2
CIVIL ENGINEERING

2.1 S.Y. B.Tech. In Civil Engineering
Sem. III & IV
Academic Scheme and Syllabus
Year 2015-16

Scheme for S.Y.B.Tech. in Civil Engineering, (Semester - III) Academic Year 2015-16

Sr. No.	Course	Code	Lectures	Laboratory	Tutorial	Credits	Test 1	Test 2	End Semester Marks	End Semester Duration (Hrs)	End Semester Weightage (%)	In Semester Evaluation	Total
1	Engineering Mathematics III	BTC201	4	--	--	4	20	20	100	3	60	--	100
2	Surveying – I	BTC202	3	--	--	3	20	20	100	3	60	--	100
3	Strength of Materials	BTC203	4	--	--	4	20	20	100	3	60	--	100
4	Engineering Materials	BTC204	3	--	--	3	20	20	100	3	60	--	100
5	Engineering Geology	BTC205	4	-	--	4	20	20	100	3	60	--	100
6	Building Construction	BTC206	3	--	2	4	20	20	100	3	60	25	125
Laboratory Work													
1	Surveying – I	BTC251	--	3	--	2	--	--	--	--	--	50[#]	50[#]
2	Strength of Materials	BTC252	--	2	--	1	--	--	--	--	--	25[#]	25[#]
3	Engineering Materials	BTC253	--	2	--	1	--	--	--	--	--	25[#]	25[#]
4	Engineering Geology	BTC254	--	2	--	1	--	--	--	--	--	25[#]	25[#]
Total			**21**	**9**	2	**27**	**120**	**120**	**600**	**--**	**--**	**150**	**750**

1. Test 1, Test 2 and End semester weightage marks will be added and shown as the theory marks in the mark sheet.Duration of Test 1, Test 2 is of 1 hour.

2. For passing in theory subjects, Student must secure minimum 40% marks in each subject with all heads of passing taken together and minimum 40% marks in the end semester examination

3. Laboratory work is considered as separate head and student must secure 40 % of marks for passing.

4. # Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:

   (i)   Attendance in Laboratory/Tutorial = 20%,

   (ii)   Journal/Drawing sheet/Sketch book = 40%,

   (iii)   MCQ/Oral/Test = 40%.

Scheme for S.Y.B.Tech. In Civil Engineering, (Semester - IV) Academic Year 2015-16

Sr. No.	Course	Code	Lectures	Laboratory	Tutorial	Credits	Test 1	Test 2	Marks	Duration (Hrs)	End Semester Weightage (%)	In Semester Evaluation	Total
			Course Plan for Each Week (Hrs)				**Evaluation (Marks)**						
									End Semester		**End Semester Weightage (%)**		
1	Probability and Statistics	BTC226	4	--	--	4	20	20	100	3	60	--	100
2	Surveying - II	BTC227	3	--	--	3	20	20	100	3	60	--	100
3	Structural Analysis – I	BTC228	4	--	2	5	20	20	100	3	60	25	125
4	Fluid Mechanics	BTC229	4	--	--	4	20	20	100	3	60	--	100
5	Concrete Technology	BTC230	3	--	--	3	20	20	100	3	60	--	100
6	Building Design and Drawing - I	BTC231	1	--	--	1	20	20	100	4	60	--	100
Laboratory Work													
1	Surveying - II	BTC276	--	3	--	2	--	--	--	--	--	50[#]	50[#]
2	Fluid Mechanics	BTC277	--	2	--	1	--	--	--	--	--	25[#]	25[#]
3	Concrete Technology	BTC278	--	2	--	1	--	--	--	--	--	25[#]	25[#]
4	Building Design and Drawing - I	BTC279	--	3	--	2	--	--	--	--	--	50[#]	50[#]

Total	**19**	**10**	**2**	**26**	**120**	**120**	**600**	**--**	**--**	**175**	**775**

1. Test 1, Test 2 and End semester weightage marks will be added and shown as the theory marks in the mark sheet.Duration of Test 1, Test 2 is of 1 hour.

2. For passing in theory subjects, Student must secure minimum 40% marks in each subject with all heads of passing taken together and minimum 40% marks in the end semester examination

3. Laboratory work is considered as separate head and student must secure 40 % of marks for passing.

4. # Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:

   (i) Attendance in Laboratory/Tutorial = 20%,

   (ii) Journal/Drawing sheet/Sketch book = 40%,

   (iii) MCQ/Oral/Test = 40%.

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC201	COURSE: Engineering Mathematics III	
Prerequisites	BT101, BT201	
Period per week (each of 60 minutes)	Lecture	04
	Laboratory	---
	Tutorial	---
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	---	--
	TOTAL	---	100

*60% Weightage for end semester

Course Objectives:
1. Introduce Laplace & Inverse Laplace transforms and its application to solve differential equations.
2. Introduction to Fourier series orthogonal orthonormal functions.
3. Introduce Rank of Matrix, Caley-hamilton theorem.
4. Introduce vector integration, Green's Stoke's & Gauss theorems.

Course Outcomes:

Upon successful completion of the course, students should be able to

1. Solve problems based on Laplace and inverse Laplace transform.
2. Solve problem based on Fourier series expansion.
3. Solve problems on vector integration.

Course Content

Module No.	Details	Hrs.
1	**Laplace Transforms** Function of bounded variation (Statement only) Laplace Transforms of $1, e^{at}, \sin at, \cos at, \sinh at, \cosh at, t^n, erf\left(\sqrt{t}\right), J_0(t)$ Shifting theorems, change of scale, $L\{t^n f(t)\}, L\left\{\dfrac{f(t)}{t}\right\} L\left\{\dfrac{d^n f(t)}{dt^n}\right\} L\left\{\displaystyle\int_0^t f(u)du\right\}$ Convolution theorem (with proof), Evaluation of real integrals using Laplace transforms	07
2	**Laplace transforms** Laplace transforms of special functions (Heaviside Unit step function, Dirac Delta function and periodic functions) Inverse Laplace Transforms, Evaluation of Inverse Laplace Transforms using partial fractions, convolution theorems, shifting theorems and other properties. Application of Laplace Transform to solve initial & boundary value problems involving ordinary differential equation with one dependent	07

	variables	
3	**Fourier Series & Integrals** Orthogonal & Orthonormal set of functions Fourier series, Determination of Fourier constants, Dirichlet's conditions Fourier series for $f(x),\ x\in\left[c,c+2\pi\right]$ and $x\in\left[c,c+2L\right]$	06
4	**Fourier Series** Fourier series of Odd and Even functions Half range Fourier Sine & Cosine series, Parseval's Identity Complex form of Fourier series Fourier Integral, Fourier integrals with of even and odd functions	06
5	**Matrices** Types of matrices(including orthogonal & unitary) Adjoint of a matrix, Partitioning of Matrices. Inverse of a matrix Elementary Transformation, rank of a matrix, normal form	08
6	**Matrices** System of Homogeneous and Non Homogeneous linear equations, their consistency & Solution. Eigen values and Eigen vectors Cayley Hamilton Theorem	08
7	**Vector Calculus and Analysis** Gradient, Curl and Divergence (with properties). Conservative, Irrotational and Solenoidal fields Line integrals, properties of line integral. Green's theorem in plane Stoke's theorem and Gauss divergence theorem (without proof). Related identities and deductions	10

Text Books:-

1. G.V kumbhojkar "Applied Mathematics-III", C.Jamanadas 1st Edition.

Reference Books:-

1. "Laplace Trasnsforms" by Murray Spiegel (Schaum Series)
2. "Engineering Mathematics" by Bali & Iyengar (Laxmi Publications)
3. "Matrices" by Shanti Narayan (S Chand)
4. Vector calculus by Murray Spiegel

Sr. No.	Examination	Module
1	T-1	1 and 2
2	T-2	3 and 4
3	Final Examination	1 to 7

SEMESTER- III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC202	COURSE : Surveying – I	
Prerequisites	BT103, BT203, BT253	
Period per week (each of 60 minutes)	Lecture	03	
	Laboratory	--	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	---	100

* 60% Weightage for end semester

Course Objectives:
Students will learn :
1. Various methods of surveying.
2. To determine the location and reduced level of different points using appropriate instruments
3. To use different methods commonly employed for linear measurement, angular measurement, relative heights, determining areas of irregular bodies
4. Explain the concept of volume measurement and its methods and plane table surveying and its applications.

Course Outcomes:
Students will be able to
1. Apply the knowledge for collection of data required for the linear measurement, angular measurement to determine contour of ground to prepare the map.
2. Demonstrate their capability for preparing ground map at their own which is useful for their future.
3. Apply concept of surveying and its application in different construction work.

