
		0	**0**	**18**	**9**

Course Objectives

5. To develop the capacity of students in correlating theoretical knowledge into practical systems either to perform creative works or to perform analysis and hence to suggest solutions to problems, pertaining to civil engineering domain.
6. Foster collaborative learning skills.
7. Develop self-directed inquiry and life-long skills.
8. To enhance the communication skills of the students by providing opportunities to discuss in groups and to present their observations, findings and report in formal reviews both in oral and written format.

Course Outcomes:

On completion of this course, the students will be able to

CO1	Submit a project synopsis comprising of the application and feasibility of the project.
CO2	Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health care, safety and sustainability.
CO3	Work and communicate efficiently in multidisciplinary teams.
CO4	Identify, formulate, and solve engineering problems.
CO5	Develop an understanding of professional and ethical responsibility.

Course Content

Project work is of duration of two semesters and is expected to be completed in the eighth semester. Each student group consisting of not more than five members is expected to design and develop a complete system or make an investigative analysis of a technical problem in the relevant area. The project batches are expected to fix their topics, complete preliminary studies like literature survey, field measurements etc. in the seventh semester.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
50		**50**	**100**

PROGRAMME ELECTIVES

Name of The Course	Advanced Concrete Design			
Course Code	BTCE3015			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the behaviour of indeterminate structures.
2. To help the students to know the concepts of elastic analysis and plastic analysis.

Course Outcomes

On completion of this course, the students will be able to

CO1	Design different types of RC footings.
CO2	Design dog legged and open well stair case.
CO3	Design cantilever and counterfort retaining walls.
CO4	Understand the concept of yield line theory.
CO5	Design continuous beams and understand the concept of moment redistribution.

Text Books

1. Gambhir, M. L., (2011), Design of Reinforced Concrete Structures, ISBN: 9788120331938

Reference Books

1. Varghese, P.C., (2009), Advanced Reinforced Concrete Design, 2nd ed. ISBN: 9788120327870.
2. Jain, A.K., (1999) "Reinforced Concrete: Limit State Design 7th Edition, ISBN: 8185240663.
3. IS:456 (2000) & SP:16.

Course Content

Unit I: Design of Footings **8 Hours**
Types of foundation - Design of isolated footing - combined footing – Concept of raft footing and well foundation.
Unit II: Design of Stair Cases **8 Hours**
General specifications, Types of stair cases, Loads on stair cases, Effective span of stairs, Design of dog legged stair case, Design of open well stair case.
Unit III: Retaining Walls **8 Hours**
General specifications, Forces acting on retaining walls, Stability consideration, Wall proportioning, Design of cantilever retaining walls and counterfort retaining walls.
Unit IV: Yield Line Theory **8 Hours**
Yield line pattern, Moment capacity along yield line, Ultimate load on slabs, Analysis by virtual work method and equilibrium method.
Unit V: Design of Continuous Beams **8 Hours**
Design of continuous RC beams, Plastic hinge, Moment redistribution.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Quantity Surveying and Estimating			
Course Code	BTCE3016			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the types of estimates.
2. To make the students to understand rate analysis and process of preparation of bill of quantity.

Course Outcomes

On completion of this course, the students will be able to

CO1	Prepare a detailed estimate for different types of structures.
CO2	Estimate RCC and steel work.
CO3	Understand rate analysis & preparation of bills
CO4	Calculate the valuation of a building.
CO5	Understand schedule of rates.

Text Books

1. B.N. Datta (2010), Estimating and costing, USBPD. ISBN 9788174767295.

Reference Books

1. Rangwala (2011), Specifications of Estimating, Costing and Valuation, Charotar Publishing House Pvt. Ltd. ISBN 978938
2. Vazirani, V. N. (2013), Civil Engineering Estimating Costing & Valuation, Khanna publishers. ISBN 9788174091277.