Course Content

Module No	Details	Hrs
1	**Introduction :** Various types of surveying – based on methods and instruments, classifications, uses and necessity of geodetic surveying, photographic, astronomy and hydrographic surveying, Diagonal scale, various types of verniers, micrometers on surveying instruments, principles of surveying. Different types of ranging, tapes, chains, steel band, Linear measurements, approximate, direct, optical and electronic methods, Chain surveying, minor instruments for setting out right angle.	05
2	**Compass survey:** Bearings – different types, compass – prismatic, surveyor, whole circle, reduced bearings, declination, local attraction, plotting of compass survey by different methods.	05

3	**Levelling:** Definitions, technical terms, different types of levels such as dumpy, quickset, precise auto Temporary and permanent adjustments of dumpy and auto level, Difficulties in leveling, reduction of levels, problems, Difficulties in leveling work, corrections and precautions to be taken in leveling work, Running a level line, L section and cross section	06
4	**Contouring:** Definitions, contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring, methods of interpolation , Grade contour – definition, use, setting out in field, Computation of volume by trapezoidal and prismoidal formula, volume from spot levels, Volume from contour plan.	04
5	**Areas:** Area of a irregular figure by Trapezoidal rule, average ordinate rule, Simpson's 1/3 rule, various coordinate methods, Planimeter: types of planimeter including digital planimeter, area of zero circle, use of planimeter.	03
6	**Theodolite traverse:** Various parts and axis of transit, technical terms, temporary and permanent adjustments of a transit, horizontal and vertical angles, methods of repetition and reiteration, Different methods of running a theodolite traverse, Gales traverse table, balancing of traverse by Bow-Ditch's transit and modified transit rules, Problems on one-plane and two-plane methods, omitted measurements, Precautions in using theodolite, errors in theodolite survey, Use of theodolite for various works such as prolongation of a straight line, setting out an angle.	09
7	**Plane table surveying:** Definitions, uses and advantages, temporary adjustments, Different methods of plane table surveying, Two point problem, Errors in plane table survey, use of telescopic alidade	04

Recommended Books:

1. T.P Kanetkar (2000); "Surveying and Levelling Vol I", Pune Vidyarthi Griha New Central Book Agency. ISBN-13 9788185825113.
2. N. N. Basak (2014); "Surveying And Levelling", Mcgraw Hill Education (India) Private Limited. ISBN-13: 978-9332901537.
3. R Agor (2009); "Surveying and Leveling", Khanna Publishers. ISBN-13: 978-8174092359.
4. Dr. B.C. Punamia (2005); "Surveying Vol –I", Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088530. 536 p.
5. Dr. B.C. Punamia (2005); "Surveying Vol-Li". Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088837. 658 p.
6. R. Subramanian (2007); "Surveying And Levelling", Oxford University Press. ISBN-13: 9780195684247. 970p.

Sr. No.	Examination	Module
1	T – I	Module 1 , 2
2	T – II	Module 3, 4
3	Final Examination	Module 1 to 7

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC203	COURSE: Strength of Materials	
Prerequisites	BT104, BT154, BT204	
Period per week (each of 60 minutes)	Lecture	04	
	Laboratory	--	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	---	100

* 60% Weightage for end semester

Course Objectives:
The main objectives of the course are
- To introduce the students to the behavior of an elastic member Subjected to various types of forces such as axial force, shear force, bending moment, torsion etc.
- To prepare the base for the students to study other structural engineering subjects at a later stage.

Course Outcomes:
At the end of the course the students shall be able to
- Draw axial force, shear force and bending moment diagrams for determinate beams.
- Analyse members subjected to axial force, shear force, bending moment, torsion in terms of stresses including principal stresses.
- Find deflection in determinate beams.

Course Contents

Module No.	Details	Hrs.
1	**Axial force, shear force and bending moment in beams:** Axial force, shear force & bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading, relationships between rate of loading, shear force and bending moment.	07
2	**Stress & strain:** Stress, yield stress, ultimate stress, shear stress, factor of safety, strain, modulus of elasticity (E), modulus of rigidity (G), bulk modulus (K), Poisson's ratio, relationship between elastic constants, bars of varying sections, stresses in composite section, temperature stresses **Thin cyllendrical and spherical shells:** Stresses and strains in thin cylindrical and spherical shells subjected to internal pressure	09

3	**Simple theory of bending:** Flexure formula for beam, simple problems involving the application of flexure formula, section modulus, moment of resistance of a section, flitched/ composite beams.	06
	Unsymmetrical bending: Moment of inertia about rotated axes, principal axes and principal moment of inertia, flexural stresses due to bending in two planes for symmetrical sections, bending of unsymmetrical sections.	04
4	**Shear stress in beams:** Distribution of shear stress across plane sections used commonly for beams, shear connectors. Shear center of thin walled open sections such as angle, tee, channel, I, etc.	06
	Simple theory of torsion: Torsion of circular shafts - solid and hollow, stresses and strains in shaft when transmitting power	04
5	**Bending moment combined with axial loads:** Application to members subjected to eccentric loads, core of the section. Problems on chimneys, retaining walls, etc.	04
6	**Principal stresses:** General equations for transformation of stress, principles planes and principal stresses, maximum shear stress, determination using Mohr's circle.	04
7	**Deflections of beams:** Deflection of cantilever simply supported and overhanging beams for different types of loadings using double integration method and Macaulay's method.	04

Text Books
1. Popov, Egor P, (1978), "Mechanics of materials", Englewood Cliffs, N.J: Prentice-Hall, ISBN 0135711584 (pbk), 864 p.
2. S.B. Junnarkar (2007), "Mechanics of materials Vol-1", Charotar Publications, ISBN 8185594678, 447 p.
3. Bear & Johnson (2007), "Mechanics of materials", Tata McGraw-Hill, ISBN: 0070042845, 780 p.

Reference Books:
1. Timoshenko & Gere (2006), "Mechanics of materials", Tata McGraw Hill, CBS Publishers & Distributors, ISBN 8123908946, 762 p.
2. James M. Gere, Books/cole (2012), "Mechanics of materials", Cengage Learning, ISBN 1111577730, 1056 p.
3. G.H. Ryder (2002), "Strength of materials" Macmillan Publishers India Limited, ISBN 0333935365, 352 p.
4. William A. Nash (2005), "Strength of materials", Schaum's outline series, Tata McGraw-Hill Education, ISBN 0070601631, 216 p.

Sr. No.	Examination	Module
1	T – I	1 , 2
2	T – II	3, 4
3	Final Examination	1 to 7

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC204	**COURSE:** Engineering Materials	
Prerequisites	**BT105, BT106, BT205, BT206**	
Period per week (each of 60 minutes)	Lecture	03	
	Laboratory	--	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	**---**	**100**

* 60% Weightage for end semester.

Course Objectives:
1. To describe the classification of different construction materials and the requirements of buildings materials from functional, aesthetic and economic point of view.
2. To discuss the properties of materials such as stones, bricks, cement, lime, concrete, timber, glass, metals, alloys, paints varnishes and other miscellaneous materials.
3. To explain different manufacturing processes of stones, bricks, cement, lime, concrete, timber, glass, metals, alloys, paints varnishes and other miscellaneous materials.

Course Outcomes:
The course will enable the students to
1. Select appropriate building materials.
2. Use good quality materials in construction.

Course Content

Module No.	Details	Hrs.
1	**Introduction** Classification of materials, requirements of building materials and products: functional, aesthetical and economical. Study of properties of materials- physical, mechanical, chemical, biological and other like durability, reliability, compatibility and economic characteristics.	03
2	**Stones, Bricks and Concrete blocks** **i) Stones:** Classification of rocks, properties and uses of stones, quarrying, dressing, seasoning, deterioration and preservation of stones, requirements of good building stone, test on stones, common building stones **ii) Bricks:** Uses, types of bricks, good brick earth, harmful ingredients, manufacture of bricks, properties of good building bricks, factors affecting quality of bricks, test on bricks, and classification of bricks. **iii) Concrete Blocks:** Raw materials, manufacturing process, advantages, uses	08
3	**Binder materials** **Lime and Cement:** Composition, classification, manufacturing process, precautions during handling, physical properties, uses. **Mortar:** Classification of mortar, properties of good mortar mix, types of mortar – manufacturing process and uses.	06