Course Content

Unit I:Estimation of building **10 Hours**
Estimation of building works – Procedure of estimating, Types of estimates, detailed estimate of buildings including sanitary &
Unit II: Estimate of R.C.C and Steel works **9 Hours**
Estimate of R.C.C and Steel works - Scheduling - Slab - beam - column & trusses, Road – earthwork fully in banking, cuttin partly filling - Detailed estimate for WBM, Bituminous road.
Unit III: Rate analysis & preparation of bills **8 Hours**
Rate analysis - preparation of bills – Data analysis of rates for various items of works – abstract estimates for Building projec software for Bill of Quantities & estimates.
Unit IV: Valuation **9 Hours**
Valuation- rent fixation, tenders, - contracts –accounting procedure, measurement book, stores, cost & quality control – PWD
Unit V: Detailed specifications and Schedule of Rates **9 Hours**
Specifications of various items of works - Schedule of Rates.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Bridge Engineering			
Course Code	BTCE3017			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the design and codal concepts of different types of bridges.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand IRC Code.
CO2	Apply Pigeauds curves to calculate bending moments in deck slab.
CO3	Explain Courbon's method of load distribution in deck slab.
CO4	Design plate girder and steel truss bridges.
CO5	Design piers and abutments.

Text Books

1. Victor D. J. (2008), Essentials of Bridge Engineering, 6th Edition, Oxford University Press, ISBN: 9788120417175.
2. Ramachandra (2004), Design of Steel structures, 4th Edition, Standard Publishers Distributors, ISBN: 9780071544115.

Reference Books

1. Duggal S. K. (2008), Design of Steel Structures, 3rd Edition, Tata McGraw-Hill, ISBN: 9780070260689.
2. IRC Bridge Code.

Course Content

Unit I: Introduction **9 Hours** Site selection, various types of bridges, loads on bridges according to IRC codes, Design of RC bridges under concentrated loads using effective width method.
Unit II: Deck slab of T-Beam Bridges **9 Hours** Pigeauds curves, Calculation of bending moments, Design of deck slab for T-beam Bridge for different types of vehicles.
Unit III: Girders of T-Beam Bridge **9 Hours** Courbon's method of load distribution, Analysis and design of girders for T-beam Bridge for different types of vehicles, Concept of box culverts.
Unit IV: Design of Plate Girders and Steel Trussed Bridges **9 Hours** Design principles, Design and detailing of plate girder bridges, Types of trusses, Design of steel trussed bridges.
Unit V: Design of Substructures **9 Hours** Types of piers, Forces acting on piers, Design of piers, General features of abutments, Forces acting on abutments, Design of abutments.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Applications of Matrix Methods in Structural Analysis			
Course Code	BTCE3018			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the basic concepts of flexibility method and stiffness method.
2. To make the students to learn the differences between force method and displacement method.
3. To enable the students to know the behaviour of plane trusses & plane frames.

Course Outcomes

On completion of this course, the students will be able to

CO1	Know the concept of static and kinematic indeterminacy.
CO2	Analyze beams by flexibility matrix method.
CO3	Analyze beams by stiffness matrix method.
CO4	Analyze of plane truss by stiffness matrix method.
CO5	Analyze of plane frame by stiffness matrix method.

Text Books

1. Pundit G.S., & Gupta S.P., (2008), Structural Analysis (A matrix approach), Tata McGraw Hill Publishing Ltd.
2. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach". Sixth Edition, 2007, Chapman & Hall.

Reference Books

1. DevdasMenon,"Advanced Structural Analysis"(2009), Narosa Publishing House
2. DevdasMenon,"Structural Analysis"(2008), Narosa Publishing House, 2008
3. A.S.Meghre& S.K.Deshmukh, "Matrix Methods of Structural Analysis" (2010) Charotar Publishing House Pvt. Ltd.
4. Kanchi M. B., "Matrix Methods of Structural Analysis" (2002), Wiley Eastern Limited, New Delhi,

Course Content

Unit I: Introduction to Flexibility Matrices and Stiffness Matrices 9 Hours Flexibility and stiffness matrices- relationship between flexibility and stiffness matrices- properties of stiffness and flexibility matrices - concept of co-ordinates-solution of simple problems.
Unit II: Analysis of Beams by Flexibility Matrix Method 9 Hours Flexibility matrices for beams - solution of statically indeterminate beams–shear force diagram and bending moment diagram.
Unit III: Analysis of Beams by Stiffness Matrix Method 9 Hours Stiffness matrices for beams - solution of kinematically indeterminate beams–shear force diagram and bending moment diagram.
Unit IV: Analysis of Plane Truss by Stiffness Matrix Method 9 Hours Stiffness matrices for plane truss - solution of simple problems.
Unit V: Analysis of Plane Frame by Stiffness Matrix Method 9 Hours Stiffness matrices for plane frame - solution of simple problems.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Expansive Soil and Ground Improvement Techniques

Course Code	BTCE3019			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to identify preventive measures for mitigating effect of soil expansion on structures founded on expansive soil.
2. To make the students to use geo-textiles and stabilizers for soil improvement.