	Cement Concrete: Ingredients, properties, preparation and uses, types of cement concrete	
4	**Tiles and other ceramic products** Roofing tiles, ceiling and ridge tiles, clay terracing tiles, burnt clay tiles, flooring and wall tiles, terracotta, earthenware, stoneware pipes, sanitary appliances.	03
5	**Timber and its alternative material** **Timber:** Uses, classification, properties, seasoning and conversion of timber, defects in timber, preservation of timber, fire resistance of timber, timber based products, advantages and drawbacks of timber construction **Alternative materialsof Timber:** **Glass:** Ingredients, manufacture, treatment, types, properties and uses **Plastic:** Polymerization, classification, fabrication, fiber reinforced plastic, properties and uses of plastics in building. **Metal and alloys:** Ferrous and non ferrous metals and alloys, aluminum, tin , zinc, nickel, types and uses and anti-corrosive treatment	07
6	**Protective Materials and Bituminous Materials** **Protective Materials:**Paints, varnishes and distemper – characteristics, ingredients, types and uses **Bituminous Materials:**Bitumen, asphalt and tar – characteristics, types and uses	02
7	**Miscellaneous Materials** Asbestos, cork, rubber, gypsum and its products, turpentine, waterproofing and damp-proofing materials, linoleum, geosynthetics, geofabrics, siporex/light weight concrete blocks, adhesive, sealant and joint fillers, electric, thermal and sound insulating materials.	03

Recommended Books:
1. S. S. Bhavikatti (2012); "Building Materials", Vikas Publishing House Pvt Ltd. ISBN-13: 978-9325960442. 488p.
2. Rangwala (2012);"Engineering materials", Charotar Publications. ISBN-13: 978-9380358796.
3. S.K. Duggal (2010); "Building Materials", New Age International Publishers. ISBN-13: 978-8122433791. 616p.
4. Varghese P. C (2005); "Building Materials" PHI. ISBN-13: 978-8120328488. 180p.
5. M. Gambhir (2011); "Building Materials Products, Properties and Systems" McGraw Hill Education (India) Private Limited. ISBN-13: 978-0071077606.
6. IS codes of different materials, BIS publications.

Sr. No.	Examination	Module
1	T – I	1 , 2 (i, ii)
2	T – II	2(iii), 3, 4
3	Final Examination	1 to 7

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE:BTC205	COURSE: Engineering Geology	
Prerequisites	BT105, BT106, BT205, BT206	
Period per week (each of 60 minutes)	Lecture	04
	Laboratory	--
	Tutorial	---

Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	**---**	**100**

*60% Weightage for end semester

Course Objectives:
1. To classify the various branches of geology that are applicable to civil engineering
2. To describe the geological processes of agents modifying the earth's surface, weathering, earthquakes and preventive measures for structures constructed in earthquake prone areas.
3. Explain mineralogy, petrology, geological history and structural geology of India.
4. To discuss the importance and methods of surface and sub-surface investigations and geological considerations while selecting sites for dams, reservoirs, tunnels, etc.
5. Outline Ground water and its implications for foundations in civil engineering, types, causes and preventive measures for landslide prevention.

Course Outcome:
At the end of this course, the students will be able to
1. Relate the processes associated with the origin and formation of various earth surface features, rock types, especially in India
2. Carry out proper geological and geotechnical investigations for major engineering projects.
3. Examine and give opinions regarding the geological hazards, erosion, flooding, dewatering and seismic investigations and its impact on structures etc.

Course Content

Module No.	Details	Hrs.
1	**Introduction:** Branches of geology useful to civil engineering, importance of geological studies in various civil engineering projects. **Physical geology:** Internal structure of the earth and use of seismic waves in understanding the interior, Agents modifying the earth surface, study of weathering and its significance in physical and engineering properties of rocks like strength and water tightness, durability etc., Geological action of river, wind and glaciers, erosion; transport and depositional landforms created by them. Earthquakes – earthquake waves, construction and working of seismographs, earthquake zones of India, Geological aspects earthquake resistance structures.	08

2	**Mineralogy:** Methods of mineral identification, physical properties of minerals, rock forming minerals, ore forming minerals, megascopic identification of common primary and secondary minerals family.	03
3	**Petrology:** Study of igneous, sedimentary rocks, distinguishing properties between igneous, sedimentary and metamorphic rocks to identify them in field. Igneous petrology – mode of formation, textures, structures etc. Hatch's scheme of classification, study of common igneous rocks, Sedimentary petrology – mode of formation, textures, characteristics of shallow water types, residual like lamination, bedding, current bedding etc., classification of secondary rocks, types, residual deposits, chemically formed and organically formed deposits, commonly occurring sedimentary rocks, Metamorphic petrology –mode of formation, agents and types of metamorphism, metamorphic minerals, rock cleavage, structures and textures in metamorphic rocks, classification, commonly occurring metamorphic rocks.	08
4	**Structural geology:** Structural elements of rocks – dip, strike, outcrop patterns, unconformities, outliers and inliers, study of joints, faults and folds, importance of structural elements in engineering operations. **Stratigraphy :** Principle of stratigraphy and co-relation, geological time scale, physiographic divisions of India – study of formations occurring in peninsular India.	08
5	**Geological investigations:** Preliminary geological investigations and their importance to achieve safety and economy of the projects, supporting case histories of dams and tunnel projects in Maharashtra State, Methods of surface and sub surface investigations – trial pits, trenches, drill holes, geological logging, inclined drill holes, Resistivity method and seismic methods, Use of aerial photographs and satellite imageries in civil engineering projects. **Engineering properties of rock.** Requirements of good building stone, geological factors controlling properties of good building stones, consideration of common rocks as building stones, study of different building stone from various formation in Indian peninsula, geological factors controlling location of quarries, quarrying methods and quarrying operations	07
6	**Ground water:** Sources and zones, water table, unconfined and perched, springs, Factors controlling water bearing capacity of rocks, pervious and impervious rocks, cone of depression and its use in civil engineering, Methods of artificial recharge of ground water, geology of percolation tank.	04

	Role of engineeringgeology of Dam, Tunnel and Reservoir site: Importance of geological conditions while selecting the type of dam, ideal geological conditions for dam and reservoir site, favorable and unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions, significance of faults, folds, crushed zone, dykes and fractures on the dam site and treatment giving to such structures, tail channel erosion, Improvements of sites.	
7	**Tunneling:** Importance of geological considerations while choosing sites and alignment of the tunnel, Ideal site conditions for tunneling; geological conditions to be avoided.Tunneling to various types of rocks under various geological and structural condition, difficulties during tunneling and methods to overcome the difficulties. **Stability of hill slopes:** Landslides, their types, causes and preventive measures for landslides	09

Recommended Books:

1. Singh Parbin (2012), "Engineering & General Geology", S K Kataria and Sons Ltd. ISBN- 9350142678.
2. Kesavulu Chenna N. (2009), "Textbook of Engineering Geology", 2nd Edition, Trinity Press, ISBN-13: 9789380856278.
3. Winter J.D. (2011), "Principles of Igneous & Metamorphic Petrology", 2nd Edition Phi Learning Pvt. Ltd-New Delhi. ISBN-13: 9788120343979.

Sr. No.	Examination	Module
1	T – I	1,2
2	T – II	3,4
3	Final Examination	1 to 7

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC206	COURSE: Building Construction	
Prerequisites	BT103, BT203	
Period per week (each of 60 minutes)	Lecture	03
	Laboratory	--
	Tutorial	02

Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	25
	TOTAL	**---**	**125**

*60% Weightage for end semester

Course Objectives:
1. To describe basic components of buildings and to differentiate the types of building as per Codal provisions.

2. To discuss the students to the basic activity of construction from foundation up to finishing, including various building services required at various stages of construction.

Course Outcomes:
The course will enable the students to
1. Utilize basic principles used in building construction.

2. Implement the various building services required during construction such as plumbing, fire fighting and ventilation.

3. Identify ways and means to overcome the problems of dampness, thermal and termite resistance.

4. Implement acoustical and thermal insulation systems for specific situations.

Course Content

Module No.	Details	Hrs.
1	**Introduction** Classification of buildings based on occupancy and types of construction, Basic components of building	2

2	**Foundations and Masonry Constructions**
	1. **Foundations :**
	   Functions, Requirements, Types, Layouts, Excavation, Foundation in special situation, Caissons, Failure of foundation and preventive measures
	2. **Stone Masonry :**
	   Materials and Types of stone masonry, Structural member built of
		18

	stones, Joints, Lifting appliances, Permissible loads, Supervision during construction, Maintenance 3. **Brick Masonry :** Materials for brick masonry, Terminology, Art of brick laying, tools for brick works, Bonds, Junctions, Quoins, Typical structural members in brickworks – columns/piers, footings, thresholds, jambs, window sills, corbels, Defects in brick masonry, Supervision of brick masonry works, Comparison of brick masonry and stone masonry, thickness of brick wall 4. **Concrete block Masonry and Composite Masonry:** Concrete block masonry, Stone composite masonry, Brick-Stone composite masonry, Reinforced brick masonry 5. **Masonry Finishes :** Plastering, Pointing, Painting and Other Decorative finishes	
3	**Building Openings and Vertical Circulation** 6. **Building Openings:** Doors, Windows - terminology, dimensions, types, fixtures and fastenings, Ventilators 7. **Vertical Circulation:** Staircase – terminology, types, requirements, geometric design, Ramps, Escalators, Lifts	4
4	**Floors and Roofs** 8. **Floors :** Construction of ground floor, Selection of flooring materials, Types of flooring, Upper floors 9. **Roofs:** Features of good roof, Classification of roofs, wooden and steel trusses, Roof covering, Drainage	4
5	**Temporary Works** Formworks, Scaffolding, Shoring, Underpinning	4
6	**Building services** Plumbing Services**,** Ventilation, air conditioning and thermal insulation**,** Acoustics of buildings, Fire fighting, Damp-proofing and water proofing, Maintenance of building	7
7	**Green Building** Energy consumption in building, Concept of green building, Advantages of green building.	1

In Semester Evaluation:
Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
   (i)   Attendance in Laboratory/Tutorial = 20%,
   (ii)   Journal/Drawing sheet/Sketch book = 40%,
   (iii)   MCQ/Oral/Test = 40%.

Recommended Books:
1. Dr. B.C. Punamia (2008); "Building Construction" Laxmi Publications (P) Ltd. ISBN-13: 978-8131804285. 666p.
2. S. S. Bhavekatti (2012); "Building Construction" Vikas Pulishing House Pvt Ltd. ISBN-13: 978-9325960794. 356p.

3. S. P. Arora and S. P. Bindra (2010); "Textbook of Building Construction", Dhanpat Rai & Sons publication, ISBN-13: 978-8189928803. 688p
4. Sushil Kumar (2010); "Building Construction" Standard Publishes-Distributors. ISBN-13: 978-8180141683. 796p.
5. Varghese P. C (2007); "Building Construction" PHI. ISBN-13: 978-8120330832. 472p.

Sr. No.	Examination	Module
1	T – I	1 , 2
2	T – II	3, 4
3	Final Examination	1 to 7

SEMESTER- III	CLASS: S.Y.B.Tech. (Civil)		
CODE: BTC251	**COURSE : Surveying – I**		
Prerequisites	**BTC202**		
Period per week (each of 60 minutes)	Lecture	--	
	Laboratory	03	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	50
	TOTAL	**---**	**50**

Course Objectives:
Students will learn :
1. Various methods of surveying.
2. To determine the location and reduced level of different points using appropriate instruments
3. To use different methods commonly employed for linear measurement, angular measurement, relative heights, determining areas of irregular bodies

Course Outcomes:
Students will be able to
1. Apply the knowledge for collection of data required for the linear measurement, angular measurement to determine contour of ground to prepare the map.
2. Demonstrate their capability for preparing ground map at their own which is useful for their future.
3. Apply concept of surveying and its application in different construction work.

List of Experiments:
1. Chaining , ranging and offsetting
2. To find internal angles of a polygon with a prismatic and a surveyor compass.
3. Level simple and compound leveling, booking methods, practice on levels Dumpy, Tilting and Auto levels.
4. Measurement of Horizontal angles by Repetition method
5. Measurement of Horizontal angles by Reiteration method
6. Measurement of Bearing of line using theodolite
7. Measurement of vertical angle using theodolite
8. Use of digital planimeter for measuring area of irregular figures
9. Plane table survey by Radiation method.

Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
      (i)   Attendance in Laboratory/Tutorial = 20%,
      (ii)   Journal/Drawing sheet/Sketch book = 40%,
      (iii)   MCQ/Oral/Test = 40%.

Recommended Books:
1. T.P Kanetkar (2000); "Surveying and Levelling Vol I", Pune Vidyarthi Griha New Central Book Agency. ISBN-13 9788185825113.

2. N. N. Basak (2014); "Surveying And Levelling", Mcgraw Hill Education (India) Private Limited. ISBN-13: 978-9332901537.
3. R Agor (2009); "Surveying and Leveling", Khanna Publishers. ISBN-13: 978-8174092359.
4. Dr. B.C. Punamia (2005); "Surveying Vol –I", Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088530. 536 p.
5. Dr. B.C. Punamia (2005); "Surveying Vol-Li". Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088837. 658 p.
6. R. Subramanian (2007); "Surveying And Levelling", Oxford University Press. ISBN-13: 9780195684247. 970p.

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)		
CODE: BTC252	COURSE: Strength of Materials		
Prerequisites	BTC203		
Period per week (each of 60 minutes)	Lecture	--	
	Laboratory	02	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	25
	TOTAL	---	25

Course Objectives:
The main objectives of the course are to introduce the students to the experimental methods
- To determine the behavior of an elastic member subjected to various types of forces such as axial force, shear force, bending moment, torsion etc. and
- To test material properties of hardess and toughness.

Course Outcomes:
At the end of the course the students shall be able to
- Experimentally determine the various material properties.

Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
- (i)   Attendance in Laboratory/Tutorial = 20%,
- (ii)   Journal/Drawing sheet/Sketch book = 40%,
- (iii)   MCQ/Oral/Test = 40%.

Practicals (At least eight to be performed)
1. Tension test on mild steel / tor steel rod.
2. Transverse test on cast iron specimen.
3. Shear test on metal specimens.
4. Torsion test on mild steel / cast iron specimen.
5. Load deflection test on metal specimens.
6. Brinell hardness test on metal specimens.
7. Rockwell hardness test on metal specimens.
8. Charpy impact test on metal specimens
9. Izod impact test on metal specimens
   Report on experiments performed as detailed above shall be submitted as laboratory work.

Text Books
1. Popov, Egor P, (1978), "Mechanics of materials", Englewood Cliffs, N.J: Prentice-Hall, ISBN 0135711584 (pbk), 864 p.
2. S.B. Junnarkar (2007), "Mechanics of materials Vol-1", Charotar Publications, ISBN 8185594678, 447 p.
3. Bear & Johnson (2007), "Mechanics of materials", Tata McGraw-Hill, ISBN: 0070042845, 780 p.

Reference Books:
1. Timoshenko & Gere (2006), "Mechanics of materials", Tata McGraw Hill, CBS Publishers & Distributors, ISBN 8123908946, 762 p.
2. James M. Gere, Books/cole (2012), "Mechanics of materials", Cengage Learning, ISBN 1111577730, 1056 p.
3. G.H. Ryder (2002), "Strength of materials" Macmillan Publishers India Limited, ISBN 0333935365, 352 p.
4. William A. Nash (2005), "Strength of materials", Schaum's outline series, Tata McGraw-Hill Education, ISBN 0070601631, 216 p.

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC253	COURSE: Engineering Materials	
Prerequisites	BTC204	
Period per week (each of 60 minutes)	Lecture	--
	Laboratory	02
	Tutorial	---
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	25
	TOTAL	---	125

Course Objectives:
- To carry out test for material properties such as compression, flexural strength and abrasion.
- To report various physical properties of cement

Course Outcomes:
At the end of the course the students shall be able to
- Examine the various material properties.

List of Experiments:
1. Water absorption and compression test of bricks.
2. Water absorption and transverse load test on tiles
3. Moisture content and flexural strength test on timber.
4. Compression test on timber (Parallel / perpendicular to the grains).
5. Physical properties of cement: Fineness, consistency, Setting time, Soundness, Compressive strength.
6. Compression test on Paver blocks
7. Water absorption, density and compression test on masonry blocks
8. Abrasion test on tiles

Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
    (i)   Attendance in Laboratory/Tutorial = 20%,
    (ii)   Journal/Drawing sheet/Sketch book = 40%,
    (iii)   MCQ/Oral/Test = 40%.

Recommended Books:
1. S. S. Bhavikatti (2012); "Building Materials", Vikas Publishing House Pvt Ltd. ISBN-13: 978-9325960442. 488p.
2. Rangwala (2012);"Engineering materials", Charotar Publications. ISBN-13: 978-9380358796.
3. S.K. Duggal (2010); "Building Materials", New Age International Publishers. ISBN-13: 978-8122433791. 616p.
4. Varghese P. C (2005); "Building Materials" PHI. ISBN-13: 978-8120328488. 180p.

5. M. Gambhir (2011); "Building Materials Products, Properties and Systems" McGraw Hill Education (India) Private Limited. ISBN-13: 978-0071077606.
6. IS codes of different materials, BIS publications.

SEMESTER-III	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC254	COURSE: Engineering Geology	
Prerequisites	BTC205	
Period per week (each of 60 minutes)	Lecture	--	
	Laboratory	02	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	25
	TOTAL	**---**	**25**

Course Objectives:
1. Identification and description of physical properties of rock-forming and ore-forming minerals.
2. Identification and systematic description of megascopic features of Igneous, Sedimentary and Metamorphic rocks.
3. Description and drawing of vertical cross-section of structural geological maps and study of core samples and the engineering problems encountered on site.