Course Outcomes

On completion of this course, the students will be able to

CO1	Know the physical & mineralogical properties of expansive soil.
CO2	Conduct tests for identification of swelling soil.
CO3	Design suitable method for improving properties of expansive soil.
CO4	Choose correct method for ground improvement.
CO5	Design grouting process for various soil engineering problems.

Text Books

1. Swami Saran (2008), Analysis and Design of sub structures 2nd edition, Limit State Design, Oxford & IBH Publishing Co. Pvt Ltd., 66, Janpath, New Delhi. ISBN: 978-81-204-1700-7.
2. F.H.Chen (1995), Foundations in Expansive Soils, Elseivier Publications. ISBN:978-04-444-3036-6.
3. NiharRanjanPatra (2012), Ground improvement techniques, 1st Edition, Vikas Publishing House. ISBN: 978-93-259-6001-5.
4. Nelson, John D. Nelson, Ron Miller (1997), Expansive Soils: Problems and Practice in Foundation and Pavement Engineering New edition, Wiley-Interscience. ISBN: 978-04-711-8114-9.

Reference Books

1. R.E.Peck, W.E.Hansen&T.H.Thornburn (2004), Foundation Engineering, John Wiley. ISBN: 978-04-716-7585-3.
2. Varghese P.C (2009), Foundation Engineering 1st Edition, Prentice-Hall of India Private Limited. ISBN: 978-81-203-2652-1.
3. P. Purushothama Raj (1999), Ground Improvement Techniques 1st Edition, Laxmi Publications. ISBN: 978-81-318-0594-7.
4. Rao (1990), Engineering with Geo-synthetics, Mcgraw-hill Education. ISBN: 978-00-746-0323-9.

Course Content

Unit I: Origin, Occurrence and Identification of Expansive Soils **9 Hours**

Occurrence and distribution in India - Moisture equilibrium - Soil, structure, environmental interaction - Distress symptoms case histories - Soil Structure - Clay mineralogy Swell potential - Field exploration - laboratory tests for identification.

Unit II: Chemical stabilization and Special Foundation **9 Hours**

Mechanical alteration – Sand cushion technique - CNS concept – Chemical stabilization with lime, flyash and cement – Special foundations – Under-reamed piles – Straight-shafted drilled piers - Belled piers – Granular pile-anchors.

Unit III: Introduction to Ground Improvement Techniques **9 Hours**

Need and objectives of ground improvement, classification of ground modification techniques, suitability and feasibility, emerging trends in ground improvement, methods of de-watering, sumps and interceptor ditches, single, multi stage well points, vacuum well points, Horizontal wells, foundation drains, blanket drains, criteria for selection of fill material around drains, Electro-osmosis.

Unit IV: Stabilization **9 Hours**

Soil improvement by adding materials, lime, flyash, cement and other chemicals and bitumen, sand column, stone column, sand drains, prefabricated drains, lime column, soil-lime column, stabilization of soft clay or silt with lime, bearing capacity and settlement of treated soils, improvement in slope stability, control methods.
Unit V: Grouting **9 Hours** Introduction, suspension grout, solution grout, grouting equipments and methods, grouting, design and layout granular piles – ultimate bearing capacity and settlement, method of construction, load test.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Advanced Geotechnical Engineering			
Course Code	BTCE3020			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to identify preventive measures for mitigating effect of soil expansion on structures founded on expansive soil.
2. To make the students to use geo-textiles and stabilizers for soil improvement.

Course Outcomes

On completion of this course, the students will be able to

CO1	Comprehend and utilize the geotechnical literature to establish the framework for foundation design.
CO2	Plan and implement a site investigation program including subsurface exploration to evaluate soil/structure behavior and to obtain the necessary design parameters.
CO3	Carry out slope stability analysis for various fills and slopes.
CO4	Determine allowable bearing pressures and load carrying capabilities of different foundation systems.
CO5	Understand theories of earth pressures and designing of retaining walls.