Course Outcome:

At the end of this course, students will be able to
1. Identify the different properties of minerals and differentiate and identify the different rock types.
2. Interpret the cross-section of the geological maps and evaluate the suitability of site for different engineering projects from study of core samples.

List of Experiments:
1. Study of physical properties of the minerals.
2. Megascopic identification of rock forming minerals – crystalline, crypto-crystalline and amorphous silica and their varieties, Orthoclase, Microcline, Plagioclase, Muscovite, Biotite, Hornblende, Asbestos, Augite, Olivine, Tourmaline, Garnet, Natrolite, Actinolite, Calcite, Dolomite, Gypsum, Corundum, Talc, Fluorite, Kyanite
3. Megascopic identification of ore forming minerals - Bauxite, Graphite, Galena, Pyrite, Hematite, Magnetite, Chalcopyrite, Chromite, coal
4. Identification of rocks –
- Megascopic identification of Igneous rocks : Granite and its varities, Synite, Dionite, Gabbro, Pegmatite, Porphyry, Dolerite, Rhyolite, Pumice, Trachyte, Basalt and its varieties, Volcanic Breccia, Volcanic Tuffs.
- Megascopic identification of Sedimentary rocks : Conglomerate, Breccia, Sandstone and its varieties, Shales, Limestone, Melliolite, Laterite,
- Megascopic identification of Metamorphic rocks: Slate, Phyllite, Mica, Schists, Hornblende schists, Granite gneiss and its varieties, Augen gneiss, Marbles and quartzite.

5. Study of Structural geological maps. (at least eight).
6. Study of core samples, percentage recovery, RQD, core logging and engineering problem based on field data collected during site investigation.

\# Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
      (i)   Attendance in Laboratory/Tutorial = 20%,
      (ii)   Journal/Drawing sheet/Sketch book = 40%,
      (iii)   MCQ/Oral/Test = 40%.

Recommended Books:
1. Singh Parbin (2012); "Engineering & General Geology", S K Kataria and SonsLtd. ISBN- 9350142678.
2. Kesavulu Chenna N. (2009)" Textbook of Engineering Geology" 2nd Edition Trinity Press, ISBN-13: 9789380856278.
3. WINTER (2011);"Principles of Igneous & Metamorphic Petrology", 2nd Edition PHI LEARNING PVT. LTD-NEW DELHI. ISBN-13: 9788120343979.

S.Y. B.Tech. In Civil Engineering

Sem. IV

Academic Scheme and Syllabus

Year 2015-16

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE:BTC226	COURSE: Probability and Statistics	
Prerequisites	Std. XII Maths	
Period per week (each of 60 minutes)	Lecture	04
	Laboratory	---
	Tutorial	---

		Hours	Marks
Scheme of Evaluation	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	**---**	**100**

* 60% Weightage for end semester

Course Objectives:
1. Introduce Statistical methods, probability distributions and testing of hypothesis.
2. Introduce complex integration (Cauchy's theorems).
3. Introduce simplex and allied simplex methods to solve LPP.

Course Outcomes:
Upon successful completion of the course, students should be able to
1. Solve problem in basic statistics, probability, probability distributions, testing of hypothesis.
2. Solve integration of complex valued functions.
3. Solve linear programming problems using various simplex methods.

Course Content

Module No.	Details	Hrs.
1	**Statistics** Measures of central tendency (mean, median, mode, quartiles, deciles, percentiles, only introduction no questions to be asked) Measures of dispersion(mean deviation, quartile deviation, standard deviation), coefficient of variation Covariance & correlation .Karl Pearson's coefficient & Spearman's rank coefficient (with proofs) (repeated and non-repeated ranks) Regression analysis(Linear and multiple)	07
2	**Probability** Introduction to probability and conditional probability, Baye's theorem Discrete and continuous random variable, Probability mass function & probability density function. Probability distribution for random variables. Expected value. Variance, Moments and Moment generating function. Binomial, Poisson and Normal distribution for detailed study. Central limit theorem (only statement) & problems based on this theorem.	07
3	**Sampling Theory & Testing of Hypothesis** Population and sample. Sampling with & without replacement. Random samples. Population parameters, Sample statistics Sampling distributions. Sample mean Sampling distribution of means. Sampling distribution of proportions. The sample variance. Sampling distribution of variances.	

	Cases where population variance is unknown. Sampling distribution of ratios of variances. Other statistics Statistical decisions. Statistical hypothesis. Null hypothesis and alternate hypothesis. Test of hypothesis and significance. Type I& Type II errors. Level of significance. One- tailed and two tailed tests. Tests of significance for large samples (between sample & population mean, difference between the means of two samples) Tests of significance for small samples (t-test, paired t-test, F-test).The χ^2 test for goodness of fit and contingency tables.	
4	**Estimation Theory** Unbiased estimates and efficient estimates. Point and interval estimates Confidence interval estimates of population parameters. Confidence interval for means, proportions, variance ratios. Maximum likelihood estimates.	04
5	**Complex analysis** Line integrals for complex valued functions, Cauchy's integral theorem and formula with proof, Problems based on above, Taylor and Laurent series expansion, Cauchy residue theorem(proof & problems), Application to real integrals	10
6	**Linear Programming Problem** Solving LPP using graphical method and Simplex method. Solving LPP using big M method, Solving LPP using duality, Solving LPP using dual simplex method.	08
7	**Linear Programming Problem** Non linear programming problem using Hessian matrix. Lagrangian method KUHN TUCKER conditions (problems based on above)	06

Text Books
1. G.V kumbhojkar "Applied Mathematics-III", C.Jamanadas 1st Edition.

Reference Books
1. Vector Calculus by Shanti Narayan & J.N.Kapur (S.Chand & company Limited)
2. Probability& Statistics for engineers by Richard Johnson & Gupta (Pearson Education)
3. Probability& Statistics by Murray Spiegel (Schaum series)
4. Operations research by Hamady Taha.
5. Complex analysis by Shanti Narayan.

Sr. No.	Examination	Module
1	T-1	Module 1 and 2
2	T-2	Module 3 and 4
3	Final Examination	Module 1 to 7

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC227	COURSE: Surveying – II	
Prerequisites	**BTC202**	
Period per week (each of 60 minutes)	Lecture	03	
	Laboratory	--	
	Tutorial	---	
		Hours	Marks
Scheme of Evaluation	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	**---**	**100**

* 60% Weightage for end semester

Course Objectives:
1. Acquire knowledge of curves, types and its application to civil engineering projects.
2. Acquire the knowledge of modern surveying instruments
3. Discuss electronic distance measurements and precision levelling
4. Use of computers for level computation and plotting contour plan using software.

Course Outcomes:
Students will be able to
1. Use the knowledge for collection of data required for the linear measurement, angular measurement to determine contour of ground to prepare the map.
2. Demonstrate their capability for preparing longitudinal section, cross section, contour plan
3. Apply the actual concept of surveying and its application by performing project work.
4. Perform setting out foundation plan for load bearing and framed structure with surveying instruments.

Course Content

Module No.	Details	Hrs.
1	**Curves-I :** Definitions of different terms, necessity of curves and types of curves,Simple circular curves and compound curves, office and field work, linear methods of setting out of curves, Angular methods for setting out of curves, two theodolite and Rankine's deflection angle methods, difficulties in setting out curves and their solutions.	06
2	**Curves-II :** Reverse and transition curves, their properties and their advantages, design of transition curves, shift, spiral angle, Composite curves – office and field work, setting out of curve by angular method, composite curve problems, Vertical curves– definitions, geometry and types, tangent correction and chord gradientmethods, sight distance on a vertical curve	10
3	**Modern Surveying instruments:** Electronics in surveying, general principles used in the instruments. Auto levels, self compensating instrument, Electronic distance Measurements – types, principles, applications in surveying, corrections forfield observations, Electronic digital theodolite –	04

	types, uses andapplication, concept of total station. Use of computer in survey work forlevel computation and plotting contour plan, Introduction of GPS	
4	**Precision Leveling:** Precise level and leveling staff, field procedure for precise leveling, field notes.	02
5	**Tacheometric surveying:** Principles and uses, advantages, stadia formula, different methods of tacheometer, subtense bar method, location details by tacheometer, stadia diagram and tables, error and accuracy in tacheometry survey work,Application in plane table and curve setting	06
6	**Setting out works:** General horizontal and vertical control, setting out of foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite, Setting out of sewer line, culvert, use of laser for works, Setting out centre line for tunnel, transfer of levels of underground work, Project / route survey for bridge, dam and canal. Checking vertically of high rise structures.	04
7.	**Geodetic surveying:** Basic concept of triangulation, order of triangulation, size & shape of triangles, strength of figure, triangulation field work, base line measurement, problems on base line measurement, measurement of angles.	04

In Semester Evaluation

Report on experiments conducted, the term work shall comprise of:

Three A1 size drawing sheets comprising practical work on: L section and cross section block contouring, tacheometric survey. Office and field work for minimum two types of curves by angular method, plotting of a contour plan on computer using suitable software,

Recommended Books:

1. T.P Kanetkar (2000); "Surveying and Levelling Vol I", Pune Vidyarthi Griha Prakashan. ISBN-13 9788185825113.
2. T.P Kanetkar (2000); "Surveying and Levelling Vol II", Pune Vidyarthi Griha New Central Book Agency. ISBN-13 9788185825007.
3. N. N. Basak (2014); "Surveying And Levelling", Mcgraw Hill Education (India) Private Limited. ISBN-13: 978-9332901537.
4. R Agor (2009); "Surveying and Leveling", Khanna Publishers. ISBN-13: 978-8174092359.
5. Dr. B.C. Punamia (2005); "Surveying Vol –I", Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088530. 536 p.
6. Dr. B.C. Punamia (2005); "Surveying Vol-II". Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088837. 658 p.
7. Dr. B.C. Punamia (2006); "Surveying Vol-III". Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088257. 280p.
8. R. Subramanian (2007); "Surveying And Levelling ", Oxford University Press. ISBN-13: 9780195684247. 970p

Sr. No.	Examination	Module
1	T – I	1 , 2
2	T – II	3, 4
3	Final Examination	1 to 7

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)		
CODE: BTC228	**COURSE: Structural Analysis – I**		
Prerequisites	**BTC203**		
Period per week (each of 60 minutes)	Lecture	04	
	Laboratory	---	
	Tutorial	02	
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	25
	TOTAL	**---**	**125**

* 60% Weightage for end semester

Course Objectives:
The main objectives of the course are
- To introduce the students to the behavior and analysis of determinate structures.
- To prepare the base for the students to study other structural engineering subjects at a later stage.

Course Outcome:
At the end of the course the students shall be able to
- Draw axial force, shear force and bending moment diagrams for rigid jointed frames.
- Find deflection in beams, rigid jointed and pin jointed frames using different methods.
- Draw influence line diagrams for determinate beams and pin jointed frames.
- Analyse three hinged arches and cables and suspension bridges.
- Find buckling load of columns.

In Semester Evaluation:

\# Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
- (i)   Attendance in Laboratory/Tutorial = 20%,
- (ii)   Journal/Drawing sheet/Sketch book = 40%,
- (iii)   MCQ/Oral/Test = 40%.

Course Contents

Module No.	Details	Hrs.
1	**Axial force, shear force and bending moment in frames:** Axial force, shear force and bending moment diagrams for statically determinate frames with and without internal hinges	06
2	**General theorems:** Theorems relating to elastic structures, principle of virtual work. Strain energy in elastic structures, stresses due to axial load & impact load. Complementary energy, Castigliano's theorem, Betti's and Maxwell's reciprocal theorems, principle of superposition	04
3	**Deflection of statically determinate structures:** Deflection of cantilevers, simply supported and overhanging beams for different types of loadings using following methods; Moment area method, Conjugate beam, Principle of virtual work (unit load method) and Castigliano's theorem. Deflection of determinate pin jointed and rigid jointed frames by principle of virtual work (unit load method) and Castigliano's theorem.	12

4	**Influence lines for statically determinate structures:** Influence lines for cantilevers, simply supported, overhanging beams and pin jointed truss, criteria for maximum shear force and bending moment at a section, absolute maximum shear force and bending moment under moving loads (udl and series of point loads) for simply supported beams.	08
5	**Three hinged arch:** Determination of normal thrust, radial shear force and bending moment for three hinged parabolic and segmental arches.	06
6	**Cables and suspension bridges:** Simple suspension cable, minimum and maximum tensions in the cable supported at same and at different levels, anchor cable, cable supports, suspension cable with three hinged stiffening girder, shear force and bending moments at any section of the stiffening girder.	07
7	**Columns and Struts:** Short and long/slender columns, Concept of buckling in slender columns subjected to axial loads, Euler's and Rankine's design formulae for columns with different support conditions.	05

Text Books:
1. Reddy C.S.(1999), "Basic Structural Analysis", Tata McGraw hill, ISBN 0070702764, 540 p.
2. Junnarkar S.B. (2013), "Structural Analysis, Vol. II" Charotar Publishers ISBN 9380358703, 986 p.
3. S S Bhavikatti (2011), "Structural Analysis ", Vikas Publishing House PVT. Ltd.-Noida, ISBN 8125942696, 436 p.
4. Devdas Menon (2009), "Structural Analysis", Narosa Book Distributors Pvt Ltd-New Delhi, ISBN 8173197504, 685 p.

Reference Books:
1. Stephen P. Timoshenko, Donovan H. Young (1965), "Theory of Structures", Tata McGraw Hill Higher Education, ISBN 0070648689, 629 p.
2. Charles H. Norris , John Benson Wilbur (1990),"Elementary Structural Analysis", Tata McGraw Hill Higher Education, ISBN 0070659338.
3. Harold I. Laursen (2007), "Structural Analysis", Tata McGraw Hill Higher Education, ISBN 0070366438, 468 p.
4. B.G. Neal (1963), "Structural Theorems and Their Applications", Pergamon Press ISBN 0080108717, 208 p.
5. Russell C. Hibbeler (2011), "Structural Analysis", Prentice Hall, IBN 0132570534
6. Alexander Chajes (1982), "Structural Analysis", Longman Higher Education, ISBN 0138534080, 352 p.
7. Aslam Kassimali (2014), "Structural Analysis", Cengage Learning, ISBN 1133943896, 613 p.
8. Dr. Ramachandran Vaidyanathan, Dr. P. Perumal (2006), "Comprehensive Structural Analysis", Laxmi Publications, ISBN 8170088917, 466 p.

Sr. No.	Examination	Module
1	T-1	Module 1 and 2
2	T-2	Module 3 and 4
3	Final Examination	Module 1 to 7

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC229	**COURSE: Fluid Mechanics**	
Prerequisites	**Std. XII Physics**	
Period per week (each of 60 minutes)	Lecture	04
	Laboratory	--
	Tutorial	---
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	---	**100**

* 60% Weightage for end semester

Course Objectives:
The students will learn about –
1. To describe the various properties of fluids.
2. To discuss the students to the basics of fluid statics, fluid kinematics, fluid dynamics as well as various flow measuring devices.

Course Outcomes:
The course will inculcate in the students,
1. Calibrate the various flow measuring devices such as venturimeter, nozzlemeter, notches and weirs.
2. Use the hydrostatic principle to the floating/submerged body analysis.

Course Content

Module No.	Details	Hrs.
1	**Properties of Fluids** Mass density, weight density, specific gravity, specific volume, viscosity, compressibility, bulk modulus, surface tension, capillary action, vapour pressure, types of fluids, basic concepts.	06
2	**Fluid Statics** Pascal's Law, Pressure variation in fluid at rest, absolute, atmospheric , gauge pressure, measurement of pressure, hydrostatic forces on plane and curved surfaces. Buoyancy and flotation: Archimede's principle, Met center, meta centric height, equilibrium of floating and submerged bodies.	06
3	**Fluid Kinematics and Dynamics** Description of fluid flow: Lagrangian method, Eulerian method, Streamlines, pathlines, streaklines, classification of fluid flows, continuity equation, rotational flow, rotation and vorticity, velocity and stream function. Circulation, flow net. Eular's equation, Bernoulli's theorem, its application to real fluid, flow measuring devices, Venturimeter, nozzle meter, pitot tube, rotameter.	10
4	**Flow measurement** Orifices: Hydraulic coefficients, small and large orifices, time of emptying of tank through orifices. Mouthpieces: External, convergent, Borda's mouthpiece. Notches and weirs: rectangular, triangular, Cipolleti weirs,	08

	velocity of approach, end contraction.	
5	**Ideal Fluid flow** Uniform flow, source and sink, free vortex flow, superimposed flow, doublet, flow past half bodies, Rankine's body and cylinder only.	06
6	**Compressible flow** Basic equation of flow, velocity of sound or pressure wave in fluid, Mach number, Mach cone, area velocity relationship, stagnation properties.	06
7	**Liquids in relative equilibrium** Uniform linear acceleration, liquid container subjected to constant horizontal and vertical acceleration, constant rotation with vertical axis.	06

Recommended Books
1. Dr. R.K. Bansal (2005); "A Textbook of Fluid Mechanics", Laxmi publication. ISBN-13: 978-8131802946. 501p.
2. Dr. P.N. Nodi (2009); "Hydraulics and Fluid Mechanics" Standard Book House ISBN-13: 978-8189401269. 250p.
3. Dr. Jain A.K (2010); "Fluid Mechanics" Khanna Publishers. ISBN-13: 978-8174091949.
4. K Subramanya (2008); "Flow in Open Channels" 978-0070086951. 576p.
5. Subramanaya K (2010); "Fluid mechanics & hydraulic Machines". McGraw Hill Education (India) Private Limited. ISBN-13: 978-0070699809.