Text Books

1. Varghese P.C (2009), Foundation Engineering 1st Edition, Prentice-Hall of India Private Limited. ISBN: 978-81-203-2652-1.
2. Arun Kr. Jain, B.C. Punmia, Ashok Kr. Jain (2005), Soil Mechanics and Foundations Sixteenth Edition, Laxmi Publications. ISBN: 978-81-700-8791-5.

Reference Books

1. Shashi K. Gulhati & Manoj Datta (2005), Geotechnical Engineering 1st edition, Tata McGraw Hill Ltd. ISBN: 978-00-705-8829-5.
2. Donald P Coduto, William A. Kitch, Man-chu Ronald Yeung (2010), Geotechnical Engineering: Principles and Practices 2nd revised Edition, Pearson Education. ISBN: 978-01-313-5425-8.
3. Joseph E. Bowles (2006), Foundation Analysis and Design 5th edition, McGraw-Hill, New York. ISBN: 978-00-711-8844-9.
4. Braja M. Das (2007), Principles of Foundation Engineering 6th Edition, Nelson Engineering. ISBN: 978-81-315-0202-0.
5. Ramamurthy (2010), Engineering in Rocks for Slopes, Foundations and Tunnels, PHI Learning Private Limited. ISBN: 978-81-203-4168-5.

Course Content

Unit I: Soil Exploration and Types of Foundations **6 Hours**

Objective of site investigation - reconnaissance – detailed site investigation - methods of exploration – geophysical methods - seismic refraction survey. Depth of exploration – factors governing location and depth of foundation – types of foundations – selection of foundation – plate load test – standard penetration test.

Unit II: Capacity and Settlements of Shallow Foundations **10 Hours**

Terzaghi's theory of bearing capacity – general and local shear failure - effect of water table – design of footings – settlement of footings - immediate and time dependent settlement – permissible limits – differential settlement, introduction to Codal provisions.

Unit III: Deep Foundations **10 Hours**

Classification and selection of piles – static and dynamic formulae for single pile capacity – efficiency and capacity of pile groups – design of pile group – settlement of pile groups– load test on piles.

Unit IV: Slope Stability **9 Hours**

Failure of infinite and finite slopes – Swedish circle method – Factor of safety - slope stability of earth dams, introduction to Bishop's method – IS codes

Unit V: Theories of Earth Pressure **10 Hours**

Definitions – Earth pressure at rest – Rankine's active and passive earth pressures - Coulomb's earth pressure theories – types of retaining walls and its design. Introduction of tunneling, ground improvement methods – compaction, deep compaction and fiber reinforced plastic and geo-textiles.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Highway Pavement Design			
Course Code	BTCE3021			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand various analysis and design procedures of different types of pavements.
2. To make the students to learn maintenance, evaluation, strengthening and rehabilitation of the pavements.

Course Outcomes

On completion of this course, the students will be able to

CO1	Learn general principles of pavement design.
CO2	Understand flexible pavement design.
CO3	Explain rigid pavement design.
CO4	Understand distresses in flexible pavements.
CO5	Know about maintenance of bituminous surface concrete roads.

Text Books

1. ChakroborthyPartha, and Das Animesh, (2003) "Principles of Transportation Engineering", Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.

Reference Books

1. Yoder.E.J., and Witczak. M. W., Principles of Pavement Design, Second Edition, John Wiley & Sons, ISBN-9780471977803.
2. Garber. Nicholas J., and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning, ISBN-9780495082507.
3. S.K. Sharma (1998), Principles, Practice and Design of Highway Engineering, S. Chand & Co Ltd, New Delhi.
4. Bruce.A.G. and Clarkeson.J., (1952), Highway Design and Construction, Third Edition, International Textbook Co.

Course Content

Unit I: General Principles of Pavement Design **10 Hours** Components of a road and functions – factors affecting pavements stability – equivalent single wheel load – vehicle and traffic factors – moisture factors – climate factors – soil factors – stress distribution in different conditions – modulus of elasticity of various layers.
Unit II: Flexible Pavement Design **6 Hours** Empirical method using soil classification tests – estimation of CBR value method of designing pavement – plate bearing test method Ashpalt Institute method – AASSO method – Burmister design method.
Unit III: Rigid Pavement Design **9 Hours** Stresses in concrete pavement – IRC method – design of steel reinforcements – design of different joints in concrete pavements and their functions – construction of concrete pavements and their functions.
Unit IV: Pavement Evaluation **10 Hours** Distresses in flexible pavements – distress in rigid pavements – service ability index – structural evaluation of flexible and rigid pave-ments – evaluation by deflection measurement – strengthening of pavements – flexible overlays – rigid overlays.
Unit V: Highway Maintenance **10 Hours** Maintenance of Bituminous surface concrete roads and low cost roads – maintenance shoulders and drainage system – maintenance of bridges and road structures.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Traffic Engineering			
Course Code	BTCE3022			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to get concepts of traffic studies, traffic facilities and their regulations and management.
2. To make the students to understand the methods for efficient management of traffic in urban roads.

Course Outcomes

On completion of this course, the students will be able to

CO1	Perform traffic studies.
CO2	Explain traffic facilities
CO3	Know traffic regulations and traffic management measures.
CO4	Factors affecting pavements stability
CO5	Understand rigid pavement design

Text Books

1. Kadiyali L. R. (2008), Traffic Engineering and Transportation Planning, Khanna Publishers, ISBN-9788174092205.
2. Chakroborthy Partha, and Das Animesh, (2003), Principles of Transportation Engineering, Eighth Printing, Prentice-Hall of India, ISBN-9788120320840.

Reference Books

1. Khisty C. J., and Lall B. K., (2003) "Transportation Engineering", Indian Edition, Prentice-Hall of India , ISBN-9788120322127.
2. Papacostas C. S. and Prevedouros P. D., (2001) "Transportation Engineering and Planning", Indian Edition, Prentice-Hall of India , ISBN- 9788120321540.
3. Garber. Nicholas J. and Hoel. Lester A., (2009), Traffic & Highway Engineering, Fourth Edition, Cengage Learning, ISBN-9780495082507.

Course Content

Unit I: Traffic Studies **10 Hours** Road user and Vehicle Characteristics - Traffic Studies -Traffic volume and composition - speed, Headway - Concentration and Delay & Flow principles - Capacity and level of service.
Unit II: Traffic Facilities **6 Hours** Signals - Islands - Types and General layout of at-grade and grade separated intersections.
Unit III: Traffic Regulations and Management **9 Hours** Traffic signs and markings - Parking practices - Traffic management measures.
Unit IV: General Principles and Flexible Pavement Design **10 Hours** Factors affecting pavements stability – equivalent single wheel load – vehicle, soil, traffic & Climatic factors - stress distribution in different conditions - CBR method of design - AASSO method & Burmister design method.
Unit V: Rigid Pavement Design **10 Hours** Stresses in concrete pavement – IRC method – design of steel reinforcements – Function of joints, design of joints in concrete pavements - Joint Fillers and sealant.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Advanced Transportation Engineering

Course Code	BTCE3023			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives

1. To enable the students to get concepts of traffic studies, traffic facilities and their regulations and management.
2. To make the students to understand the methods for efficient management of traffic in urban roads.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand rail gauges, permanent way.
CO2	Explain track geometrics and safety.
CO3	Learn airports and aircraft characteristics.
CO4	Understand runway and taxiway geometric designs.
CO5	Explain docks and harbour engineering.

Text Books

1. Chandra.S., and Agarwal. M.M., (2007), Railway Engineering, Oxford University Press India, ISBN-9780195687798.
2. Rangwala.S.C., Rangwala.P.S., (2008), Airport Engineering, Charotar Publishing House Pvt. Limited, ISBN-9788185594972.
3. Oza.H.P., and Oza. G.H., (2011), Dock and Harbour Engineering, Sixth Edition, Charotar Publishing House Pvt., ISBN-9789380358383.

Reference Books

1. Arora.S.P., and Saxena. S.C., (2001), A Textbook of Railway Engineering, Sixth Edition, Dhanpat Rai Publications.
2. Khanna.S.K, and Arora.M.G. (1971), Airport Planning and Design, Nem Chand & Bros.
3. Rangwala.S.C, (1965), Principles of Railway Engineering, Charotar Publishing house.