Sr. No.	Examination	Module
1	T – I	1 , 2
2	T – II	3, 4
3	Final Examination	1 to 7

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC230	COURSE: Concrete Technology	
Prerequisites	BT106, BT206	

Period per week (each of 60 minutes)	Lecture	03	
	Laboratory	--	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	03	100
	In Semester Evaluation	--	--
	TOTAL	**---**	**100**

*60% Weightage for end semester.

Course Objective:

To understand the behavior of concrete, its types, and to introduce laboratory and non-destructive testing methods for concrete.

Course Outcomes:

The course will enable the students to
1. Test properties of fresh and hardened concrete.
2. Design concrete mix.
3. Analyze a situation and recommend the suitable type of concrete and admixtures.

Course Contents

Module No.	Details	Hrs.
1	**Ingradients of Concrete:** **Cement:**Types of cement and their use, physical properties of 33 Grade, 43 Grade, 53 Grade ordinary Portland cement, Portland pozzolana cement, rapid hardening Portland cement, hydrophobic cement, low heat Portland cement and sulphate resisting Portland cement as per relevant I.S. codes **Aggregates:** Properties of coarse and fine aggregates and their influence on concrete. **Admixtures:** Plasticizers, retarders, accelerators and other admixtures, test on admixtures, chemistry and compatibility with concrete.	13
2	**Grades of concrete:** Concrete for ordinary work, light weight concrete, high density concrete, workability, durability and strength requirements, effect of w/c ratio, acceptability criteria, laboratory testing of fresh and hardened concrete, concreting under special conditions, work in extreme weather conditions, under-water concreting.	08
3	**Concrete mix design:** Mix design for compressive strength by I.S. methods, road note method and British method, mix design for flexural strength.	05
4	**High performance concrete:** Constituents of high grade concrete, various tests and application of high performance concrete.	05

5	**Ready mix concrete:** Requirements of RMC, transit mixer details, mix design of RMC.	05
6	**Concrete for repairs and rehabilitation of structures:** Polymer concrete, fiber reinforced concrete, polymer impregnated concrete, polymer modified cement concrete/mortar and ferro cement, different tests.	08
7	**Non-Destructive testing of concrete:** Hammer test, ultrasonic pulse velocity test, load test, carbonation test, ½ cell potentiometer test, and corrosion of steel test, core test and relevant provision of I.S. codes.	06

Text Books:
1. R. Santhakumar (2006), "Concrete Technology", Oxford University Press (Rs), Isbn 0195671537, 771 p.
2. Shetty M. S. (30 November 2000), "Concrete Technology - Theory And Practice", S Chand & Co Ltd, Isbn 8121903483, 658 p.

Reference Books:
1. O.P. Jain & Jaikrishna (2007), "Plain & Reinforced Concrete -Vol. I", Nem Chand & Brothers Isbn 8185240086.
2. A. M. Neville (2012), "Properties Of Concrete", Trans-Atlantic Publications, Inc., Isbn 0273755803, 846 p.
3. Relevant I.S. Codes.
4. Special Publication Of Aci On Polymer Concrete And Frc:
5. Proceedings Of International Conferences On
6. Polymer Concrete And Frc

Sr. No.	Examination	Module
1	T-1	Module 1 and 2
2	T-2	Module 3 and 4
3	Final Examination	Module 1 to 7

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC231	COURSE: Building Design and Drawing – I	
Prerequisites	BT103, BT203, BT253, BTC206	
Period per week (each of 60 minutes)	Lecture	01
	Laboratory	--
	Tutorial	---
Scheme of Evaluation		Hours	Marks
	In Semester	01	20 X 02
	End Semester*	04	100
	In Semester Evaluation	--	--
	TOTAL	---	100

* 60% Weightage for end semester

Course Objectives:
Students will learn to:
1. Interpret various types of building drawings.
2. Comprehend building rules, regulation and bylaws, Building codes.
3. Acquire the knowledge of the principles of planning of residential and public (non-residential) buildings, sun path diagram & its importance.
4. Prepare and analyze plans of various types of residential building considering the functional requirements.

Course Outcomes:
At the end of this course, the students will be able to
1. Understand & interpret the drawings.
2. Transform their ideas to create plans and designs for various types of building.
3. Convert design parameters, process details into 2D and 3D views.
4. Supervise various construction processes and execute civil engineering structures such as buildings, roads, railways, dams, bridges.

Course Content

Module No.	Details	Hrs.
1	**Introduction:** Introduction: Various types of drawings, Importance of above drawings, Situations where above drawings are prepared/required, Symbols, Conventions and Abbreviations, Commonly used symbols and conventions for Electric fittings, Water supply, Sanitary, Furniture, Material of construction etc., Abbreviations used for the above, Actual use of symbols, conventions and abbreviations. Scales: Definition, Scales used for various types of drawings, Title, Margins and size of letters as per IS: Sizes of various standard papers, Layout of various views on drawing paper	1
2	**Planning approach** Basic areas in residential buildings-Process of planning-family requirement & analysis-conceptual plan outlines-princiles and techniques for functional planning-planning for service & landscaping-concept of art & creativity-	3

	role of architect & engineer-structural system & functional classification of buildings-residential building forms.	
3	**Building bye-laws** Building bye-law for residential buildings, (as per I.S. recommendations) Following important bye-laws : Plot area & Built-up area, Size of rooms, Margins, Heights, Passages, Ventilation, Circulation, Open space, Water supply & sanitary, Electrification, Fire safety, Other safety, Lifts, Environment Approval procedure with respect to bye-laws	3
4	**Housing** Importance of housing- demand of house-buiding site-requirement-claasification-trends in multi storied building-Design of residential building.	2
5	**Details of building drawing** Site plan: Drawing of details, Line plan, Layout plan, Detailed plan, Services plan, Elevation (Plan showing drainage, Section water supply and electricity Foundation plan lines), Importance and purpose of preparing above drawings. Details to be shown and location of the details.	1
6	**Planning residential buildings** Given situations & plot area; prepare detailed drawing of a single storeyed residential building (Load Bearing & RCC) i.e line plan, detailed plan, elevation and section of the building, Given situations & plot area; prepare detailed drawing of a two storeyed residential building (Load Bearing & RCC) i.e line plan, detailed ground floor plan, first floor plan, second floor plan, design of stair case, elevation and section, Other plans and tables required to be submitted for approval	2
7	**Building components** Draw sketches of floors and floorings, roofs and roof coverings, false ceiling, doors, windows, ventilators	2

Recommended Books:
1. M.G. Shah, C.M. Kale, S.Y. Patil (2011); "Building Drawing with an Integrated Approach to Built Environment" McGraw Hill Education (India) Private Limited; ISBN-13: 978-0071077873. 408p.
2. V.B. Sikka (2013); "A Course in Civil Engineering Drawing" S.K. Kataria & Sons; ISBN-13: 978-9350142721. 550 p.
3. Dr.N.Kumara Swamy & A.Kameshwara Rao (2012); "Building Planning & Drawing" Charotar Publishing House. ISBN-13: 978-9380358581. 434 p
4. Rangwala (2013); "Town Planning" Charotar Publishing House Pvt. Ltd. ISBN-13: 978-9380358680. 344 p**.**

Sr. No.	Examination	Module
1	T – I	1 , 2
2	T – II	3, 4
3	Final Examination	1 to 7

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC276	COURSE: Surveying – II	
Prerequisites	BTC202, BTC251, BTC227	
Period per week (each of 60 minutes)	Lecture	--	
	Laboratory	03	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	50
	TOTAL	---	50

Course Objectives:
1. Acquire knowledge of curves, types and its application to civil engineering projects.
2. Acquire the knowledge of modern surveying instruments
3. Discuss electronic distance measurements and precision levelling
4. Use of computers for level computation and plotting contour plan using software.

Course Outcomes:
Students will be able to
1. Use the knowledge for collection of data required for the linear measurement, angular measurement to determine contour of ground to prepare the map.
2. Demonstrate their capability for preparing longitudinal section, cross section, contour plan
3. Apply the actual concept of surveying and its application by performing project work.
4. Perform setting out foundation plan for load bearing and framed structure with surveying instruments.

List of Experiments:
1. Determination of Tacheometric constants.
2. Height and distance calculation using tacheometric formulae.
3. To set out circular curves by linear method (offset from tangent and from long chord)
4. To set out circular curve by angular method (Rankine's and two theodolite method)
5. Determination of RL and horizontal distance of object by one plane method.
6. Determination of RL and horizontal distance by of object by two plane method.
7. Setting out a simple foundation plan in the field
8. Study of modern surveying instruments

In Semester Evaluation
Report on experiments conducted, the term work shall comprise of:
Three A1 size drawing sheets comprising practical work on: L section and cross section block contouring, tacheometric survey. Office and field work for minimum two types of curves by angular method, plotting of a contour plan on computer using suitable software,

Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
      (i)   Attendance in Laboratory/Tutorial = 20%,
      (ii)   Journal/Drawing sheet/Sketch book = 40%,
      (iii)   MCQ/Oral/Test = 40%.

Recommended Books:

1. T.P Kanetkar (2000); "Surveying and Levelling Vol I", Pune Vidyarthi Griha Prakashan. ISBN-13 9788185825113.
2. T.P Kanetkar (2000); "Surveying and Levelling Vol II", Pune Vidyarthi Griha New Central Book Agency. ISBN-13 9788185825007.
3. N. N. Basak (2014); "Surveying And Levelling", Mcgraw Hill Education (India) Private Limited. ISBN-13: 978-9332901537.
4. R Agor (2009); "Surveying and Leveling", Khanna Publishers. ISBN-13: 978-8174092359.
5. Dr. B.C. Punamia (2005); "Surveying Vol –I", Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088530. 536 p.
6. Dr. B.C. Punamia (2005); "Surveying Vol-II". Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088837. 658 p.
7. Dr. B.C. Punamia (2006); "Surveying Vol-III". Laxmi Publications (P) Ltd., New Delhi. ISBN-13: 978-8170088257. 280p.
8. R. Subramanian (2007); "Surveying And Levelling ", Oxford University Press. ISBN-13: 9780195684247. 970p

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC277	COURSE: Fluid Mechanics	
Prerequisites	**BTC229**	
Period per week (each of 60 minutes)	Lecture	--
	Laboratory	02
	Tutorial	---
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	25
	TOTAL	---	**100**

Course Objectives:
- To summarize various principles and fluid properties.
- To explain calibrations of various flow flow measuring devices.

Course Outcomes:
- To utilize various properties of fluids.
- To carry out calibrations of various flow flow measuring devices.

List of experiments: (preferably eight to be performed)
1. Determination of Specific Weight of Fluid by using Buoyancy/Archimedes principle.
2. Determination of Specific Gravity of Fluid by using U-Tube Manometer.
3. Verification of Bernoulli's theorem
4. Determination of metacentric height
5. Calibration of Orifice
6. Calibration of notches
7. Calibration of venturimeter
8. Calibration of mouthpieces
9. Calibration of weirs
10. Calibration of nozzlemeter

Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
   (i)   Attendance in Laboratory/Tutorial = 20%,
   (ii)   Journal/Drawing sheet/Sketch book = 40%,
   (iii)   MCQ/Oral/Test = 40%.

Recommended Books
1. Dr. R.K. Bansal (2005); "A Textbook of Fluid Mechanics", Laxmi publication. ISBN-13: 978-8131802946. 501p.
2. Dr. P.N. Nodi (2009); "Hydraulics and Fluid Mechanics" Standard Book House ISBN-13: 978-8189401269. 250p.
3. Dr. Jain A.K (2010); "Fluid Mechanics" Khanna Publishers. ISBN-13: 978-8174091949.
4. K Subramanya (2008); "Flow in Open Channels" 978-0070086951. 576p.
5. Subramanaya K (2010); "Fluid mechanics & hydraulic Machines". McGraw Hill Education (India) Private Limited. ISBN-13: 978-0070699809.

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)		
CODE: BTC278	COURSE: Concrete Technology		
Prerequisites	BTC230		
Period per week (each of 60 minutes)	Lecture	--	
	Laboratory	02	
	Tutorial	---	
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	25
	TOTAL	---	25

Course Objectives:
The main objectives of the course is to introduce the students to the experimental methods
   1. To determine properties of cement, aggregates and concrete.

Course Outcomes:
At the end of the course students will be able to
   1. Test physical properties of cement, aggregates and concrete.
   2. Evaluate the effects of admixtures on physical properties of concrete.
   3. Design the concrte mix.

Practicals: (At least eight to be performed)
   1. Study of properties of fine and coarse aggregates.
   2. Physical properties of cement.
   3. Effect of w/c ratio on workability (slump cone, compaction factor, V-B test, flow table)
   4. Effect of w/c ratio on strength of concrete,
   5. Mix design in laboratory
   6. Non destructive testing of concrete – some applications (hammer, ultrasonic)
   7. Secant modulus of elasticity of concrete & indirect tensile test on concrete.
   8. Study of admixtures & their effect on workability and strength of concrete.
   9. Modulus of rupture of concrete.
   10. Permeability test on concrete.
   11. Tests on polymer modified concrete/mortar.
   12. Tests on fiber-reinforced concrete.

Report on experiments performed as detailed above shall be submitted as laboratory work.
Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
   (i)   Attendance in Laboratory/Tutorial = 20%,
   (ii)   Journal/Drawing sheet/Sketch book = 40%,
   (iii)   MCQ/Oral/Test = 40%.

Text Books:
   1. R. Santhakumar (2006), "Concrete Technology", Oxford University Press (Rs), Isbn 0195671537, 771 p.
   2. Shetty M. S. (30 November 2000), "Concrete Technology - Theory And Practice", S Chand & Co Ltd, Isbn 8121903483, 658 p.

Reference Books:
1. O.P. Jain & Jaikrishna (2007), "Plain & Reinforced Concrete -Vol. I", Nem Chand & Brothers Isbn 8185240086.
2. A. M. Neville (2012), "Properties Of Concrete", Trans-Atlantic Publications, Inc., Isbn 0273755803, 846 p.
3. Relevant I.S. Codes.
4. Special Publication Of Aci On Polymer Concrete And Frc:
5. Proceedings Of International Conferences On Polymer Concrete And Frc

SEMESTER-IV	CLASS: S.Y.B.Tech. (Civil)	
CODE: BTC279	COURSE: Building Design and Drawing – I	
Prerequisites	BTC231	
Period per week (each of 60 minutes)	Lecture	--
	Laboratory	03
	Tutorial	---
Scheme of Evaluation		Hours	Marks
	In Semester	--	--
	End Semester*	--	--
	In Semester Evaluation	--	50
	TOTAL	---	50

Course Objectives:
Students will learn to:
1. Interpret various types of building drawings.
2. Prepare and analyze plans of various types of residential building considering the functional requirements with respect to building rules, regulation and bylaws, Building codes

Course Outcomes:
At the end of this course, the students will be able to
1. Understand & interpret the drawings.
2. Transform their ideas to create plans and designs for various types of building.
3. Convert design parameters, process details into 2D and 3D views.

Term Work:
The term work shall comprise of:
- A₃ size practice sheet which includes, lines, their thicknesses and application in building drawing, Symbols, Commonly used symbols and conventions for Electric fittings, Water supply, Sanitary, Furniture, Material of construction etc and line plan for any type of building.

- Planning and design of two residential buildings designed as

1. Load bearing structure having ground plus one floor with pitched roof
2. RCC framed structure having ground plus one floor

One A1 size drawing sheets- Working Drawing, drawn independently for the two structures designed as mentioned above, showing following details drawn to scale as per standard practice: site plan, ground floor plan, first floor plan, elevation, section, door and window schedule

One A1 size drawing sheet – Detailed Drawing, drawn for the two structures designed as mentioned above, showing following details drawn to scale as per standard practice: roof plan

and its section, foundation plan and its section, stair and its section, typical door and window details including section, and any other specific detail

Assessment criteria for laboratory/Tutorial work. i.e. weightage for assessment shall be as follows:
  (i)   Attendance in Laboratory/Tutorial = 20%,
  (ii)   Journal/Drawing sheet/Sketch book = 40%,
  (iii) MCQ/Oral/Test = 40%.

Recommended Books:
  1. M.G. Shah, C.M. Kale, S.Y. Patil (2011) ; "Building Drawing with an Integrated Approach to Built Environment" McGraw Hill Education (India) Private Limited; ISBN-13: 978-0071077873. 408p.
  2. V.B. Sikka (2013); "A Course in Civil Engineering Drawing" S.K. Kataria & Sons; ISBN-13: 978-9350142721. 550 p.
  3. Dr.N.Kumara Swamy & A.Kameshwara Rao (2012); "Building Planning & Drawing" Charotar Publishing House. ISBN-13: 978-9380358581. 434 p
  4. Rangwala (2013); "Town Planning" Charotar Publishing House Pvt. Ltd. ISBN-13: 978-9380358680. 344 p**.**