Course Content

Unit I: Introduction to Railway Engineering **9 Hours** History and administrative setup of Indian Railways; rail gauges, permanent way – functions, requirements, sections in embankment and cutting, stresses in different components of track, Types of joints and fastenings.
Unit II: Track Geometrics and Safety **9 Hours** Requirements of Railway alignment, vertical alignment and horizontal alignment, points and crossings – terminologies, Turnouts – Types and design aspects, Signals classification and their functions, train operation control systems, interlocking of tracks.
Unit III: Introduction to airports and Aircraft Characteristics **9 Hours** Air transport development in India, national and international organizations in air transport, aircraft characteristics and their impact on planning of an airport, selection of site for an airport, airport obstruction, imaginary surfaces, runway orientation clam period and wind coverage.
Unit IV: Geometric Designs and Airport Traffic control Aids **9 Hours** Runway and taxiway geometric designs, exit taxiway, its design and fillet curves, runway configuration, separation clearance, design of apron and their layout. Visual aids, marking and lighting of runway and apron area, wind and landing direction indicator.
Unit V: Docks and Harbour Engineering **9 Hours** Historical development in India , tides, winds & waves, docks, harbours, break waters, jetties, landing stages & wharves, dry docks, transit sheds, cargo handling, , inland water transport. Maintenance.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	**30**	**50**	**100**

Name of The Course	Ground Water Engineering

Course Code	BTCE3024			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to educate on ground water movement analysis & predictions.
2. To make the students to understand the concept to increase ground water potential.
3. To enable the students to identify the sources of the ground water.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand hydrologic cycle.
CO2	Explain geophysical methods.
CO3	Analyze and evaluate pumping test.
CO4	Monitor pollution of groundwater.
CO5	Calculate groundwater storage capacity and groundwater potential.

Text Books

1. David Keith Todd (2005), Groundwater Hydrology, Third Edition, John Wiley & Sons Singapore. ISBN: 9780471059370.

Reference Books

1. Raghunath H.M. (2007), Groundwater, Third Edition, New Age International. ISBN: 9788122419047.
2. Abdel-Aziz ismailkashef (2008), Groundwater Engineering, McGraw-Hill International Editions, Newyork. ISBN: 9780071005333.

Course Content

Unit I: Occurrence and Movement of Groundwater 10 Hours Introduction to Hydrologic cycle – Origin and Age of groundwater, classification of groundwater, aquifer - water table - Darcy's Law, Coefficient of Transmissibility and storage - Flow rates and equation.
Unit II: Well Hydraulics 9 Hours Geophysical methods, study of radial flow - well flow, Multiple well system - characteristic well losses, open well, tube well, well depth, well screen - head losses through the screen gravel packing and formation stabilization.
Unit III: Analysis and Evaluation of Pumping Test 9 Hours Definition of terms - static water level, pumping level, drawdown – residual, drawdown pumping rate -automatic water level recorder - time drawdown analysis - distance drawdown analysis, Jacob's methods, pumping test methods.
Unit IV: Pollution of Groundwater 8 Hours Injection methods-monitoring: - Cement lime, Lime - flyash and chemical stabilization, Deep mixing techniques.
Unit V: Groundwater Assessment and Budgeting 9 Hours Hydrological equilibrium - rain gauge network, runoff procedure for conducting infiltration test – artificial recharge, rainwater harvesting – calculation of groundwater storage capacity and groundwater potential.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Advanced Hydrology			
Course Code	BTCE3025			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the planning and construction of irrigation structures.
2. To make the students to understand the measures of flood control and economic functioning of hydrologic structures.

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand details of hydrograph.
CO2	Explain ground water hydrology.
CO3	Know the causes and effects of water logging.
CO4	Understand the functions of dams and reservoirs.
CO5	Carry out flood analysis.

Text Books

1. Subramanya K. (2008), Engineering Hydrology, Tata McGraw Hill Co., Graw Hill Co. ISBN: 9780074624494.

Reference Books

1. Varshney R.S. (2012), Engineering Hydrology, Nem Chand & Brothers Publishers. ISBN: 8185240688.
2. Das (2009), Hydrology & Soil Conservation Engineering, Prentice-Hall of India. ISBN: 9788120335868.

Course Content

Unit I: Hydrograph **9 Hours**

Runoff - Factors affecting runoff – measurement – stream gauging – stage discharge relationship –Hydrograph components – Hydrograph separation – Module hydrograph – Derivation of Module Hydrograph – S. Hydrograph – Synthetic hydrograph.

Unit II: Ground Water Hydrology **9 Hours**

Ground water-Aquifers, Permeability & transmissibility- steady flow towards a well in confined & water table aquifer - Dupits & Theims equation - measurement of yield of an open well - Tube well & infiltration galleries. Interference among wells-well losses, comparison of well and flow irrigation.

Unit III: Canal Irrigation **9 Hours**

Sediment Transport- Importance & Mechanics of transport, bed load & suspended load- Estimation, Design of channels in India- Regime channels- Kennedy and Lacey's theory, Water logging- causes- effects- control measures, canal lining, Land Reclamation.

Unit IV: Dams and Reservoirs **9 Hours**

Classification of dams - factors governing their selection – elementary design of gravity dam – earthen dam – arch dam – spillways – energy depositors – spillway gates – important dams in India – Yield of reservoir – storage capacity – strategies and operation – sedimentation process – effects and control measures.

Unit V: Flood Analysis **9 Hours**

Empirical methods – statistical methods – flood routing – routing through reservoir routing – through channels (Muskinggum method) – flood forecasting.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100

Name of The Course	Pollution Control and Monitoring			
Course Code	BTCE3026			
Prerequisite	-			
Corequisite	-			
Antirequisite	-			
	L	T	P	C
	3	0	0	3

Course Objectives

1. To enable the students to understand the factors that must be satisfied for potable water, land and air for the removal and treatment of pollutants.
2. To make the students to know about strong link between the Pollution Damage, Public Authority Control Systems and Technical Control Systems

Course Outcomes

On completion of this course, the students will be able to

CO1	Understand water pollution & control.
CO2	Explain air pollution & control.
CO3	Understand noise pollution & control.
CO4	Know solid waste management
CO5	Understand the purposes of environmental sanitation

Text Books

1. Rao C.S. (2006), Environmental Pollution Control Engineering, New Age International, ISBN: 9788122418354.
2. Arcadio P Sincero, Gregoria A Sincero (2009), Environmental Engineering : A Design Approach, PHI Learning, ISBN: 9788120314740.

Reference Books

1. George Tchobanoglous, Donald R. Rowe, Howard S. Peavy, Environmental Engineering, McGraw-Hill Publishing Co., ISBN: 9780071002318.
2. P. AarneVesilind, Susan M. Morga (2004), Introducing to Environmental Engineering, Nelson Engineering, ISBN: 9780534378127.
3. Gerard Kiley (1996), Environmental Engineering, McGraw-Hill, ISBN: 978-0077091279.

Course Content

Unit I: Water Pollution & Control **9 Hours**

Natural process-pollution due to industrial, agricultural and municipal wastes-limitations of disposal by dilution-BOD consideration in streams – Oxygen Sag Curve-Water pollution control legislation.

Unit II: Air Pollution and Control **10 Hours**

Pollution and their sources-effects of pollution on human health, vegetation and climate-prevention and control of particulate-industry and air-pollution surveys and sampling-Air quality monitoring- air pollution control legislation.

Unit III: Noise Pollution and Control **8 Hours**

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution; fundamentals of sound generation, propagation etc; sound measurement; sound level meters – types, components, Measures for prevention and control of noise; environmental and industrial noise; noise control legislation.

Unit IV: Solid Waste Management **8 Hours**

Source characteristics – quantities – collection methods and disposal techniques – sanitary landfill – incineration – and pyrolysis, composting, aerobic and anaerobic- economics of composting; recycling and reuse.

Unit V: Environmental Sanitation **10 Hours**

Relation of food to disease-principles of food sanitation-sanitation of kitchens, restaurants and other catering establishments-quality changes in milk-milk as carrier of infection-pasteurisation of milk-HTST and LTLT processes – cattle shed sanitation. Orientation of buildings with respect to the direction of prevailing winds and solar movement. Air movement inside the buildings for a healthy residential environment.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Exam (MTE)	End Term Exam (ETE)	Total Marks
20	30	50	100